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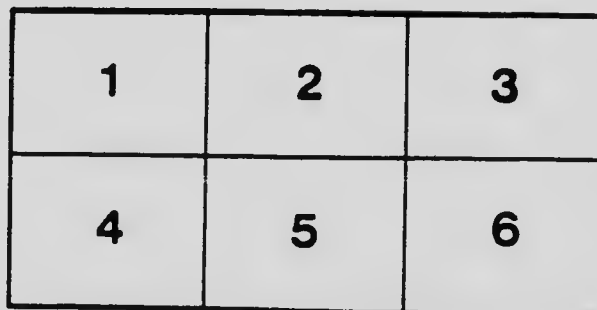
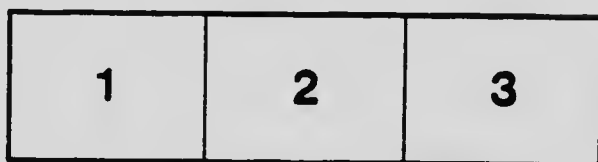
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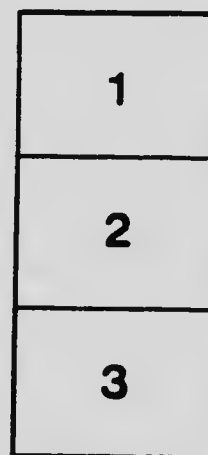
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1862

**SURGICAL THERAPEUTICS**  
**AND**  
**OPERATIVE TECHNIQUE**



SURGICAL THERAPEUTICS  
AND  
OPERATIVE TECHNIQUE

BY  
E. DOYEN

*ENGLISH EDITION*

PREPARED BY THE AUTHOR IN COLLABORATION WITH

H. SPENCER-BROWNE, M.B. CANTAB., ETC.

ÉLÈVE DE L'INSTITUT PASTEUR; PHYSICIAN TO AND CHIEF DE CLINIQUE DE L'INSTITUT DOYEN

VOL. III.

REGIONAL SURGERY (*Continued*)

OPERATIONS ON THE ABDOMEN

TORONTO  
THE MACMILLAN COMPANY OF CANADA, LTD.

1920

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## TRANSLATOR'S PREFACE.

This volume, which completes the English edition of his published works prepared by Dr. Doyen, requires a few words of introduction. The long and regrettable delay between the appearance of Volumes II. and III. was caused by the sudden death of the author and my subsequent enforced absence in other military hospitals. This rendered the preparation of Volume III. an impossible task for many months; all my notes were stored away, and had to be sought out after the Armistice from an almost inextricable confusion. Grave delay was the result, and the work was only completed at a recent date.

The present volume is divided into two sections. In the first, devoted to the surgery of the abdomen, the author has incorporated a résumé of his researches into the physiology of the stomach and gastric digestion. This work was originally published in a separate volume.

The much discussed treatment of visceral cancer by a vaccine composed of the dead bodies of the *Micrococcus neoformans* has also been described in connection with surgery of the stomach and intestines, as its efficiency was found to be more pronounced in restoring the permeability of an intestinal cancerous stricture than in other parts of the body. A preface is the last place in which to introduce controversial matter; but, in justice to an eminent man who is now no more, I would like to correct one erroneous impression which is prevalent concerning Doyen and the question of the origin of cancer. It is true that he leaned to the microbial theory as to its origin, and was wont to point to the undoubted improvement gained in certain cases of intestinal cancer by his vaccine. But, at the time of his death, Doyen regarded the problem of the origin of cancer as unsolved.

His researches were continuous on the subject, and though greatly hampered by the war, were only interrupted by his death.

Attention is drawn to the many excellent drawings and photographs taken from sections of the frozen body and the interesting anatomical relations which these sections reveal.

The second part of the volume contains much that is of historical interest in vaginal surgery. Amongst many other operations, Poyen did much to simplify the operation of vaginal hysterectomy; in fact, there are few operations in this region which do not bear the stamp of his genius. The last pages of this volume were not personally reviewed by him, but I am satisfied that nothing essential has been omitted.

Bringing to its close the arduous work of preparing these volumes for the press, I crave the usual indulgence for the translator, whose task is always invidious, since he can do justice neither to his author nor to himself. But the work is not in vain if I have been able to quicken the interest of the English-speaking profession in an original genius whose influence was great in contemporary surgery.

H. SPENCER-BROWNE.

29, RUE PIERRE CHARRON,

PARIS.

Jan., 1920.

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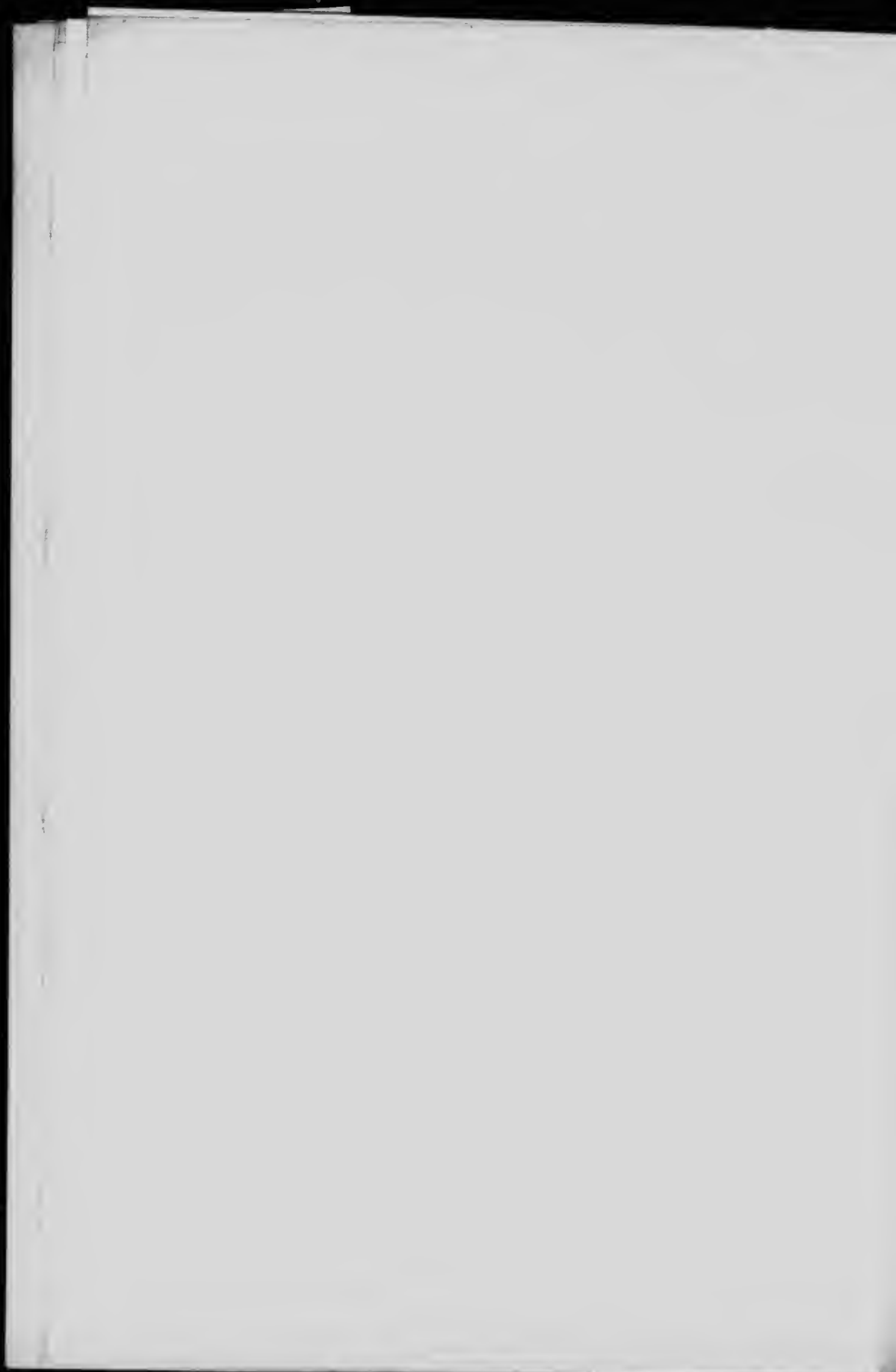
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# SURGICAL THERAPEUTICS AND OPERATIVE TECHNIQUE

VOL. III.

REGIONAL SURGERY (*Continued*)

**OPERATIONS ON THE ABDOMEN**  
GENERAL TECHNIQUE EMPLOYED IN LAPAROTOMY

## **INCISION AND REPAIR OF THE ABDOMINAL WALL**

### **INCISION OF THE ABDOMINAL WALL.**

THE abdominal cavity is almost always approached in the antero-lateral region. The most usual incisions are the following:

#### **A. Median Supra-umbilical Incision.**

This incision is convenient as a means of approach to the stomach and retro-omental cavities. In many cases it is necessary to prolong the incision 2 or 3 centimetres beyond the umbilicus. The incision passes to the left of the umbilicus in order to avoid the umbilical vein. Since this vein is rarely permeable, I consider that it is not of primary importance whether the incision passes to the left or to the right. In order to assure perfect asepsis of the peritoneum the following technique should be employed:

#### *Preliminary Precautions.*

*Toilet of the Skin.*—The patient is shaved and takes a bath. The skin is washed first with soap and hot water, then with ether and a 2 per cent. solution of formol in alcohol. The region is covered above, below, and on either side of the line of incision with four sterilized towels.

**Operation**—FIRST STAGE: *Incision of the Skin and Cellular Subcutaneous Tissues.*—The skin and subcutaneous fatty layer are incised boldly with the scalpel between the two lateral towels, the incision reaching to the aponeurosis.

## 2 SURGICAL THERAPEUTICS AND OPERATIVE TECHNIQUE

**SECOND STAGE: Protection of the Field of Operation.**—The edges of the two lateral towels are folded over the edges of the skin incision, and are fixed thereto by means of four or five hooked forceps on each side.

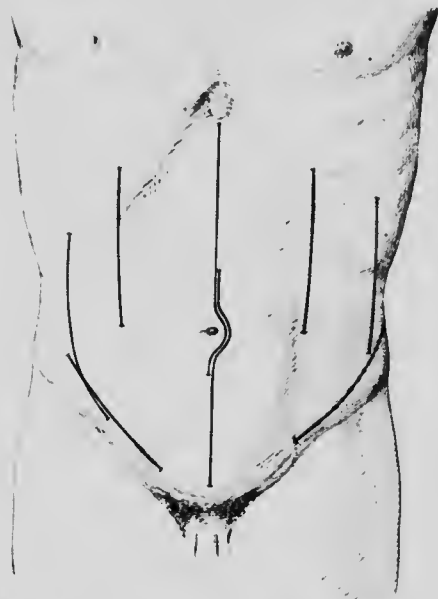


FIG. 1.—SCHEMA OF DIFFERENT INCISIONS FOR LAPAROTOMY.

At each extremity of the incision the lateral towels are joined together and to the subjacent towels by means of several Doyen's ringed forceps with oblique claws (Vol. I., Figs. 181, 313, and 315). The skin of the patient is thus completely excluded from the field of operation.



FIG. 2.—SECTION OF THE ABDOMINAL WALL IN THE SUPRA-UMBILICAL REGION WHERE THE WIDTH OF THE LINEA ALBA VARIES FROM 10 TO 15 MILLIMETRES.

**THIRD STAGE: Incision of the Linea Alba.**—The linea alba from the xiphoid sternum to a point several centimetres below the umbilicus is several millimetres wide, and it is possible to incise it without opening the straight muscular sheath. The blade of the scalpel which has served for the skin incision may be contaminated with epidermal debris infected with microbes, and should be changed for a sterile scalpel for the incision of the aponeurosis.



Ringed forceps are then placed on the lips of the aponeurotic incision, and the peritonium is incised. This is seized by the same forceps. The field of operation is surrounded with aseptic compresses, large or small as occasion requires. These compresses are introduced into the serous cavity, care being taken to attach to the end of each a hooked forceps.

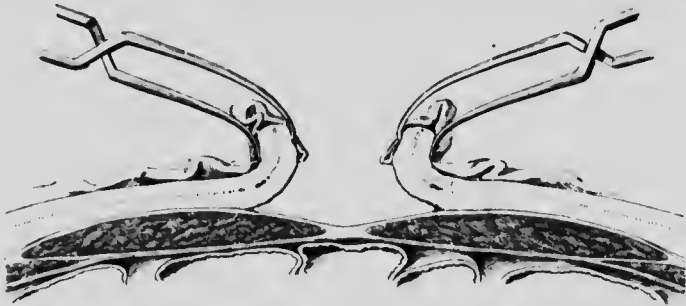


FIG. 3.—SECTION OF THE ABDOMINAL WALL IN THE SUPRA-UMBILICAL REGION WHERE THE WIDTH OF THE LINEA ALBA VARIES FROM 10 TO 15 MILLIMETRES.

The skin and subcutaneous cellular tissue are incised. The aseptic towels are fixed to the edges of the incision with hooked forceps.

Traction never opens the teeth of these forceps; it is therefore impossible to leave a compress in the abdominal cavity of the patient, when they are methodically employed.

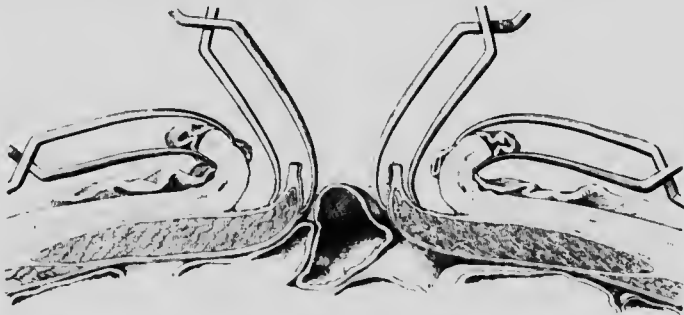


FIG. 4.—SECTION OF THE ABDOMINAL WALL IN THE SUPRA-UMBILICAL REGION WHERE THE WIDTH OF THE LINEA ALBA VARIES FROM 10 TO 15 MILLIMETRES.

The linea alba and the parietal peritoneum are seized with two other hooked forceps which serve as tractors and retractors.

### B. Median Subumbilical Incision.

This is the incision generally used in gynaecology. In male subjects it is used to reach tumours in the lower part of the small intestine (which are rare), and for the removal of tumours of the first part of the rectum.

#### 4 SURGICAL THERAPEUTICS AND OPERATIVE TECHNIQUE

This incision can also be used in male subjects for the performance of a superior ileo-rectal anastomosis in cases of cancerous occlusion of the sigmoid flexure. The patient is usually placed in the Trendelenburg position, the incision terminating a few centimetres below the umbilicus.

The technique of the first and second stages—viz., skin incision and protection of the field of operation—is the same as described above for the supra-umbilical incision.



FIG. 5.—SECTION OF THE ABDOMINAL WALL IN THE SUPRA-UMBILICAL REGION WHERE THE WIDTH OF THE LINEA ALBA VARIES FROM 10 TO 15 MILLIMETRES.

The incision may pass on either side of the umbilicus.

**THIRD STAGE.**—Owing to the fact that the disposition of the linea alba changes in this region, the technique of the incision and repair of the abdominal wall is different.

*Incision of the Linea Alba.*—In the lower four-fifths of the subumbilical region the rectus muscles are joined together in the middle line by their inner borders, which are very thick. Between the two muscles is a thin aponeurotic partition, which extends from the junction of the two anterior aponeuroses to that of the two posterior. These are reduced to a thin fibrous

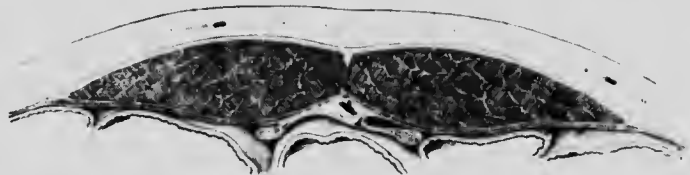


FIG. 6.—HORIZONTAL SECTION OF THE ANTERIOR ABDOMINAL WALL IN THE SUBUMBILICAL REGION.

The rectus muscles are only separated from one another by a thin aponeurotic partition. The incision opens one of the two muscular compartments.

layer. In fact in the lower four-fifths of the subumbilical region the greater part of the fibrous fascia of the united great and small oblique pass in front of the rectus. It follows that the bistoury must necessarily open the sheath of either rectus.

The sheath of the rectus is incised, in suturing, to obtain a better coaptation of surfaces.

Two hooked forceps draw outwards the edges of the aponeurotic incision,



FIG. 7.—HORIZONTAL SECTION OF THE ANTERIOR ABDOMINAL WALL IN THE SUBUMBILICAL REGION.

The skin is incised. The aseptic towels are fixed to the edges of the wound with hooked forceps.

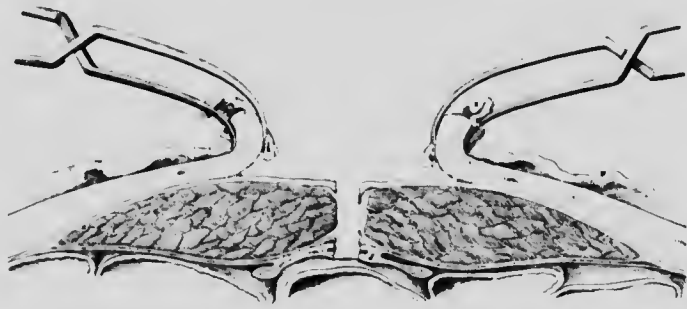


FIG. 8.—HORIZONTAL SECTION OF THE ANTERIOR ABDOMINAL WALL IN THE SUBUMBILICAL REGION. INCISION OF THE MUSCULAR APONEUROTIC WALL.

Care has been taken to open the sheath of the rectus muscles.

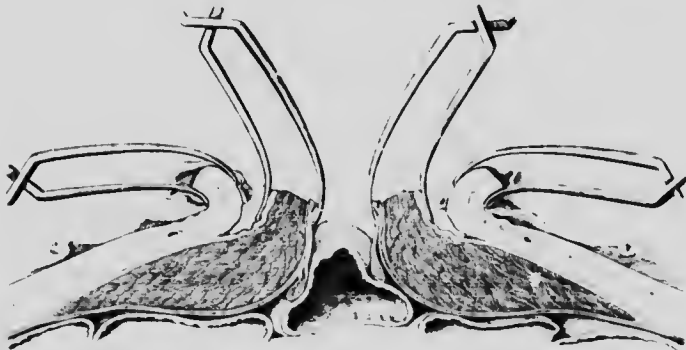


FIG. 9.—APPLICATION OF THE HOOKED FORCEPS ON THE MUSCULAR APONEUROTIC WALL.

## 6 SURGICAL THERAPEUTICS AND OPERATIVE TECHNIQUE

and the peritoneum is now reached. This is opened to the necessary extent. Aseptic compresses are introduced around the wound, care being taken to fix to the extremity of each compress a hooked forceps. The intraperitoneal manipulation can then be carried out.

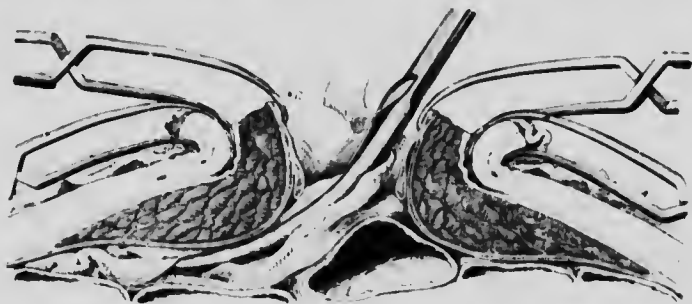


FIG. 10.—A LONG CURVED FORCEPS INTRODUCES A COMPRESS UNDER THE LEFT EDGE OF THE INCISION.

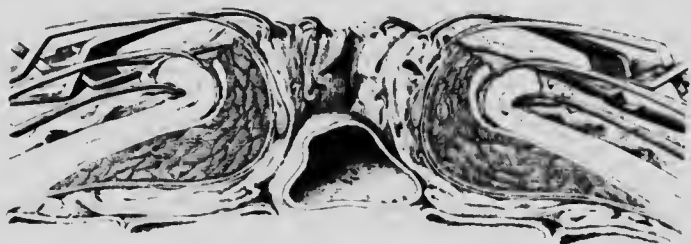


FIG. 11.—THE PERITONEAL CAVITY IS PROTECTED BY COMPRESSES, TO EACH OF WHICH A DOYEN'S HOOKED FORCEPS IS FIXED.

### C. Vertical Incision in the Mammary Line.

This incision is used, on the right side to reach lesions of the liver and bile-ducts, on the left side to reach the greater curvature of the stomach, the tail of the pancreas, and the spleen. We shall see that in operations on the spleen and liver the incision must be carried higher, cutting through the last costal cartilages. This vertical incision of the tenth costal cartilage, followed by that of the ninth, eighth, and seventh, gives a good view in the depths of the wound without damaging the diaphragm and without exposing the pleural cul-de-sac. The same aseptic precautions are observed as described above. The incision passing outside the rectal sheath, three successive muscular planes are traversed. The section of the muscular planes should always be performed with a second bistoury, since the blade of the bistoury which has served for the skin incision is generally contaminated with epidermal debris. This epithelial debris is

infected with microbes, present in the skin, which for the most part are pathogenic. Where the rectal sheath is wide the mammary or juxta-mammary vertical incision may open the external part of the rectal sheath of the same side.

#### D. External Vertical Incision.

The line of this incision passes, below, slightly to the inner side of the anterior superior iliac spine; above, it may encroach upon the last costal cartilages, to reach the right lobe of the liver or the spleen.

The same incision, below the costal cartilages, and curved along the line of the crural arch, is useful for transperitoneal nephrectomy, to reach the ascending colon, the hepatic and splenic flexures, and the descending colon. By means of this incision extirpation of the ileum, the cæcum, the ascending colon, the hepatic flexure, and part of the transverse colon, can be carried out on the right side. The same aseptic precautions are observed as described above. The bistoury traverses the three lateral musculo-aponeurotic planes.

#### E. Iliac Incision.

This is the best incision for inferior lateral laparotomy. It is made parallel to and 2 or 3 centimetres above the crural arch. The length of the incision varies according to the particular indications in each case. I have altogether abandoned the vertical incision at the external border of the rectal sheath in order to reach the iliac fossa. This gives much less light than the iliac incision, and gives also much less facility for drainage in cases of periappendicular or pelvic suppurations.

The bistoury meets, above the crural arch, the aponeurosis of the great oblique, the great oblique muscle, the small oblique, and the transverse aponeurosis, then the transversalis fascia and the peritoneum.

The iliac incision, as well as the external vertical incision described above, with which it can be combined, gives equal facility of approach both to the peritoneal cavity and the lateral retroperitoneal region.

For example, in the case of a lesion of the kidney, the vertical external subcostal incision opens the peritoneum and facilitates completion of the diagnosis. The external peritoneal sinus is then detached from the abdominal wall, and the kidney is reached. The incision can then be prolonged downwards above the crural arch, in order to reach the pelvic portion of the ureter.

The iliac incision gives access to the cæcum and appendix, in the absence of adhesions. Periappendicular and encysted intraperitoneal phlegmons can also be opened. The same applies to iliac abscesses proper, which are situated between the peritoneum and the iliac fascia; abscesses in the sheath of the psoas muscle, which are situated below the iliac fascia; and subperiosteal iliac cold abscess.

## REPAIR OF THE ABDOMINAL WALL.

## 1. Sero-musculo-aponeurotic Suture.

The repair of the abdominal wall should be carried out in so perfect a manner that the patient is not in any way inconvenienced by the laparotomy.

The general technique of the repair of the abdominal wall should follow the same principles as those governing the technique of the repair of all musculo-mucous and entaneo-mucous walls. All procedures which do not assure a wide affronting surface should be abandoned. Amongst other defective procedures, I should mention the old suture in one plane with thick silver threads.

In the majority of persons operated on in this manner the suture yielded after a few months, and the intestine formed a hernia under the skin.

In our dissection of the repair of these post-operative eventrations, it will be seen that the technique is practically the same as that of the suture of the abdominal wall in stages.

I will here describe the repair of the abdominal wall:

1. In the supra-umbilical region, where the linea alba is wide.
2. In the subumbilical region, where the sheath of either rectus is always opened, and where we find in the middle line an anterior aponeurosis, the muscular plane, a posterior aponeurosis, and the peritoneum.

## A. Median Supra-umbilical Region.

When the two edges of the linea alba can be easily approximated—*i.e.*, where there is no fear of any dragging on the line of sutures—separate sutures or a simple continuous suture can be used, uniting at once the peritoneum and the aponeurosis.

The suture which I prefer is made with interrupted sutures of silk placed alternatively—that is to say, the first taking the serous, muscular, and aponeurotic layers, and the next the aponeurosis alone. The coaptation of the edges should be perfect. Should, however, catgut be preferred, a spirally arranged continuous suture can be employed, the turns being alternately superficial and deep. This suture is arranged as in Fig. 13. The needle pierces at first both edges of the aponeurosis at one end of the incision, and the thread is stayed with a preliminary knot. The needle then takes in the peritoneum alone, and afterwards, on the opposite side, peritoneum and aponeurosis. The suture continues with a superficial spiral, taking in the aponeurosis alone; the needle then pierces the peritoneum on the same side as in the first manœuvre, from without inwards, and issues on the opposite side from within outwards, traversing *en route* peritoneum and aponeurosis.

When the thread is drawn tight, the surface of coaptation of the edges of the aponeurosis is very extensive, as is shown in Fig. 14. Should,



FIG. 12.—SCHEMATIC SECTION OF AN ILL-CONCEIVED REUNION OF THE SERO-APONEUROTIC WALL IN THE SUBUMBILICAL REGION. THE SUTURE TAKES THE PERITONEUM AND THE APONEUROSIS OF THE LINEA ALBA "EN MASSE."

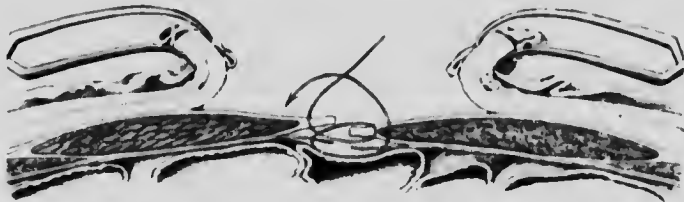


FIG. 13.—DOYEN'S SPIRAL SUTURE WITH ALTERNATIVE SUPERFICIAL AND DEEP TURNS.



FIG. 14.—DOYEN'S SUTURE DRAWN TIGHT. COAPTATION OF THE SERO-APONEUROTIC LAYER OVER A WIDE SURFACE.

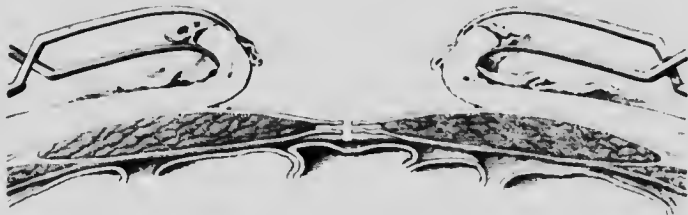


FIG. 15.—UNSHEATHING OF THE LINEA ALBA ON THE RIGHT AND THE LEFT OF THE MEDIAN INCISION IN ORDER TO ENSURE A WIDER COAPTATION.

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however, the suture be made *en masse*, as shown in Fig. 17, coaptation is imperfect, and the suture has no assurance of solidity for the future.

To make the final knot, the surgeon slips the last loop of catgut over the index and middle fingers of the left hand, whilst he takes the end of the thread, from which the needle has been removed, between the thumb and index finger of the right hand. The last spiral should be drawn tight,



FIG. 16.— UNSHEATHING OF THE LINEA ALBA ON THE RIGHT AND THE LEFT OF THE MEDIAN INCISION IN ORDER TO ENSURE A WIDER COAPTATION. DOYEN'S SUTURE WITH ALTERNATIVE SUPERFICIAL AND DEEP TURNS ASSURING THE REUNION ON A LARGE SURFACE.

this being done by drawing on the two ends of the loop which are held by the left index and middle finger. When thus drawn tight, it is knotted with the end of the suture which is held in the right hand.

A more solid suture can be effected than that which is indicated in Fig. 13. For this the sheath of the rectus must be opened on either side, unsheathing the linea alba (Fig. 15). Spiral continuous suture, as



FIG. 17.— SCHEMA OF A DEFECTIVE REUNION SUCH AS WOULD BE OBTAINED BY THE SUTURE "EN MASSE" AND WITH INTERRUPTED SUTURE.

already described, is then carried out. The suture is first fixed taking in the aponeurosis simply, then from before backwards the muscle, the posterior aponeurosis and the peritoneum, are traversed, and afterwards on the opposite side the needle perforates from before backwards the peritoneum, posterior aponeurosis, muscle, and anterior aponeurosis. The next turn of the suture takes the aponeurosis only, and so on (Fig. 16).



### B. Subumbilical Region.

We have noticed in our description of the median subumbilical incision that one of the rectus sheaths is opened without exception. If it should be noticed that the line of reunion be not thick enough, the sheath of the muscle on the opposite side should be opened as shown in Fig. 18.

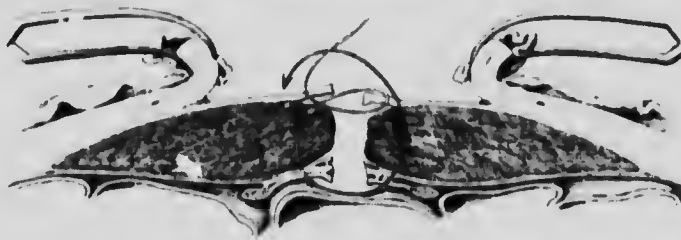


FIG. 18. SUBUMBILICAL REGION. DOYEN'S SPIRAL SUTURE WITH ALTERNATIVE SUPERFICIAL AND DEEP TURNS.

The old method of suture *en masse*, a procedure which attenuates the line of reunion without assuring the proper coaptation of the corresponding layers, gives, as a rule, deplorable results. Layer by layer, using Doyen's continuous spiral suture, the anterior aponeurosis, the muscle, the posterior aponeurosis, and the peritoneum, should be joined together. This is



FIG. 19.—SUBUMBILICAL REGION. DOYEN'S SPIRAL SUTURE WITH ALTERNATIVE SUPERFICIAL AND DEEP TURNS. DOYEN'S SUTURE IS DRAWN TOGETHER. THE MUSCULAR APONEUROTIC COAPTATION IS MADE ON A LARGE SURFACE.

accomplished, as we have already described, by a continuous suture, whose spiral turns are alternately superficial and deep. This suture accomplishes the coaptation of the layers where they are very thick. The superficial turns, causing overlapping of the superficial aponeurosis, assure the perfect solidity of the line of reunion.

### C. Lateral Abdominal Region.

At times the wound is completely sutured, at others it is incompletely sutured, either because a deeply seated organ is fixed to the edges of the

wound—*e.g.*, the gall-bladder—or because an opening is left for partial plugging of the serous cavity. In this case at least two silk sutures should be placed above and below the compress which is used as a tampon. If the incision is extensive the wound should be sutured between the silk suture and the commissures of the incision, by means of Doyen's method of a spiral suture, with alternate superficial and deep turns.

**Security Sutures.**—Should the tension on the suture line appear to be dangerous, one or two No. 11 silk sutures should be placed about the middle or the middle two-thirds of the wound. These "security sutures" should traverse, first, on the side of the operator, the skin and all the underlying tissues including the peritoneum, and should emerge on the other side, having also traversed the whole of the wall from peritoneum to skin. Care must be taken that these silk sutures are not stretched tight whilst the original suture is being made, since this may lead to pinching of an intestinal loop. It is necessary to place these sutures before commencing the principal suture, their extremities being fixed by short-nosed forceps. When the suture arrives at the level of the first "security suture," it is drawn tight, and held tight by an assistant whilst the surgeon draws the thick silk suture first to the right and then to the left in order to stretch it perfectly. These security sutures are not tied until the suture of the skin is finished.

## 2. Skin Sutures.

I prefer to use Michel's metal clips. Silk and Florentine hair are reserved for cases where the skin is too thick, and where there is traction on the line of union, due to the tension or lack of tissue in the abdominal walls.

When it is necessary to leave a compress placed deeply, two sutures should be placed, one above and one below the compress. These sutures are arranged as follows: The first should take in the sero-musculo-aponeurotic layers; the second the whole thickness of the abdominal wall, skin included.

It is rarely necessary to drain the tissues comprised in the thickness of the abdominal wall.

**Dressing.**—The line of suture is carefully sponged dry; it is then sponged with a compress soaked in a 2 per cent. solution of formalin in alcohol. The wound is then covered with a dry sterilized compress, which is covered in its turn with a square of Vigier's plaster. This assures complete occlusion of the wound.

**Lateral Drainage.**—Should the wound be plugged, a compress is arranged to pass outside the occluding plaster. This conducts serous or purulent discharges outwards into the exterior dressings. The abdomen is covered with a square of gutta-percha, and ice-bags are placed over the anterior abdominal region. The serous discharge from the abdomen drains by means of the compress, passes beneath the gutta-percha, and is absorbed by

means of aseptic cotton, placed on either side and kept in place by means of a body bandage.

**Removal of Sutures and Clips.**—Metal clips can be loosened after the fourth day. They are removed on the sixth or eighth day.

The deep security sutures are left until the tenth or twelfth day. Modification of these rules is indicated in certain cases, especially where deep compresses have been left *in situ*. Should these compresses give rise to reflex irritation, with peritoneal symptoms, they must be changed on the second or third day; in the absence of any disturbance they are left in place for four to five days, when the closure of the peritoneum appears to be certain.

## OPERATIONS ON THE ABDOMINAL WALL.

### TRAUMATIC LESIONS

#### Wounds and Contusions of the Abdomen.

##### 1. Contusions.

Contusions of the abdomen are superficial or deep. Superficial contusions present the same aspects as contusions in general. They accompany abdominal wounds caused by bruising bodies, or they result from traumatism.

Deep contusions can be accompanied by tearing of the various abdominal viscera. In practice, if we have to do with a contusion of the abdomen, we should always bear in mind the possibility of a deep contusion also. And, indeed, though the presence of a large bruise may correspond with a simple contusion of the abdominal wall, some deep contusions do not betray themselves upon the surface by any appreciable sign. The general aspect of the patient is of the greatest importance in these cases. When the patient is not in a marked condition of stupor, the consequences are rarely grave. This condition of stupor is characteristic. It rests on the fact that the contused surfaces are extensive, and that the abdominal viscera are widely implicated. Where the patient's aspect is not disquieting we probably have to do with a light contusion. The urine and dejecta must nevertheless be examined for traces of blood. The abdomen is carefully and methodically palpated to see if any localized tenderness or pain exists, showing that such or another organ has been implicated. The state of the pulse must be judiciously interpreted; it is but slightly modified in light contusions, and should it fail for the moment, it is soon re-established.

Treatment of light contusions consists of absolute rest, careful regulation of the diet, and the application of ice to the abdomen.

Where the patient exhibits signs of intense shock, and is in a condition

of stupor, we have certainly to deal with a grave contusion. Here again there are degrees. If the pulse is still perceptible, even though it beats feebly, and should the patient not have lost consciousness, as soon as the methodical examination is made as described above, large doses of artificial serum must be injected to restore his strength. Caffein and spartein are also given in hypodermic injection. The patient is then kept fasting. Ice-bags are placed on the abdomen and the case is attentively watched, preparation being made for surgical intervention should the symptoms declare themselves.

The gravest cases are those where the patient falls unconscious at the moment of the accident, when the pulse is filiform and uncountable, and the nervous shock is considerable. A certain number of these cases inevitably die. What can be done to try to save them? It should be remembered first of all that *during the period of initial nervous shock, where the pulse is depressed, a patient supports surgical operation very badly.*

The general condition must therefore be improved by every possible means. Hot fomentations are used to warm the patient, and he is surrounded with hot bottles covered with flannel. The limbs are wrapped in hot blankets. These precautions do not exclude the application of ice to the abdomen, which is intended to bring about purely local refrigeration. Injections of caffein, camphorated oil, and artificial serum should be carried out. The moment that consciousness is returned, an opportune moment should be chosen for operation. I should remark here that operation is not always necessary; indeed, the early prostration of the patient is not a certain indication that a deep lesion exists. It is possible that the prostration be due to nervous disturbance caused by the accident; in these cases the pulse soon becomes normal. It is not difficult to be sure that a grave lesion exists, on considering the facies of the patient, the paleness of the mucous membranes, and the state of the pulse.

In case of rupture of the intestine the pulse becomes peritoneal in character (small rapid pulse), the eyes are sunken, the nose is pinched, respiration is uneasy, and there is a tendency to vomit. In simple internal hæmorrhage the pulse is small and rapid, the mucous membranes are pale, but the general condition is less disquieting at the commencement of peritoneal hæmorrhage than in acute peritonitis. Where the facies is bad, and the pulse shows a tendency to become feeble, operation should take place before the first twelve hours have passed.

To these peritoneal signs we can add those of hæmaturia, and lumbar infiltration of urine, which indicate a lesion of the kidney or the bladder. If the patient has not passed water, the bladder must be catheterized. Lastly, it must not be forgotten that contusions of the abdomen are sometimes accompanied by fracture of the pelvis.

When operation is decided upon, a laparotomy must be performed. Anæsthesia is commenced with ethyl chloride, and continued with chloroform. The patient being in the horizontal position, the abdomen is opened in the middle line from the umbilicus to the pubis. Should no abdominal effusion be found, the edges of the wound should be lifted with

retractors to allow rapid exploration of the deep parts in predetermined order; first the false pelvis, afterwards the right iliac fossa, the right flank, and the subhepatic region, then the left iliac fossa, the left flank, and the gastro-splenic region. Should nothing be found, the abdomen is closed. This operation, carried out with aseptic precautions, is not dangerous.

If liquid be found, all the regions of the abdominal cavity should be carefully sponged in the order described above. Dry compresses are left in the parts already examined, whilst the other regions are explored. It may be necessary to prolong the incision upwards as far as the xiphoid appendix. The operation has only a chance of success if it is performed before the appearance of abdominal distension. Lavage of the peritoneum is only indicated when aseptic blood is present; *if there is the slightest trace of intestinal perforation and infection, lavage of the peritoneum is highly dangerous, since it only serves to disseminate pathogenic microbes.*

Should a lesion be found in the intestine, a sero-serous suture should be applied, even if the lesion is superficial. Should the tear be more extensive or complete, it must be sutured, provided that the condition of the patient allows of this intervention. In cases where there is necessity for haste, a temporary artificial anus is established. This is made at the most convenient point, either in the pubic region, or by means of a specially made lateral orifice, by means of which the wounded intestinal loop is drawn outside, and kept in place by a compress which traverses its mesentery.

Rupture of the gall-bladder is treated by plugging and suture to the abdominal wall. Rupture of the principal ducts is treated also by means of plugging, or in the case of the cystic duct by ligature, provided that a temporary fistulous opening is made into the gall-bladder.

Tearing of the liver is treated either by plugging or sutures, according to the extent of the injury. Should the spleen be ruptured, it can be removed after ligature of its pedicle; it is well known that removal of the normal spleen, in cases of traumatism, is remarkably inoffensive. Drainage should be assured by means of aseptic glass drains, either by the perineal route to drain the true pelvis, or in the flanks for the higher peritoneal regions. The pouch of Douglas can be drained by a right iliac incision, such as is made in the operation for appendicitis.

Following the operation, the suture is covered with aseptic gauze fixed by Vigier's plaster; over this are placed five long-shaped ice-bags, reaching from the pubis to the epigastrium. A laterally placed compress serves for drainage. The diet consists solely of fluids: injections of serum, caffeine, spartein, etc., and some slight stimulant after twenty-four hours may be given, if the patient shows no tendency to vomit.

## 2. Wounds.

Wounds of the abdomen are caused by stabbing, cutting, or bruising instruments, or by gunshot or shell wounds. They are divided into two classes, *non-penetrating* and *penetrating*, according to whether or not they

penetrate the peritoneal cavity. The narrower the orifice of penetration, the more difficult it is to decide whether we are in the presence of a penetrating wound. Clinical diagnostic signs, such as the escape of gas or faecal matter, are only seen after several days—too late for useful intervention.

All doubt is removed in cases of wound of the peritoneum where an epiploic fringe or intestinal loop is seen exuding from the wound. But in the absence of this sign, it is of absolute importance to know at our first examination if the wound is, or is not, penetrating. The aspect of the patient may be very deceiving in the case of a penetrating wound, above all where the wound is small. After a momentary fall of the pulse, and a passing pallor, the general condition may become restored, and since pain is not severe the patient for two or three days may seem to be out of danger. In this case the onset of septic peritonitis is insidious, and there is a great risk that surgical intervention may be too late.

Whatever the wounding instrument may be—stabbing, cutting, or bullet—it is always useful to be shown the wounding object where it is possible. In cases of gunshot wounds the arm and its ammunition should be examined.

A wound of the abdomen should never be probed; in doing so the patient is subjected to a much greater risk than he is when a laparotomy is performed. Where a gunshot wound has no orifice of exit, and the projectile rests in the body, a radiographic examination should be made.

Operation, then, is the rule. Indeed, it is only possible to be certain that the wound is superficial when the patient is anaesthetized and the cutaneous wound is enlarged. Where there is reason to believe that penetration has taken place, the procedure is the same as if wound of the peritoneum was an established fact. An anaesthetic is given, and the surgeon must prepare to perform a laparotomy.

To commence, the wounded part is included in a longitudinal incision. If the peritoneum is found to be intact, the wound is sutured with or without partial tamponing of the wound.

If penetration of the peritoneal cavity has occurred, a median laparotomy is performed, the preliminary exploratory incision being temporarily plugged. The abdomen having been opened, effused fluids must be carefully swabbed with compresses, care being taken to avoid dissemination in the serous cavity, and to protect, by means of large compresses, those parts of the abdominal cavity which have remained unaffected.

The original line of direction in the wall caused by the wounding instrument, which is recognized in making the incision, gives a general indication as to which organs may be wounded.

According to the organ injured—liver, spleen, intestine, or bladder—the injured part must be isolated as rapidly as possible. Perforations are sutured by preference. It must not be forgotten in the case of a gunshot wound, where the projectile has not completely traversed the patient, that the posterior seat of infection must be sought for and drained. It is therefore *indispensable*, in order to avoid secondary peritonitis, to seek the posterior orifice in the peritoneum, and should the projectile not be dis-

covered, a counter-opening should be made without hesitation in the posterior wall—that is to say, in the dorsal region, to allow of tamponing and drainage from behind.

Since the discovery of X rays the search for foreign bodies has become simplified. Radiography and radioscopy, therefore, should always be employed where possible when their employment does not occasion a dangerous delay.

Intervention in cases of revolver wounds or wounds caused by stabbing instruments should be carried out as soon after the accident as possible. Care should be taken to avoid all moving of the patient, since the shaking caused by transport can cause the effusion of visceral fluids into the peritoneal cavity.

When the abdomen has been closed the suture is covered with a sterilized compress, Vigier's plaster, and ice-bags. The same precautions are observed as in the case of laparotomy for abdominal contusions.

#### INFLAMMATORY LESIONS.

##### **Phlegmons and Abscess of the Abdominal Wall.**

Phlegmons and abscess of the abdominal wall exhibit the same well-known signs of superficial abscesses—redness, heat, tumefaction, shooting pains, and fluctuation.

Subaponeurotic abscesses occur frequently in the course of various microbial infections, such as the abscess in the sheath of the rectus in the course of typhoid fever.

Typhoid abscesses of the rectus muscle and of the abdomen are sometimes caused by Eberth's bacillus in a pure state. At others they are caused by secondary infection, by staphylococci, *B. coli*, etc.

The diagnosis of an abscess of the abdominal wall presents no difficulties as a rule to an experienced clinician.

**General Treatment.**—Mycolysine is administered by the mouth and by hypodermic injection, with the view of limiting the infection. This may arrest the development of the abscess. If pus collects, an operation is necessary.

**Operation.**—Incision of the seat of inflammation and evacuation of the pus, which is subjected to bacteriological examination. Injections of mycolysine.

The pus is frequently fetid in spite of the relative distance from the intestine. This characteristic has no grave prognostic significance.

## DEEP SUBPERITONEAL PHLEGMON AND ENCYSTED PERITONEAL ABSCESS.

Extraperitoneal suppurations and encysted peritoneal abscess are produced at the following seats of election: (1) Subphrenic abscess; (2) subumbilical abscess; (3) iliac abscess; (4) phlegmon in the cavity of Retzius, or prevesical phlegmon; (5) perinephritic abscess. The method of intervention is very alike in all these different cases. With the operation is associated subcutaneous medication by means of mycolysine.

## 1. Subphrenic Abscess.

Subphrenic abscess has often a slow and insidious progress. Under this heading are grouped all purulent collections produced in the immediate neighbourhood of the diaphragm which appear at the edge of the false ribs. In the author's experience of this form of abscess, several originated in the region of the superior suspensory ligament of the liver, others appeared to be encysted peritoneal abscesses commencing in an ulcer of the lesser curvature of the stomach. One contained a large fish-bone. Some of these collections may be very voluminous.

## 2. Subumbilical Phlegmon.

The collection of pus forms beneath the linea alba behind the rectus sheath. The tumefaction, which is practically in the middle line, stops at a variable distance above the pubis.

Incision should be made in the linea alba at the most fluctuating point, and the incision should be prolonged as far as the inferior limit of the abscess.

**Operation.**—Incision 5 or 6 inches long at the level where the abscess points. This takes in the whole abdominal wall as far as the peritoneum. The abscess is punctured with blunt-nosed scissors, which enlarge the orifice thus formed by divulsion. Evacuation of the pus is followed by aseptic tamponing and drainage. Lavage must not be carried out before the sixth or seventh day.

## 3. Iliac Abscess.

For a long time true subperitoneal phlegmon of the iliac fossa has been mistaken for abscess in the sheath of the psoas-iliac muscle, and also for encysted peritoneal collections in the region of the appendix. In describing purulent iliac collections, and starting from the deepest regions towards the surface, subperiosteal abscess should first be mentioned. This is generally a cold abscess, and, very exceptionally, due to an osteomyelitis of the internal iliac fossa. The purulent collection may be found to be localized above the periosteum, in the sheath of the psoas muscle (Fig. 21). It is then either an osseous cold abscess coming from tuberculous disease





FIG. 20.—SUBPERIOSTEAL COLD ABSCESS OF THE ILIAC FOSSA.

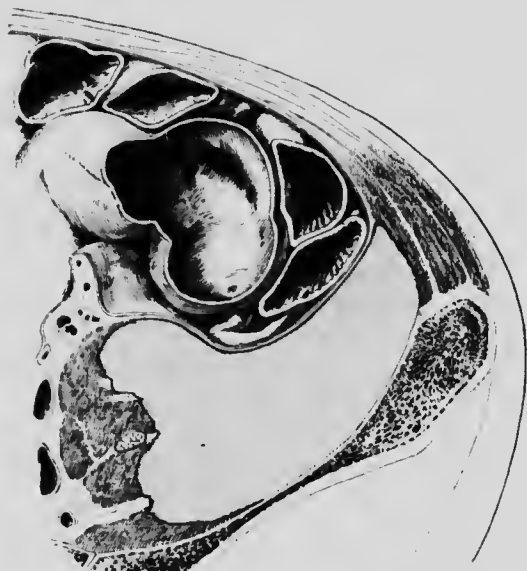


FIG. 21.—ABSCESS OF THE SHEATH OF THE PSOAS MUSCLE, BETWEEN THE FASCIA ILIACA AND THE PERIOSTEUM.

of the lateral parts of the bodies of the twelfth dorsal or first lumbar vertebrae, or an ordinary inflammatory abscess of the muscle, or a staphylococcal osteomyelitis. An abscess of this nature may be caused also by a lateral osteomyelitis of the same vertebral bodies. When the abscess lies above the iliac aponeurosis between the fascia iliaca and the peritoneum the origin is

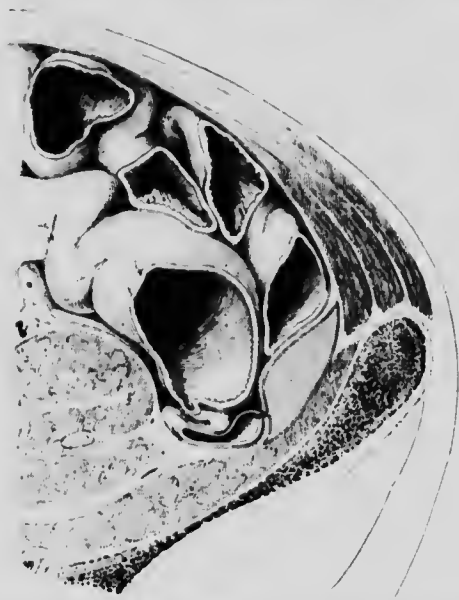


FIG. 22. SUBPERITONEAL/PERI-APPENDICULAR ABSCESS OF SMALL VOLUME.

generally appendicular. Often the appendix at the moment of perforation adheres to the parietal peritoneum, and the pus perforates the serous membrane penetrating into the cellular subperitoneal space, which it may strip to a certain extent from the transversalis fascia and the abdominal wall (Figs. 22, and 23). A peri-appendicular abscess may also form in the serous cavity, where it becomes encysted in the most external region of the iliac fossa.

*A. Congestion, Abscess, and Subperiosteal Abscess.*

Subperiosteal abscesses and abscesses caused by congestion of the internal iliac fossa are almost always tuberculous in nature. The former come from the iliac bone; the latter, on the contrary, occupy the seat of the iliac muscle, and arise in a vertebral lesion situated in the region of the muscle's attachments. These abscesses cause a considerable prominence above the crural arch, and contain a large quantity of pus. Very frequently a fluctuating swelling is observed, close to the small trochanter on the upper and inner side of the thigh.

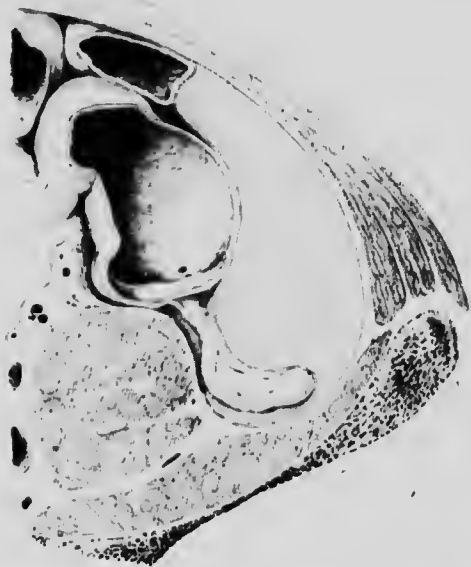


FIG. 23.—SUBPERITONEAL PERI-APPENDICULAR ABSCESS OF SMALL VOLUME.  
The collection has stripped up the parietal peritoneum for a considerable distance.



FIG. 24.—INTRAPERITONEAL ENCYSTED PERI-APPENDICULAR ABSCESS.  
The two lines show the point of incision.

**Operation—FIRST STAGE.**—Incision parallel to the crural arch, at the fluctuating point. The section of muscles should be made as close as possible to the arch in order to be sure of avoiding the peritoneum.

**SECOND STAGE.**—The upper edge of the superficial incision is pushed upwards by means of a compress, and the fluctuating wall of the abscess is made out; this is formed by the fascia iliaca.



FIG. 25.—ILIAC INCISION TO APPROACH ALL PERILENT COLLECTIONS IN THE INTERNAL ILIAC FOSSA. FIRST STAGE: INCISION OF THE SKIN.

**THIRD STAGE.**—The wall is punctured on the index finger by means of blunt-pointed scissors, the pus is evacuated, and the orifice thus made is enlarged by divulsion.

Tuberculous pus is usually serous in character, but slightly homogeneous, and contains characteristic fibrous clots. Search should be made to deter

mine whether the abscess is localized in the groove of the psoas muscle or if it is subperiosteal.

**Congestion Abscess.**—In cases of vertebral abscess all the sinuosities of the pouch must be followed out. It is often necessary to incise a crural



FIG. 26. ILIAC INCISION TO APPROACH ALL PURULENT COLLECTIONS IN THE INTERNAL ILIAC FOSSA. SECOND STAGE: SECTION OF THE SUPERFICIAL APONEUROSIS, GREAT OBLIQUE, AND TRANSVERSALIS.

At the bottom of the wound the fascia transversalis and the peritoneum can be seen.

prolongation at the level of the small trochanter, and occasionally a posterior prolongation also. It is possible that counter-openings will have to be made, behind and above, immediately above the sacro-iliac articulation.

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**Subperiosteal Cold Abscesses.**—In tuberculous osteitis of the internal iliac fossa the instrument pierces the sheath of the iliac muscle, perforates the periosteum, and the denuded osseous surface is felt by the finger at the bottom of the wound.

**FOURTH STAGE.**—Toilet of the abscess cavity and aseptic plugging. Anti-tuberculous vaccination by means of phymalose is the rule.

### *B. Psoitis.*

Suppuration in the sheath of the psoas seems to be very frequently caused by infectious osteomyelitis of the lateral portion of the bodies of the lumbar vertebrae. In practically every case which the author has had the opportunity to observe, the patients were young, and infected with the white or yellow staphylococcus. In collections of pus in the left iliac fossa, if painful retraction of the thigh with the limb in an attitude of semiflexion occurs among the symptoms, the diagnosis is rarely doubtful.



FIG. 27.—SUPPURATIVE PSOITIS. ILIAC INCISION. PUNCTURE OF THE FOCI WITH BLUNT SCISSORS, AND WIDENING OF THE ORIFICE BY DIVISION.

On the right side differential diagnosis must be made from pericæcal phlegmon. The slow and insidious onset and the history of the case suffice as a rule to make a distinction. Purulent collections in the sheath of the psoas present at the level of the crural arch.

**Operation—FIRST STAGE.**—Incision parallel to the crural arch at the point of greatest fluctuation.

**SECOND STAGE.** The peritoneum is pushed back by means of a compress, and the iliac fossa is revealed.

**THIRD STAGE.**—Puncture of the abscess cavity by means of blunt scissors, using the index finger as a guide; the pus flows out and the orifice is widened by divulsion.

**FOURTH STAGE.**—Evacuation of the abscess, tamponing, and drainage with large glass tubes. Microscopic examination of the pus; subcutaneous injections of mycolysine.

### *C. Iliac Phlegmon.*

Phlegmon of the iliac fossa, properly so-called, which lies in front of the fascia iliaca, is met with usually on the right side—*i.e.*, on the same side as the caecum.

Nowadays the etiology is well known. Whether a subperitoneal phlegmon or an iliac peritonitis is met with, the origin is almost always without exception an appendicitis. Whether the appendix be attacked by



FIG. 28.—DEEP PERITONEAL ENCYSTED PERI-APPENDICULAR ABSCESS. THE OPENING OF THIS ABSCESS NECESSITATES THE INCISION OF THE PERITONEUM.

a simple or calculous lymphangitis, whether a circumscribed appendix abscess is present or not, suppuration is localized according to nearness to the abdominal wall of the diseased portion of the organ. It is for this reason that appendices placed so that their highest extremity lies in the ceco-parietal sinus rarely occasion a generalized peritonitis.

With this fact established in the mind, it can be understood that true iliac phlegmon is often preceded by repeated attacks of appendicitis.

Once, however, pus has begun to collect the evolution varies greatly; it is rare not to observe in the first five or six days a deep painful and characteristic tumefaction.

Which is the proper moment for intervention? Before the days of antisepsis the surgeon was content to wait, in cases both of psoitis and true iliac phlegmon, until the pus reached the neighbourhood of the surface. But in modern times, provided that a proper technique is followed, the evacuation of a deeply seated collection of pus is free from danger, and the proper method is to intervene as soon as the diagnosis is certain.



FIG. 29. —DEEP PLEURONEAL ENCAPSLED PER-APPENDICULAR ABSCESS. —DISCOVERY OF THE ABSCESS AFTER OPENING THE SEROUS CAVITY. THE GENERAL PLEURONEAL CAVITY IS PROTECTED BY MEANS OF AN ASEPTIC COMPRESS.

**Operation** —FIRST STAGE. —Incision parallel to, and at a distance of 15 to 20 millimetres from, the crural arch, dividing all the layers as far as the peritoneum. Hemostasis of the bleeding vessels.

SECOND STAGE. Two conditions may be present: Either adhesions exist reaching the abdominal wall, or the abscess is situated below the cecum and at a considerable depth.

*First Condition.* Where the suppuration is superficial, if suppuration has occurred beneath the serous cavity (Fig. 23), or if adhesions have been formed which reach far enough to make contact with the anterior abdominal wall (Fig. 24) the pus will present immediately in the neighbourhood of the crural arch. Blunt scissors are plunged into the fluctuating point and



the pus escapes. The general peritoneal cavity is not opened, being shut off by the adhesions. The orifice is enlarged by divulsion. Aseptic tamponing and drainage.

*Second Condition.*—The suppurating focus is deep. The author follows a uniform technique in these cases. Should the pus not be found at once the peritoneum is incised with aseptic precautions, the caecum is exposed, and the indurated mass is found. As soon as the situation of the abscess is determined, three or four compresses are arranged in the wound to protect the peritoneum against any danger of infection, each being fixed with a



FIG. 30. DEEP PERITONEAL ENCYSTED PERI-APPENDICULAR ABSCESS. THE APPENDIX WHICH LAY IN THE ABSCESS CAVITY HAS BEEN REMOVED. ASEPTIC PLEGGING OF THE WOUND.

hooked forceps. The caecum is then stripped from the fascia iliaca, to which it adheres. The finger can only meet with the pus at a depth of several centimetres. It should be sought either on the inner side towards the promontory below the caecum, upwards in the direction of the liver, between the caecum and the abdominal wall, or on the inner side and below, following the topography of the inflammatory mass. When the pus is found the orifice is enlarged by divulsion, the abscess is drained and plugged, and a glass drain is placed below the mesh. The field of operation is then carefully swabbed, the intraperitoneal compresses are withdrawn, and the wound is partially closed, care being taken to close the serous membrane with several interrupted sutures, and by a superficial tampon by means of a compress.

Should the phlegmon be voluminous, it is sufficient at this stage to

open, evacuate, and drain the abscess cavity. The appendix can be dealt with at a later date. The presence of a small iliac abscess is no contra-indication to the immediate resection of the appendix, which is removed generally after simple ligation of the stump. In reality the deep adhesions of the caecum and the friability of its inflamed walls prevent the exclusion of the appendicular stump from being accomplished beneath a double purse-string suture, as is shown in section in Fig. 30. The wound is treated with tamponing after partial suture.

The plug is removed on the second or third day if the distension and general symptoms are not improved. Indeed, the finger may discover a deep focus situated in the depths of the wound. The orifice is enlarged by division, otherwise the deep compresses are not removed until the fourth or fifth day. Each day one to several injections of mycolysine are made.

#### 4. Phlegmon of the Cavity of Retzius.

The localized pain, bladder disturbances, and above all, the facts obtained by palpation, which reveals a deep-seated puffiness above the pubis, define without difficulty a phlegmon of the cavity of Retzius. Should immediate intervention be considered to be unnecessary, the abdomen is covered with ice-bags to limit peritoneal phenomena, and subcutaneous injections of mycolysine are given. If resolution does not take place, an operation must be performed.

**Operation.**—Vertical suprapubic incision as for hypogastric cystotomy; opening by division with blunt-pointed scissors.

#### 5. Perinephritic Abscess.

Perinephritic phlegmon manifests itself by the usual subjective symptoms of deep suppuration: fever, local stabbing pain, puffiness, inflammatory oedema, and tenderness on examination. Pus collects on the eighth to twelfth day, and works very slowly towards the surface.

**Operation**—**FIRST STAGE.**—Oblique incision along the sacrohumbar mass directed towards the iliac crest, dividing the superficial aponeuroses and afterwards the aponeurosis of the square lumbar muscles.

**SECOND STAGE.**—Exploration of the focus, puncture with blunt-pointed scissors, and when the pus escapes widening of the orifice by division.

**THIRD STAGE.**—Plugging and drainage. Bacteriological examination of the pus should be made in order to obtain indications for special therapeutic treatment in certain microbial infections. Injections of mycolysine.

#### ACTINOMYCOSIS OF THE ABDOMINAL WALLS.

Actinomycotic suppurations occur occasionally in the abdominal walls. The author operated fourteen years ago, near Reims, upon an iliac actinomycotic phlegmon. This case, which was described in the thesis of

his pupil, doctor Roussel in 1891, ended in a generalized infection. More recently the author had under observation a case of actinomycosis of the kidney: a perinephritic abscess was present, which had been opened a long time previously and remained in a fistulous condition. In operating upon this fistula a small-volumed, retracted, and suppurating kidney was found. Microscopic examination revealed that it was infected with actinomycosis. The wound was plugged and cicatrization was perfect.

## CONGENITAL AND ACQUIRED MALFORMATIONS.

### Abdominal Hernia.

Surgical intervention is justifiable in every hernia, even should it be indolent, the object of the operation being the reduction of the herniated viscera, the resection of the sac after ligation of the neck, and suture of the musculo-aponeurotic orifice. Operation for strangulated hernia is becoming rare, and will become rarer when physicians and surgeons will have learnt that the radical cure of hernias where a good technique is followed is an inoffensive operation, which gives consistently good results.

The following description will include, first, operation for strangulated hernia, and in a special chapter the radical cure of hernia deliberately undertaken, in the absence of strangulation, will be discussed.

## OPERATION FOR STRANGULATED HERNIA.

### A. Strangulated Umbilical Hernia.

Strangulation in umbilical hernia has been debated for a long time. It is true that voluminous umbilical hernias can be the seat of real obstruction, owing to the accumulation of ill-digested food in the herniated loops, which are often tortuous and adherent. Nevertheless true strangulation of umbilical hernia does exist. The author has observed it on several occasions in cases of hernias the size of an egg or an orange—*i.e.*, of small volume. In these cases strangulation was caused by the neck of the sac, which was thin and sharp-edged.

In hernias of large volume fibrous bands present in the sac cause secondary compartments to be formed. In these cases multiple strangulation can take place. This is produced both at the neck of the sac, and at the level of the fibrous bands; the bands divide the sac into a certain number of diverticula, whose orifice is more or less retracted.

The signs of strangulation in an umbilical hernia a long time irreducible are tumefaction, pain, and vomiting. Vomiting may be a late symptom, whilst sphacelation of the intestine may supervene insidiously, and very rapidly. Intervention, therefore, should take place in umbilical hernia as soon as the sac becomes tumefied and the seat of persistent pain. It is prudent to act during the first forty-eight hours of strangulation.



FIG. 31. SMALL STRANGULATED UMBILICAL HERNIA. LINE OF CUTANEOUS INCISION.



FIG. 32. SMALL STRANGULATED UMBILICAL HERNIA. THE SKIN IS ALMOST ENTIRELY CUT THROUGH. FREEING OF THE SAC.

**Operation—FIRST STAGE:—***Transverse Incision of the Skin and Exposure of the Sac.*—The sac must be approached with caution, since the thickness of the cellulo-cutaneous layer which covers it is very irregular.

**SECOND STAGE.**—The sac, now exposed, is opened, and the orifice is enlarged with blunt-pointed scissors on the end of the index finger. The incision should be prolonged for the whole extent of the sac from right to left.

**THIRD STAGE.**—The contents of the hernial sac are examined with care. There are frequently epiploic and intestinal adhesions, and old umbilical sacs become subdivided into several secondary compartments whose orifices may be very narrow.

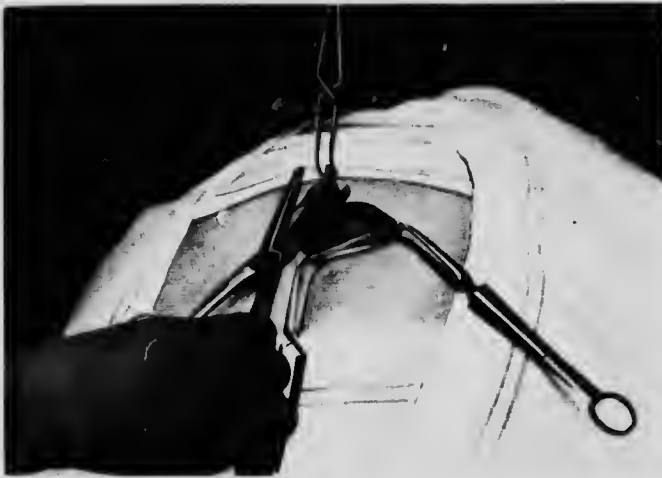


FIG. 33. SMALL STRANGULATED UMBILICAL HERNIA. SECTION OF THE LAST CUTANEOUS BRIDGE ON THE RIGHT OF THE SAC.

When the secondary compartments have been opened up and the whole contents of the hernia are freed, it must be ascertained if there are any new adhesions at the circumference of the neck of the sac, which must be explored with the greatest care. If necessary, the omentum is then resected after dividing it into two or three pedicles, which are ligatured with fine silk after preliminary crushing by means of the *écraseur*. The adherent points of the intestine are treated with a view to hæmostasis by suturing with purse-string or continuous suture.

**FOURTH STAGE.**—To facilitate reduction the hernial orifice must be enlarged. The surgeon introduces into the neck of the sac either above or laterally the extremity of a long thin curved forceps, taking care that the end slips exactly on the parietal peritoneum—quite an easy manœuvre. Seizing then the handles of the forceps in both hands, he raises it, as if he would lift the patient from the operating table. Two or three pulls are

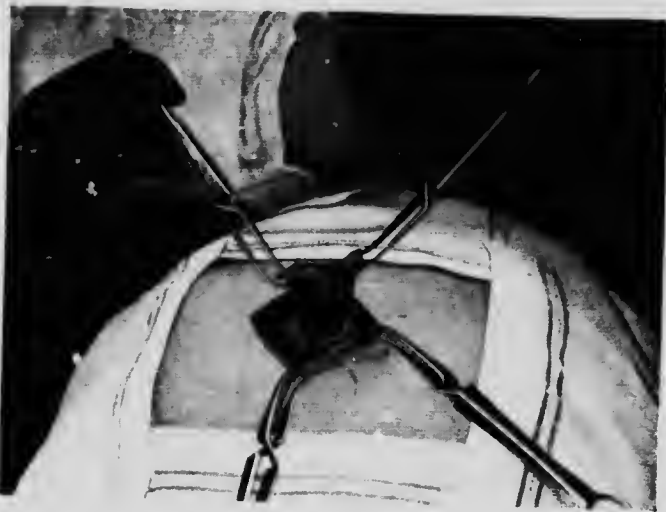


FIG. 34.—SMALL STRANGULATED UMBILICAL HERNIA. ASPECT OF THE SAC AND ITS COMPARTMENTS.

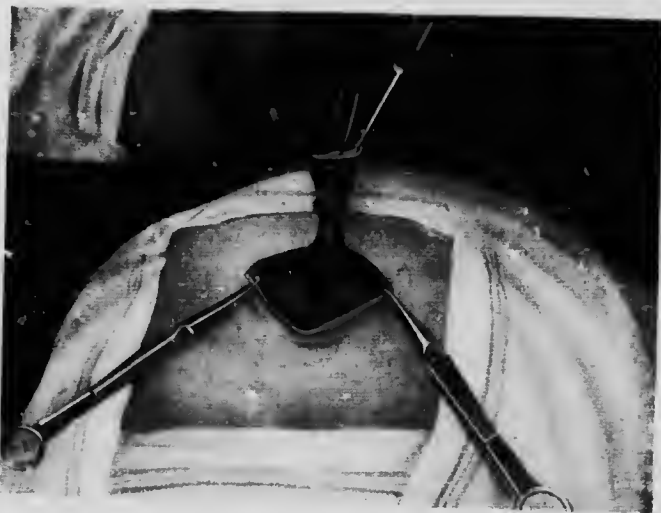


FIG. 35. SMALL STRANGULATED UMBILICAL HERNIA. THE ATTACHMENTS OF THE NECK OF THE SAC AND THE APONEUROTIC ORIFICE HAVE BEEN SEPARATED.

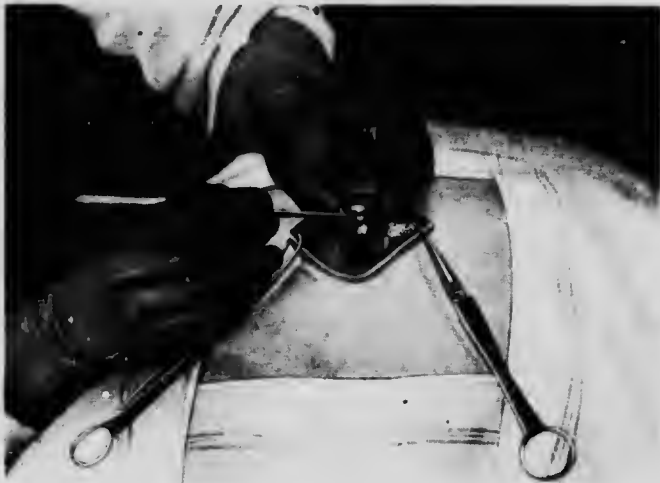


FIG. 36.—SMALL STRANGULATED UMBILICAL HERNIA. INCISION AND EXTIRPATION OF THE SAC.



FIG. 37.—SMALL STRANGULATED UMBILICAL HERNIA. CRUSHING AND RESECTION OF OMENTUM.



FIG. 38. SMALL STRANGULATED UMBILICAL HERNIA. CLOSURE OF THE NECK OF THE SAC.



FIG. 39. SMALL STRANGULATED UMBILICAL HERNIA. CLOSURE OF THE APONEUROTIC ORIFICE BY MEANS OF A PURSE-STRING SUTURE.



enough to tear the collar of the sac for a distance of 10 to 20 millimetres, and to allow of reduction.

**FIFTH STAGE.**—Reduction is carried out gradually, commencing with the herniated parts which are closest to the neck of the sac. When the reduction is finished, the end of a sterile compress is pushed into the orifice, to prevent the intestines from extruding, and to ensure that there is neither blood nor serous fluid in the abdominal cavity.

**SIXTH STAGE: Total Resection of the Sac and Resection of Exuberant Skin.**—If the sac be narrow, it is closed with a purse-string suture; if it be of wide dimensions, it is closed with separate sutures.

**SEVENTH STAGE.**—The skin should be resected in the line of the incision which is transverse in direction, in such a fashion that the suture suppresses part of the exuberant abdominal wall. Drainage with glass tubes.

### B. Strangulated Hernia of the Linea Alba.

These hernias are, as a rule, of small volume, and consist of a ball of subperitoneal fat. They rarely become strangulated. Should this accident occur operation is very simple, since the little hernia, even where a sac exists, only contains an epiploic fringe.

### C. Strangulated Inguinal Hernia.

Inguinal hernia frequently becomes strangulated. In most cases a reducible hernia has already existed.

The author has seen an inguinal hernia strangulated at the first onset in the peritoneo-vaginal canal which was 18 millimetres in diameter. The patient, twenty-two years old, had no previous knowledge that a hernia existed. In making a violent effort, he felt a sharp pain in the right groin, and at the end of twenty-four hours exhibited all the signs of internal strangulation. In the inguinal canal there was a painful spot and a cylindrically shaped tumefaction, which did not reach the external orifice.

Operation exposed a hernia very tightly strangulated, caused by the engagement of the small intestine in the peritoneo-vaginal canal just large enough to admit the index finger. The intestine had been forced through the incomplete superior diaphragm of the canal, and was engaged as far as the second diaphragm, situated 3 centimetres from the first. This very exceptional case shows that in the presence of the symptoms of internal strangulation careful search must always be made for a hitherto unsuspected hernia.

Strangulated inguinal hernia generally presents itself as a pyriform tumour, about the size of a hen's egg, its long axis lying in the axis of the inguinal canal. Small hernias strangulate more frequently than large.

Amongst certain cases of strangulation large serotal hernias are sometimes met with.

Diagnosis is easy, when the hernia has only become irreducible after the

onset of obstruction, the patient stating himself that he can no longer pass gas by the anus.

*Reduction by Taxis.*—If the strangulation is recent, and has taken place within twenty-four or forty-eight hours, reduction can be attempted after placing the patient on an inclined bed, the shoulders being lower than the pelvis. Violent efforts at reduction must be avoided. The culminating point of the sac is compressed methodically with the thumbs, whilst the fingers pedicelize and direct the efforts at reduction. In case of failure taxis may be attempted under anaesthesia.

Most surgeons only practise taxis in exceptional circumstances, in aged persons, and reduction often takes place at the first attempt.

*Accidents of Taxis.*—When taxis has been successful the patient must be kept carefully in observation; inflammatory complications may supervene. It may occur that the sac has become reduced with the hernia, which, from a strangulated inguinal hernia, has become a preperitoneal strangulated hernia. This is a very grave complication, and death occurs from gangrene of the intestine if surgical intervention is not carried out in time.

Brutal and violent taxis can provoke rupture of the intestine or rupture of the sac. The author has seen, after rupture of the sac by taxis, in a case of large scrotal hernia, almost the whole of the small intestine extruded from the peritoneal cavity, having stripped up the tegments. Although the intestine was threatened with sphacelation, the patient was operated upon with success.

*Operation.*—The region is washed and carefully disinfected, and the field of operation is surrounded with sterilized towels.

*FIRST STAGE: Incision of the Skin.*—A cutaneous incision 6 to 8 centimetres in length is made in the line of the spermatic cord. An incision of this length is enough to bring the sac to the surface. The middle of the incision should correspond with the external inguinal orifice. Wounding of the venules which cross this region can easily be avoided by exposing the aponeurosis between the two principal veins and enlarging the subcutaneous wound by division.

*SECOND STAGE: Exposure of the Sac.*—The external inguinal ring being properly exposed, the index finger is passed under the sac, which is isolated from the loose cellular tissue which surrounds it. The sac is then brought outside the wound. In cases of scrotal hernia the testicle which is situated at the periphery of the sac is brought to the surface with it.

*THIRD STAGE: Incision of the Sac and Reduction of the Intestine.*—The sac is incised at its most prominent point. The incision must be most prudently made, by means of bistoury and toothed dissecting forceps, great care being taken not to wound the intestine. The wall of the sac is thin and fibrous. When the sac is incised a variable quantity of brownish fluid escapes. This serous fluid may be blood-stained, especially if violent taxis has been applied. Should there be only a loop of intestine in the sac, this loop is violet in colour, and the walls may have become friable. The sac must be divided with blunt-nosed scissors as far as the neck.

*Division of the Neck of the Sac.*

Since his earliest operations for this condition the author has devised a very simple procedure for widening the neck of the sac. The classical method is to incise the neck of the sac with a bistoury, guided by a grooved director, a technique which is exposed to several accidents. The author's method replaces section by the bistoury with division with a blunt-nosed instrument. A long curved forceps is introduced into the mesenteric groove of the herniated intestinal loop, the concavity of the forceps being directed upwards. The forceps penetrates easily into the peritoneal cavity. On being certain that the point of the forceps is in contact with the abdominal wall, the neck of the sac and the inguinal ring are distended at the



FIG. 40.— SMALL INGUINAL STRANGULATED HERNIA. THE INTESTINE IS DISCOLOURED. DIVISION OF THE NECK OF THE SAC BY DOYEN'S METHOD.

same time by division, by lifting the patient on the concavity of the forceps, whose handles are held firmly in the hands (Fig. 42). The surgeon feels the fibrous tissues give under the effort, and then withdraws the forceps. To judge if reduction has become possible, it is sufficient to draw gently on the herniated loop. This allows itself to be drawn clear, with a certain length of the superior and inferior ends.

The surgeon has now before him the groove of strangulation. Should he reduce the hernia? When the colour of the herniated loop and the groove of strangulation is more or less violet in tint, without appreciable thinning at the level of the neck of the sac, reduction can be proceeded with. If, on the other hand, it be noticed that, either on the loop or at the level of the neck, portions have become thinned and are yellowish or dead-leaf-

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coloured reduction should not be attempted. When gangrene threatens the lesion is usually more intense at the level of the groove above the hernia where the retained contents in the upper end of the intestine exercise their



FIG. 41.—LARGE STRANGULATED INGUINAL HERNIA. INCISION OF THE SAC.



FIG. 42. THE SAME CASE. DIVISION OF THE NECK OF THE SAC BY DOYEN'S METHOD.

pressure. When reduction is possible, it is a good plan to wash the herniated loop outside the wound with artificial serum or Ringer's solution. The peritoneum is protected by means of a compress introduced into the neck of the sac. This compress is fixed with a hooked forceps. When the intestine

is reduced, the peritoneum must be explored by means of a compress, which is held between the teeth of a long curved forceps. The presence



FIG. 43.—THE SAME CASE. THE INTESTINAL LOOP IS DRAWN UPWARDS.



FIG. 44. THE SAME CASE. THE INTESTINE IS DRAWN OUT FROM THE RING FOR A DISTANCE OF FROM 6 TO 8 CENTIMETRES, IN ORDER TO EXAMINE THE TWO STRANGULATED GROOVES.

or absence of a diverticulum between the peritoneum and the abdominal wall must be verified. In some cases 200 to 300 grammes of blood-stained serous fluid are extracted by means of the compress. This serous peri-

toneal fluid corresponds with the exudation which has been already found in the hernial sac, and is produced, rather later, in the peritoneal cavity. Peritoneal sero-sanguineous exudation precedes the commencement of septic peritonitis always by twenty-four to forty-eight hours. The more abundant this fluid is in the serous cavity, the more serious is the prognosis.

*Incidents in the Course of the Third Stage of the Operation.*

**Gangrene of the Intestine.**—When the intestine presents patches dead-leaf in colour, it must be sutured to the circumference of the skin incision, the mesentery having been first traversed by a sterile compress. The intestinal loop is thus fixed outside. A small incision is made near the



FIG. 45.—THE INTESTINE IS DRAWN OUT IN ORDER TO EXAMINE THE TWO STRANGULATED GROOVES

centre of the loop, and a large rubber tube is introduced into the superior portion. This tube, which should be of the thickness of a finger and sufficiently rigid, is 30 centimetres long, and on it the intestinal orifice is ligatured.

This arrangement allows the intestinal contents to pass free of the dressings into a suitable receptacle. An artificial anus is established as the wound

ciatrizes. This is cured later on by means of an inguinal laparotomy, followed by resection of the fistulous loop and a lateral entero-anastomosis, as described later.

*Strangulated Epiplocele.*

Occasionally intestine is not found in the sac, which contains nothing but omentum. A strangulated epiplocele simulates a true strangulated hernia. Almost always the condition is one of an old hernia rendered irreducible owing to adherence of omentum to the walls of the sac. The omentum may adhere to the whole circumference of the sac; this does not prevent it descending more and more into the cavity and causing symptoms of strangulation.

Should a strangulated epiplocele be suspected, all attempts at taxis must be avoided. Besides, it is impossible to be sure before operation if a pure epiplocele is present, or a mixed hernia, epiplocele and intestine.



FIG. 46. —LARGE STRANGULATED INGUINAL EPIPOCELE. FREEING OF ADHESIONS WITH THE SAC.

The skin is incised, and the sac is turned out of the wound as already described. The sac is incised, and its contents ascertained. The adherent omentum is detached from the wall of the sac, and drawn out of the wound. The adhesions at the neck of the sac are also freed.

If the epiplocele be large the herniated omental mass may be voluminous and indurated. These omental masses altered by inflammation should be removed.

The great omentum is drawn outwards beyond the neck of the epiplocele. It is then divided into two or three principal parts where it is thinnest. Each of these is crushed with the *cérasoir* (small model) and ligatured



FIG. 47.—LARGE STRANGULATED INGUINAL EPIPOCELE. RESECTION OF THE OMENTUM AFTER THE AUTHOR'S METHOD. PRELIMINARY CRUSHING.



FIG. 48. LARGE STRANGULATED INGUINAL EPIPOCELE. VIEW OF THE GROOVE CAUSED BY THE CRUSHING INSTRUMENT. IN THIS GROOVE THE LIGATURE IS TO BE APPLIED.



with fine silk. The ligature is tied in the groove formed by the *écraseur*. It is, as a rule, quite unnecessary to form a Dionis knot, since the depth of the groove formed by the *écraseur* assures the fixation of the ligature. Ligature and fixation *en masse* can be accomplished when the pedicle is not very voluminous.

**FOURTH STAGE: Repair of the Hernia Ring.**—When reduction of intestine and omentum are finished, how should the wound be treated? Here the question of the radical cure of a strangulated hernia demands solution.

Later on it will be seen that the radical cure of hernia consists of two principal stages, the resection of the sac and the closure of the ring. The first of these stages, the resection of the sac, is difficult to accomplish satisfactorily when strangulation has taken place. Indeed, whether the widening of the neck of the sac has been brought about by the author's method (divulsion) or by the classical method of incision, the damage done at this level does not permit of proper closing of the peritoneum in a satisfactory manner by the placing of a circular ligature.

On the other hand, the damaged state of the reduced intestine often forces the surgeon to leave a gauze mesh in the neck of the sac as a measure of precaution. Radical cure, therefore, can only be attempted with a chance of success in hernias very recently strangulated, and when it is possible sufficiently to isolate the sac, to close the peritoneum *above* it by means of a circular ligature. This ligature is placed according to Dionis' technique (see Radical Cure of Inguinal Hernia). The ring only, therefore, is sutured in the male subject, taking care to leave a narrow passage below for the spermatic cord.

If the testicle has been drawn outside, it is placed back in the scrotum. In the female, radical cure is easy to accomplish even in strangulated conditions, since the hernia canal can be completely closed.

**FIFTH STAGE: Suture of the Skin.**—Drainage.

#### D. Strangulated Femoral Hernia.

Strangulated femoral hernia is almost without exception a small hernia, the size of a nut or a horse-chestnut. Often it is so small as to have hitherto escaped observation. A strangulated femoral hernia is easily recognized in a case attacked with symptoms of intestinal obstruction by the presence of a small, hard, nut-shaped tumour immediately below the crural arch and on the inner side of the base of the triangle of Scarpa. This tumour has a wide pedicle, which penetrates beneath the crural arch. The arch of Fallopius is a very important guide; it separates the crural from the femoral hernias. Every hernia situated above is inguinal, and every hernia situated below is femoral. But cases are met with where a most careful examination must be made to determine if a hernia is situated above or below the crural arch.

Femoral hernia is more subject to strangulation owing to the narrowness of the neck of the sac. It is, besides, compressed on the inner side by the falciform ligament of Gimbernat. Again, femoral hernia is more subject

to gangrene than inguinal hernia. A femoral hernia can be threatened with sphacelation after forty-eight hours, especially if a complete loop be involved. On the other hand, sphacelation in inguinal hernia rarely takes place before the fourth day.

When the herniated loop is incomplete, and the symptoms are caused by lateral pinching, the circulation of the intestinal contents is not interrupted and the onset of gangrene is not so rapid. The author has seen a case where the small intestine was pinched laterally in a femoral hernia operated upon *after seventeen days*. In this case, which was quite exceptional, there was no trace of sphacelation, and the herniated intestine was reduced without complication.

**Operation—FIRST STAGE: *Incision of the Skin.***—The classical procedure for the division of the skin over a femoral hernia consists in gripping the skin from below upward between the fingers, both on the outer and inner side of the hernia, in order to form a transverse fold of the skin. This fold is incised vertically either without inwards or by transfixation.

**SECOND STAGE: *Exposure of the Sac.***—The sac is isolated from the loose cellular tissue which surrounds it by the index finger covered with a compress; it is then drawn outside the wound.

**THIRD STAGE: *Incision of the Sac and Reduction of the Intestine.***—The sac should be incised with great care, for it contains very little fluid. The intestine being recognized, the neck of the sac and the crural ring are widened by division on a long curved forceps, in the same manner as has been described for inguinal hernia. The intestine is then drawn outside the wound in order to verify the condition of the herniated loop and the groove of strangulation. It is washed with tepid Ringer's solution and reduced. Omentum is very rarely found in a femoral hernia.

**FOURTH STAGE: *Closure of the Wound.***—Following the condition of the intestine, either the neck of the sac is plugged with sterilized gauze or the neck is closed by means of a circular suture followed by a suture of the skin. A small glass drain should be placed in the wound.

#### E. Atypical Hernia.

Lumbar, ischiatic, and obturator hernias are very rare, and their strangulation is exceptional. Should one of these hernias be attacked with strangulation, and show no local painful symptoms, it will probably escape the notice of the surgeon. It is probable then that the seat of strangulation can only be discovered in the course of a laparotomy. Reduction can be performed without difficulty, and should be followed by circular suture of the neck of the sac, and, if possible, of the hernial ring.

If diagnosis has been possible, the same operative technique as for femoral hernia is followed: incision of the skin; exposure of the sac, examination of the contents, division of the neck, examination of the groove of strangulation, reduction, plugging or suture of the ring. Strangulated diaphragmatic hernia can only be an accidental discovery in the course of an operation for internal strangulation.

## RADICAL CURE OF HERNIA.

## A. Hernia of the Linea Alba.

Small hernias of the linea alba are generally formed by subperitoneal fat. These small hernias may be very painful, especially in those individuals who are employed in heavy labour in the course of which the herniated tissues are nipped by the aponeurotic orifice. Certain hernias of the linea alba may be large enough to possess a peritoneal sac which can contain either epiploic fringes or a small portion of the stomach or transverse colon.

**Operation—FIRST STAGE: *Incision of the Skin.***—A longitudinal incision is made.

**SECOND STAGE: *Exposure of the Hernia.***—The herniated mass, however small it may be, is carefully isolated as far as its pedicle. The surgeon should freely expose the linea alba surrounding the hernial orifice.

**THIRD STAGE: *Examination of the Herniated Tissues; Reduction.***—Should the hernia be fatty and very small, reduction is all that is necessary. The orifice is closed with fine silk sutures.

When the hernia is of greater size the fatty layer covering the sac must be freed, and incised with care. If no peritoneal sac exists, the fatty pedicle is crushed, and reduced after ligaturing with fine silk. If a peritoneal sac be found, it is incised, the epiploic fringe or intestine is reduced if necessary, and the neck of the sac is isolated in order to ligature it with fine silk. This fine ligature is reduced, and the aponeurotic orifice is closed by means of two or three interrupted sutures.

**FOURTH STAGE: *Suture of the Skin.***—Small glass drain.

## B. Umbilical Hernia.

The radical cure of umbilical hernia is a very delicate operation in cases where a large hernia exists with multiple compartments, and where there are multiple intestinal and omental adhesions.

**Operation.**—Umbilical hernia of small volume. Should the hernia not be greater in size than that of an ordinary apple, the operation is rarely attended with complications.

**FIRST STAGE: *Incision of the Skin.***—The redundant skin should be circumscribed by means of two curvilinear horizontal incisions.

**SECOND STAGE: *Exposure of the Sac.***—The sac is exposed and detached from the surrounding subcutaneous fat. The aponeurosis should be exposed for the whole circumference of the neck of the sac.

**THIRD STAGE: *Incision of the Sac and Reduction.***—The sac is incised, and its contents recognized. Often the intestine is adherent at various points; these are divided with care. Should there be any solution of continuity of the serous surface of the intestine, a sero-serous suture is employed to remedy the defect. The omentum is liberated if adherent, and after

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forcipressure and ligature have been employed to arrest any source of hemorrhage, the whole of the contents of the sac are reduced.



FIG. 49. RADICAL CURE OF A LARGE UMBILICAL HERNIA. INCISION OF TEGUMENTS.



FIG. 50. RADICAL CURE OF A LARGE UMBILICAL HERNIA. ANOTHER CASE. DISSECTION OF THE SAC.

FOURTH STAGE: *Repair*.—The neck of the sac, whose exuberant portion is resected, is now detached from the aponeurotic orifice and all bleeding vessels are ligatured. The neck of the sac is closed, should it be narrow

enough, by means of a circular ligature complemented by two safety ligatures applied by means of transfixion (ligature of Dionis). If it be wider it is closed by means of a purse-string, interrupted or continuous suture.



FIG. 51. SAME CASE AS FIG. 50. SECTION OF THE ADHESIONS OF THE NECK OF THE SAC WITH THE APONEUROSIS.



FIG. 52.—SAME CASE AS FIG. 49.—THE NECK OF THE SAC IS DETACHED FROM THE APONEUROTIC ORIFICE.

The aponeurotic orifice, if narrow, is closed with a purse-string suture, and if wide, with an interrupted or continuous suture. Union is

arranged either in a vertical or transverse sense, according to whether coaptation is best obtained from right to left or from above downwards.

FIFTH STAGE: *Suture of the Skin.*—Drainage.

*Large Umbilical Hernias.*

FIRST STAGE: *Incision of the Skin.*—The redundant skin is circumscribed by two curvilinear horizontally placed incisions 15 to 20 centimetres long.

SECOND STAGE.—Exposure of the sac and aponeurotic orifice.

THIRD STAGE: *Opening of the Sac.*—Each of the compartments, of which there are sometimes five or six, should be explored in succession. The partitions must be destroyed, the intestine and omentum must be freed from their adhesions, loss of substance of the serous covering of the intestine must be repaired with a continuous suture, and all bleeding-points in the omentum secured.



FIG. 53. SAME CASE AS FIG. 51. THE SAC HAS BEEN OPENED AND RESECTED; THE INTESTINE IS REDUCED; CLOSURE OF THE NECK OF THE SAC.

When the neck of the sac is reached, fresh intestinal and omental adhesions may again be met with, the separation of which may necessitate incision of the linea alba for an extent of 4 or 5 centimetres.

The contents of the sac are then reduced.

FOURTH STAGE: *Repair.*—The orifice is closed by means of suture placed in two superimposed layers arranged so as to insure perfect closure of the serous cavity and proper coaptations of the aponeurosis.

FIFTH STAGE.—The skin is closed by several silk sutures arranged transversely, the intervals being filled with metal clips. Drainage.

### C. Eventration.

#### *Post-Puerperal Eventration.*

Post-*puerperal* eventration caused by the distension of the *linea alba* for its whole length hardly permits of repair by means of operation.

Such an operation would require a very extended longitudinal resection of the *linea alba* and the integuments. The only plan of suture which would offer any prospect of a durable success would be one which would unite in several combined planes—the peritoneum, the posterior sheath of the rectus muscles, which would have to be opened on either side, the muscles themselves, their anterior aponeuroses, and finally the integuments (see below).

#### *Post-Operative Eventration.*

Post-operative eventration is a frequent cause for surgical intervention.

**Operation—FIRST STAGE: *Incision of the Skin.***—The redundant skin is circumscribed by two curved incisions placed vertically, whose ends unite above and below the eventration. If several small eventrations are separated by cicatrization, the better plan is to unite them.

**SECOND STAGE: *Opening of the Peritoneum.***—The peritoneum is opened, by preference, either above or below the limits of the eventration, at a point where, as far as can be ascertained, the parietal serous membrane is free from adhesions.

The index finger is introduced into this opening. Epiploic or intestinal adhesions are recognized where they exist, and the peritoneum is opened freely to the full extent necessary. The abdominal cavity is protected by large sterilized compresses. Parietal adhesions are divided where met with, and bleeding-points of the omentum are secured. Serous sero-muscular, or even complete tears of the intestine which may arise in the course of these often difficult manipulations, are repaired by means of fine sutures.

The sheath of both rectus muscles must always be opened along their entire length in order that suture in successive layers can be achieved—peritoneum, posterior rectus sheath, rectus muscles, and anterior sheath. There are many ways of making this suture. The thicker it is, the more solid. Each layer must be strictly and carefully coapted to its corresponding layer on the opposite side. The author gives preference to the alternating deep and superficial spiral suture described on p. 9.

This suture should be made with thick silk or catgut. A great solidity must be aimed at; it should be fortified by means of several interrupted deep sutures of silk or Florentine hair. If there is dragging on the line of union, interrupted sutures placed alternatively deep and superficially must be employed, the latter taking in only the anterior sheath of the rectus muscles, in order to bury the sero-muscular suture under the aponeurosis.

**D. Inguinal Hernia.**

The principle followed in radical cure of hernia in general, and of inguinal hernia in particular, is the extirpation of the sac, completed by the suture of the hernial ring. The extirpation of the sac should be considered as the most important stage in the radical cure of inguinal hernia. The simplest procedure is the best.

**Operation.** Before anaesthesia the hernia must be made to descend.

**A. IN THE MALE SUBJECT.**

**FIRST STAGE: Incision of the Skin.**—A rectilinear incision of the skin is made 6 to 7 centimetres long in the direction of the spermatic cord. The centre of this incision corresponds with the external inguinal ring.

**SECOND STAGE: Exposure of the Sac.**—The subcutaneous fat is perforated as far as the aponeurosis; it is separated by division with the fingers, or better with blunt-nosed scissors, thus avoiding wounding the two groups of vessels which cross the field of operation. As soon as the external orifice



FIG. 54. RADICAL CURE OF ACQUIRED INGUINAL HERNIA. THE SAC, WHICH IS NOT ADHERENT TO THE CORD, IS EASILY DRAWN OUTWARDS, THE CORD REMAINING IN THE DEPTHS OF THE WOUND.

of the canal is exposed, the fibrous envelope of the cord below it is incised; the index finger can then encircle the pedicle of the hernial sac, which it brings outside the wound.

When the hernia is voluminous and scrotal, the whole mass is enucleated free from the scrotum with the tunica vaginalis and the testicle.

**THIRD STAGE: Freeing of the Sac.**—When the hernia is an acquired hernia it is possible that the sac be free enough from the spermatic cord to be



isolated from it without difficulty. The hernial sac is drawn upwards and outwards, and the spermatic cord is separated as far as the interior



FIG. 55. RADICAL CURE OF ACQUIRED INGUINAL HERNIA. INCISION OF THE SAC AFTER RESECTION OF THE INTESTINE: ASPECT OF THE HERNIAL ORIFICE.



FIG. 56. CONGENITAL HERNIA. ISOLATION OF THE CORD (DOYEN'S METHOD): LEFT SIDE.

of the inguinal canal, whose orifice is found sufficiently opened. But if the elements of the cord are spread around the hernial sac, which is



FIG. 57. CONGENITAL HERNIA. ISOLATION OF THE CORD (DOYEN'S METHOD) RIGHT SIDE.



FIG. 58. APPEARANCE OF A LARGE HERNIAL SAC. THE INTESTINE IS IN PROCESS OF REDUCTION.



FIG. 59. APPEARANCE OF A LARGE HERNIAL SAC. OPENING OF THE SAC. APPEARANCE OF THE HERNIAL ORIFICE.

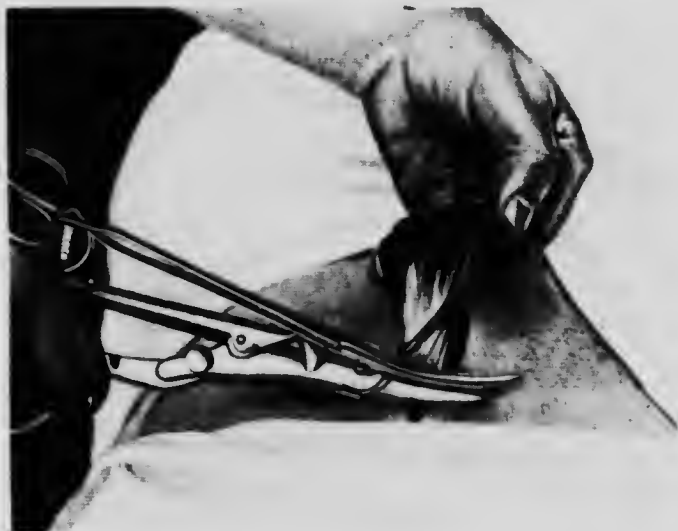


FIG. 60. THE NECK OF THE SAC HAS BEEN SEIZED IN A CURVED FORCEPS. THE ÉCRASEUR IS APPLIED BELOW THE FORCEPS.

most frequently the case in a congenital hernia, the following technique should be observed: the sac is seized in the left hand, and the elements of the cord are successively detached by the right thumb and index finger, or *vice versa*. The fingers of the right hand, having passed over the whole of the circumference of the neck of the sac which is presented to them by the left hand, detach successively the elements of the cord from the fibrous hernial covering, and bring them together in a small bundle. The left hand then holds the sac entirely free from the elements of the cord which are held on the index finger of the right hand. The cord is then isolated from the neck of the sac as far as the superior opening of the inguinal canal.



FIG. 61.—LIGATURE OF THE NECK OF THE SAC IN THE GROOVE FORMED BY THE ÉCRASEUR.

**FOURTH STAGE: *Opening and Resection of the Sac.***—The sac is opened and its contents are reduced after isolation and ligature of the omentum if it be adherent. Where a large epiplocele is present it is necessary to resect the redundant omentum after crushing, as described in the case of strangulated inguinal hernia. As soon as the contents of the sac are reduced, a sterilized compress is introduced temporarily into the inguinal canal. If the sac be constituted by the tunica vaginalis, it must be divided transversely in order that the testicle and the inferior serous end-de-sac which will serve to reconstitute the tunica vaginalis may be returned into the scrotum. The circumference of the peritoneal sac is then seized with four or five dissecting forceps or ringed forceps, and the surgeon draws it downwards with his fingers as far as possible, in order to bring into view a small portion of the parietal peritoneum beyond the neck. The compress having been removed, the left index finger is introduced into the neck of the sac, which is twisted about

180 degrees on its axis, and a circular ligature of fine silk is placed above the finger. By this manoeuvre the inclusion of the intestine or omentum in the ligature will be avoided. Ligature of the neck of the sac is completed



FIG. 62.—DOYEN'S METHOD FOR THE RECONSTITUTION OF THE INGUINAL CANAL.  
VIEW OF THE EXTERNAL INGUINAL RING ON THE RIGHT SIDE AFTER INCISION  
OF THE COMMON FIBROUS TUNIC.

by Dionis' knot, and it is cut 8 or 10 millimetres below. Immediately the ligatured stump escapes into the wound and the small pedicle mounts generally above the superior orifice of the inguinal canal.

FIFTH STAGE: *Repair*.—The inguinal canal is closed by two layers of silk sutures. The first or deep layer unites, behind the cord, the trans-

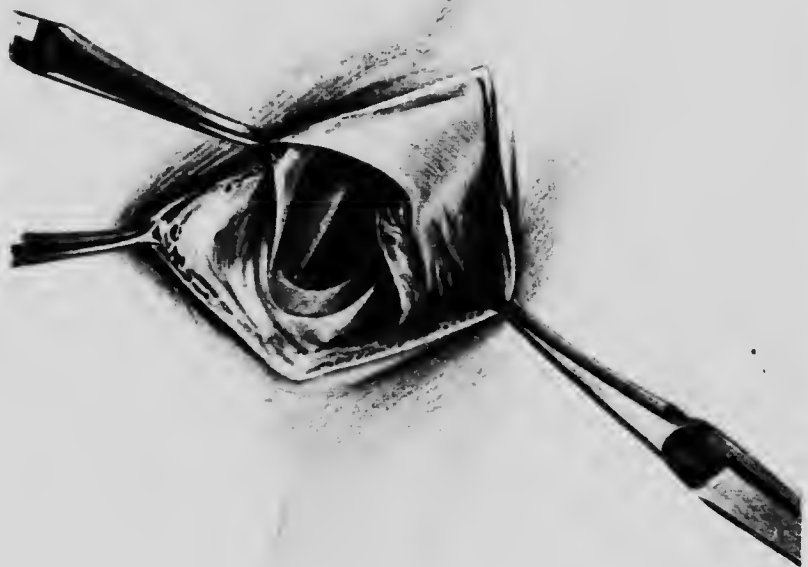


FIG. 63. THE CONJOINT TENDON OF THE OBLIQUE AND TRANSVERSALIS MUSCLES AS EXPOSED BY DRAWING ON THE INTERNAL PILLAR OF THE EXTERNAL INGUINAL RING.

versalis fascia to the conjoint tendon of the oblique and transversalis muscles (Figs. 54 to 67). The superficial layer reunites the aponeurosis of the great oblique, and leaves below a passage for the spermatic cord (Figs. 69 to 71)

This procedure is the only one which re-establishes the inguinal canal, its anterior and posterior walls, and its two orifices, in their normal position.

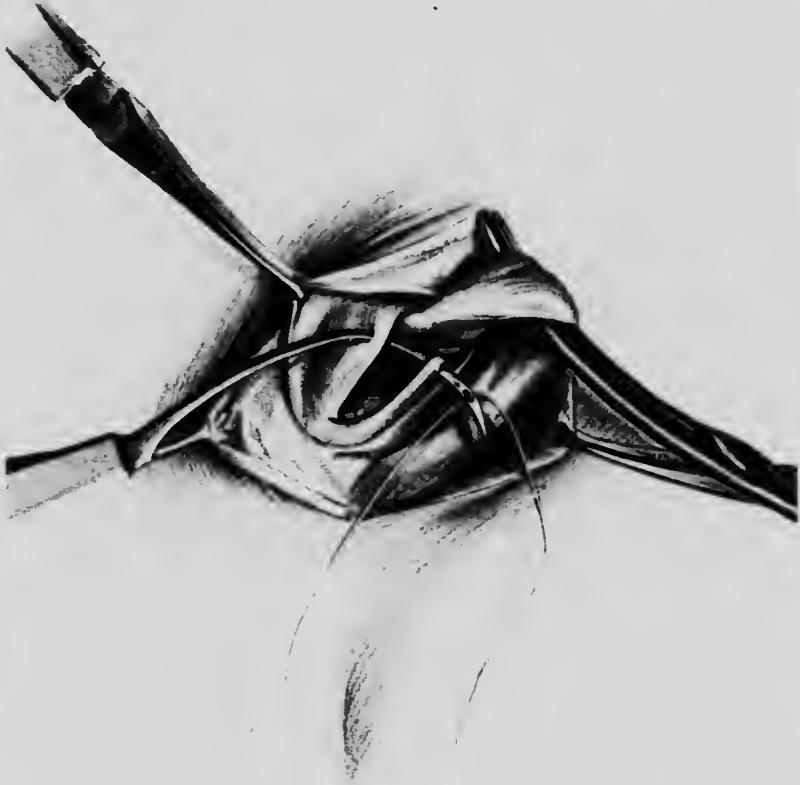


FIG. 64.— CLOSURE OF THE LOWER PART OF THE INTERNAL INGUINAL RING BY SUTURING THE CONJOINT TENDON TO THE EXTERNAL PILLAR OF THE DEEP INGUINAL RING, WHICH IS DILATED.

SIXTH STAGE: *Cutaneous Suture with Clips.*—Glass drain. If the operation has been lengthy, and has necessitated the displacement of the testicle outside the wound, the drain also may be placed low down in the scrotum.



FIG. 65.—THE FIRST SUTURE IS IN PLACE, IMMEDIATELY BELOW THE SPERMATIC FORD. PASSAGE OF THE SECOND SUTURE.



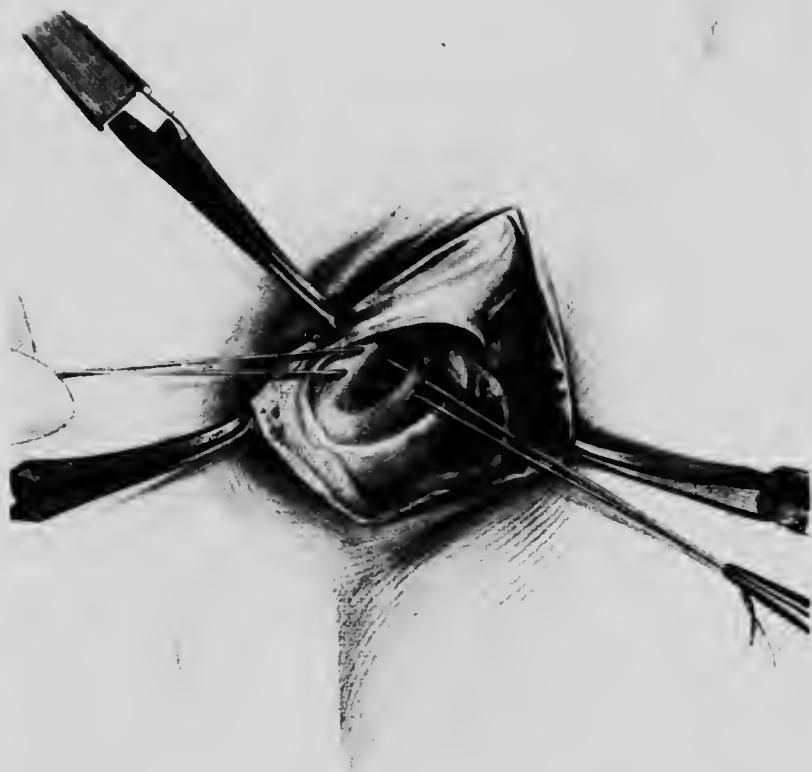


FIG. 66.—THE TWO DEEP SUTURES ARE IN PLACE; THEY FORM THE POSTERIOR WALL OF THE INGUINAL CANAL.

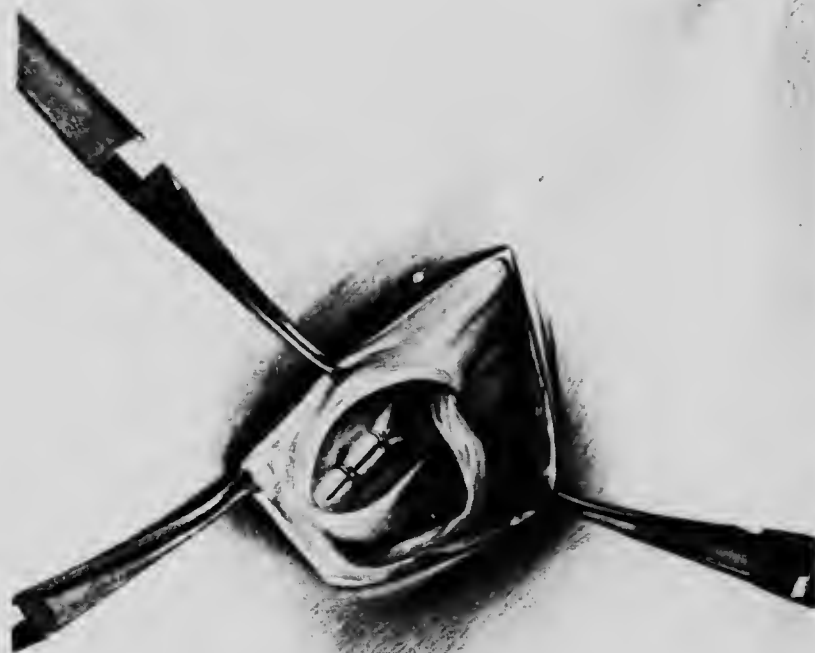


FIG. 67.— COMPLETION OF THE DOUBLE SUTURE RECONSTITUTING THE DEEP ORIFICE OF THE INGUINAL CANAL.

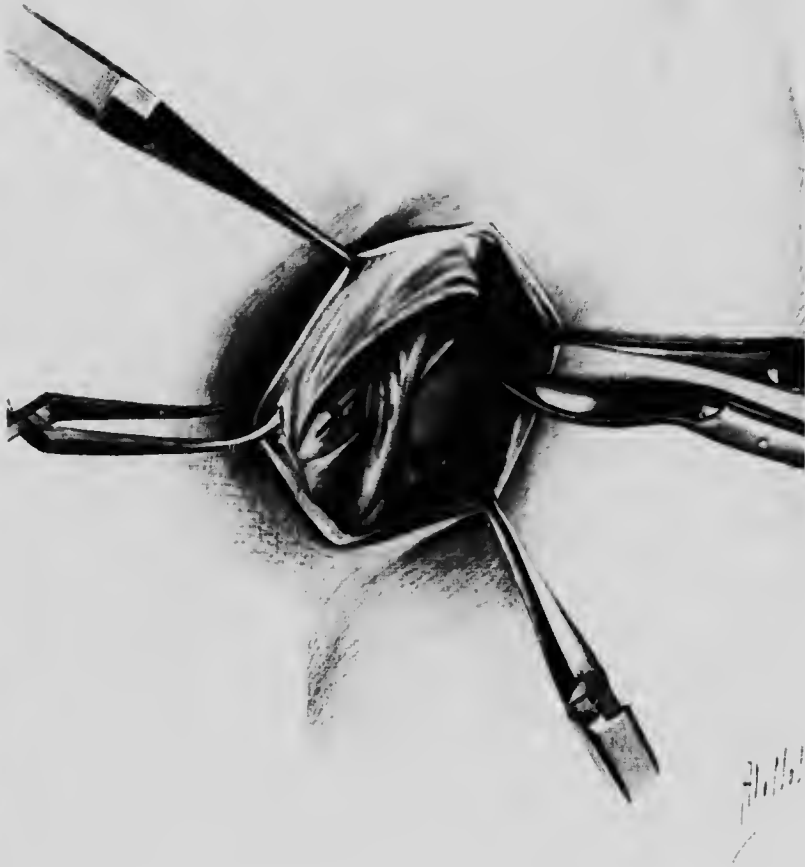


FIG. 68.— VIEW OF THE EXTERNAL INGUINAL ORIFICE, WHICH IS CONSIDERABLY DILATED.



FIG. 69. THE FIRST SUPERFICIAL SUTURE IS PLACED AT THE LEVEL OF THE UPPER COMMISSURE OF THE EXTERNAL RING.

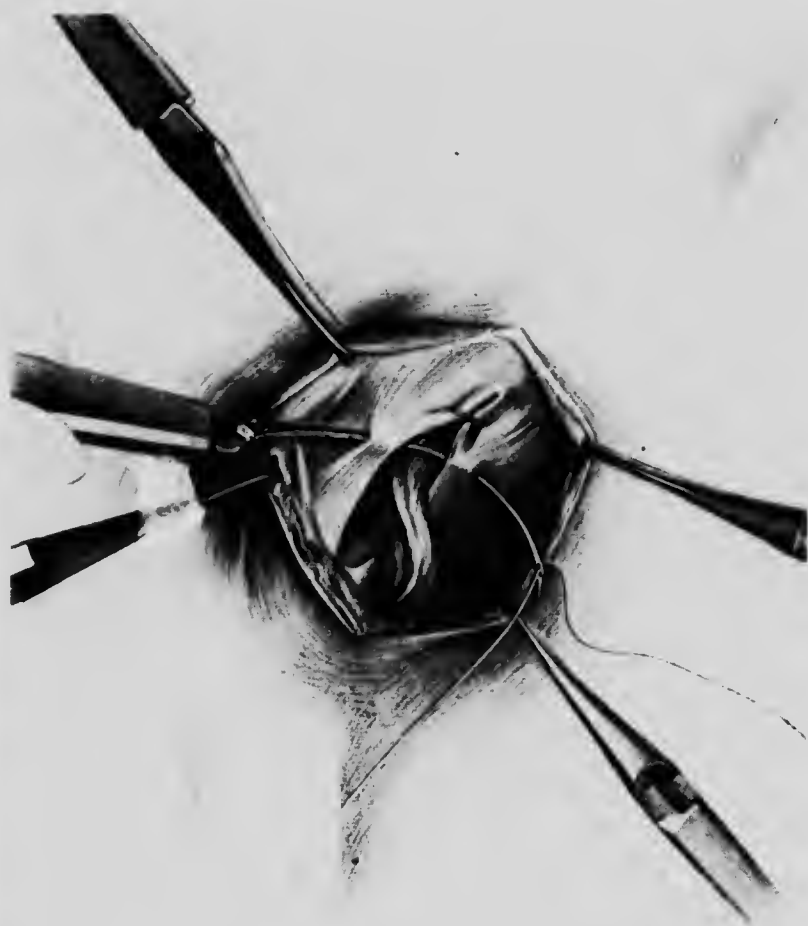


FIG. 70.—RECONSTITUTION OF THE ANTERIOR WALL OF THE INGUINAL CANAL. THE FIRST KNOT IS TIED. PLACING OF THE SECOND SUTURE.

## B. OPERATION IN THE FEMALE SUBJECT.

In the female subject operation is more simple than in the male, since there is no spermatic cord requiring arrangement. Fairly often the cystic canal of Nuck or a displaced ovary calls for resection.

This procedure for the radical cure of inguinal hernia is the simplest and the best of all. It only requires five to ten minutes to be finished successfully. The results are excellent, and the patients do not wear a truss after operation. The majority of the author's cases were mechanics used to strenuous exertions in the course of their work. In a series containing several hundred cases only three relapses were recorded.

*Inguinal Hernia of the Large Intestine.*

When the caecum or the sigmoid flexure becomes herniated in the inguinal region, the prolapsed loop is rarely surrounded by a complete peritoneal sac. The large intestine traverses the inguinal canal in the same way as the testicle, which carries in front of it in its course the peritoneo-vaginal cul-de-sac. The laxity of the retrocaecal cellular tissue allows the caecum to enter into an inguinal hernia in such a way that its posterior surface remains free from any serous envelope. It may result from this that in opening the hernial sac an inexperienced operator failing to meet with the peritoneal sac can untowardly wound the large intestine.

Since the intestinal surface, which is bare of peritoneum, lies in the postero-exterior portion, the sac should be incised on the antero-internal aspect: when the large intestine is come upon, it is easily recognized from its longitudinally placed mesenteric bands. The intestine is reduced until the peritoneal sac appears in view. The sac is opened, it is resected as for the radical cure of the small intestine, and the walls of the canal are reconstituted, conserving the external and internal orifice and the intermediary canal as described above.

*Schema of the Evolution of an Inguinal Hernia.*

In order to complete the explanation of the details of his method for the radical cure of hernia, the author has asked M. Millot to supplement the preceding figures by a series of diagrammatic illustrations representing a sagittal section of the hernial region in a direction slightly obliqued from above downwards, and from without inwards—*i.e.*, parallel to the spermatic cord.

Fig. 73 represents the normal inguinal canal. The superior inguinal orifice can be distinguished, situated at a certain distance above the body of the pubis. The cord traverses the inguinal canal bounded behind by the fascia transversalis, in front by the aponeurosis of the great oblique and above by the lower fascia of the lesser oblique and transversalis.

Fig. 74 shows the first stage of inguinal hernia—*i.e.*, interstitial hernia or hernial point. The superior or deep inguinal ring alone is dilated, the

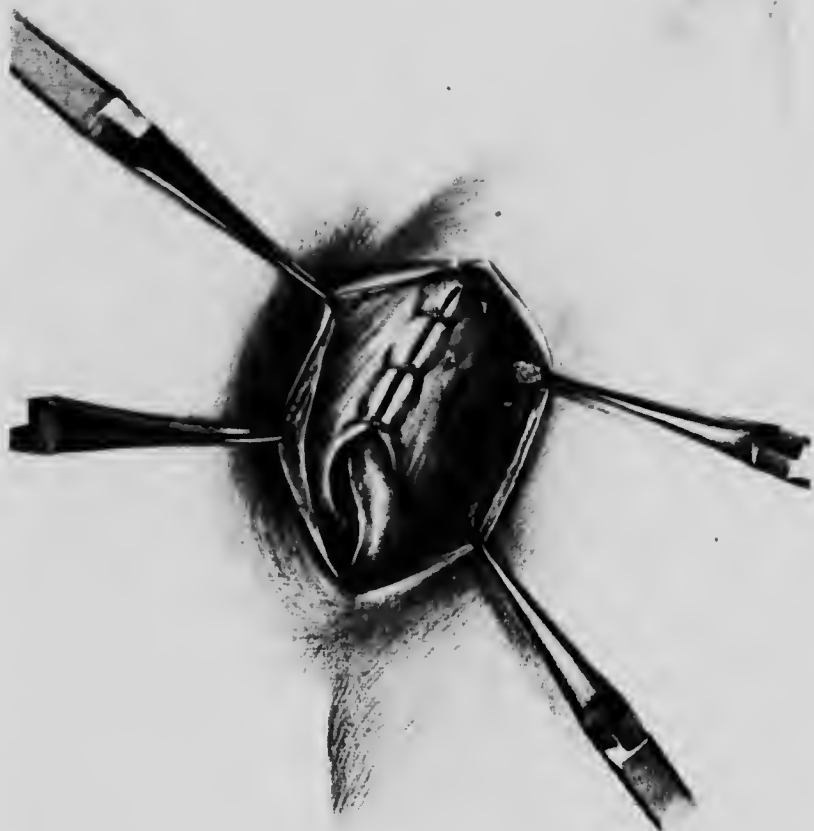


FIG. 71.—THE THIRD SUTURE IS IN PLACE. THE SUTURE OF THE UPPER PART OF THE EXTERNAL INGUINAL ORIFICE IS FINISHED. THE ANTERIOR PORTION OF THE INGUINAL CANAL AND ITS INFERIOR ORIFICE ARE RECONSTITUTED.



FIG. 72. - REUNION OF THE SKIN WITH INTERRUPTED SUTURES.





FIG. 73.—SAGITTAL SECTION OF THE INGUINAL CANAL PARALLEL TO THE DIRECTION OF THE SPERMATIC CORD.



FIG. 74.—DILATATION OF THE SUPERIOR ORIFICE AND INGUINAL CANAL BY AN INTESTINAL HERNIA.



FIG. 75.—DILATATION OF THE SUPERIOR ORIFICE AND INGUINAL CANAL BY AN INTESTINAL HERNIA. INTERSTITIAL OR PROPRIETONEAL HERNIA TAKING AN UPWARD DIRECTION.



FIG. 76.—DILATATION OF THE SUPERIOR ORIFICE AND INGUINAL CANAL BY AN INTESTINAL HERNIA. ACCIDENTAL REDUCTION OF HERNIA AND HERNIAL SAC.

intestinal herniated loop being covered by the peritoneal sac. This figure shows what happens in an acquired hernia. It will be remarked that the serous sac is not continuous below with the commencement of the tunica vaginalis, as is observed always in the case of congenital hernia.

Fig. 75 shows an interstitial hernia pushing upwards the loose connective tissue which lies in front of the fascia transversalis.



FIG. 77. DILATATION OF THE SUPERIOR ORIFICE AND INGUINAL CANAL BY AN INTESTINAL HERNIA. COMPLETE HERNIA. THE TWO ORIFICES OF THE INGUINAL CANAL ARE DILATED, AND ARE ALMOST OPPOSITE ONE ANOTHER.

Fig. 76 shows the variety called properitoneal. This variety is usually caused by the application of taxis followed by complete reduction of the hernial sac, the intestine remaining unliberated. It can be seen that, in such a case, the strangulation of the intestine by the neck of the sac persists. This relatively frequent accident of taxis is usually fatal. The possibility of such an accident is enough by itself to forbid reduction without operation, save in exceptional cases, such as in very aged people and those who refuse operation.

Fig. 77 represents a complete hernia: the two orifices of the inguinal canal are dilated and are practically superimposed.

Fig. 78, which corresponds to Fig. 67, shows the reconstruction of the

superior inguinal orifice and the posterior wall of the canal by the suture of the external pillar of the dilated deep inguinal orifice with the conjoint tendon of the oblique and transversalis muscles.

Fig. 79, which corresponds to Fig. 71, shows completion of the operation by the reconstitution of the anterior wall of the canal and its inferior orifice.



FIG. 78.—DILATATION OF THE SUPERIOR ORIFICE AND INGUINAL CANAL BY AN INTESTINAL HERNIA. RADICAL CURE. RECONSTITUTION OF THE UPPER INGUINAL ORIFICE AND THE POSTERIOR WALL OF THE CANAL.



FIG. 79.—THE OPERATION IS COMPLETE. RECONSTITUTION OF THE ANTERIOR WALL OF THE CANAL AND THE LOWER ORIFICE.

#### *Inguinal Hernia of the Ileo-Cæcal Appendix.*

**Hernial Appendicitis.**—On the right side a healthy vermiform appendix may be found in a congenital peritoneo-vaginal canal.

In a case which presented symptoms of an abscess in the inguinal canal the author found a calcenous and gangrenous appendix. The superior orifice of the canal was incised in order to draw the cæcum into the wound and to allow of extirpation of the appendix.

#### *Inguinal Hernia of the Bladder.*

A hernia of the bladder into the inguinal canal rarely comprises a complete peritoneal sac. It is caused rather by a sliding of the anterior surface and external region of the viscus, with an incomplete peritoneal sac, into which either omentum or small intestine descends. The bladder is easily



FIG. 89. CUTANEOUS INCISION TO EXPOSE THE CRURAL RING.



FIG. 81.—SURGICAL ANATOMY OF THE REGION OF THE CRURAL RING. DISSECTION OF THE CRURAL ORIFICE SHOWING AN INTERNAL LYMPHATIC GLAND, HAVING ON ITS OUTER SIDE VEIN, ARTERY, AND NERVE.



FIG. 82.—RELATIONS OF THE INGUINAL RING AND CEREAL CANAL. ABOVE IS SEEN THE CORD, BELOW THE INTERNAL SAPHENOUS VEIN PIERCING THE CRIBRIFORM FASCIA.

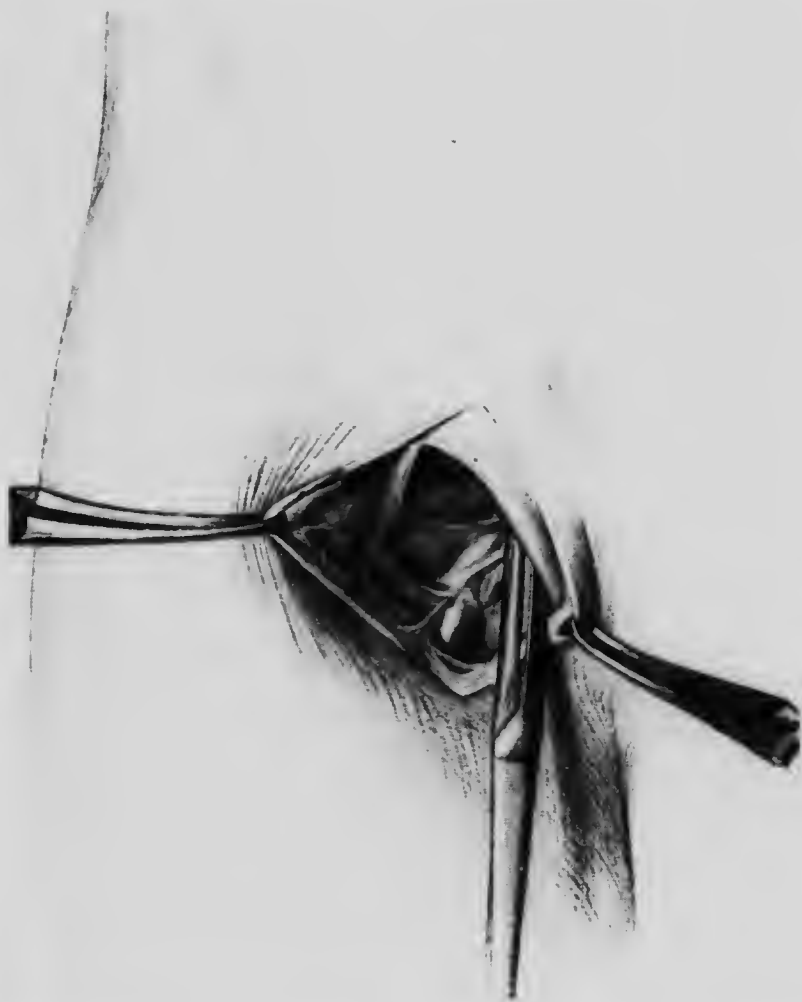


FIG. 83. —A CURVED FORCEPS IS INTRODUCED INTO THE FEMORAL CANAL. BELOW THE FORCEPS THE INFERIOR EXTREMITY OF GIMBERNAT'S LIGAMENT CAN BE SEEN.

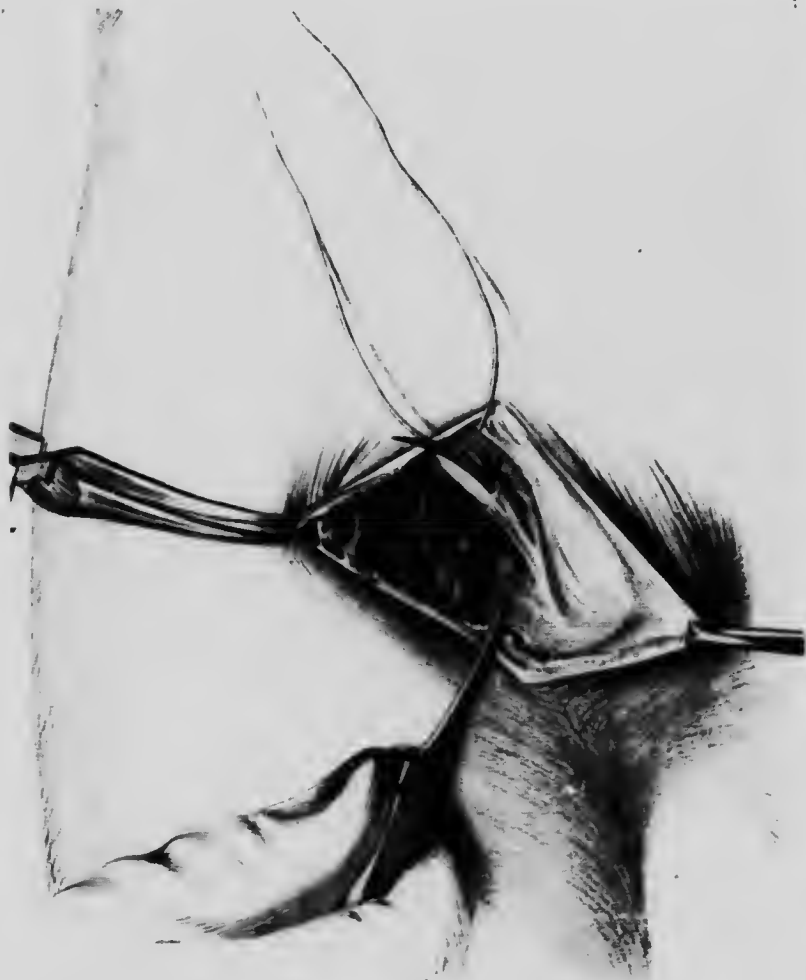


FIG. 84.—CLOSURE OF THE CRURAL RING. PLACING THE FIRST SUTURE UNITING THE PECTINEAL APONEUROSIS TO THE CRURAL ARCH.



recognized by the muscular structure of its wall. The author removed from one of these cases of herniated bladder an enormous phosphatic calculus. The bladder was bilched, having a large diverticulum, which communicated with the chief cavity by means of a narrow opening. After removal of the calculus the diverticulum was resected; the bladder was reduced after being closed with a double purse string suture.

### E. Femoral Hernia.

The exposure of the hernia and isolation of the sac are carried out as in a case of strangulated hernia. The sac is incised with care, and the contents are reduced. The neck is isolated from the arch of Fallopius and ligatured as high as possible. The ring is closed by interrupted sutures, which must be placed with great care, above all on the outer side, since here the femoral vein may be wounded by inadvertence. Suture of the skin and glass drain.

The details of the operation are clearly shown in Figs. 80 to 86, which represent the dissection of the normal crural canal. Fig. 80 shows the cutaneous incision which is used for exposure of the femoral ring; this incision is made over the most prominent part of the tumour.

Fig. 81 shows the relations of the crural or lymphatic canal with the vasculo-nervous bundle. The cribriform fascia has been raised and the edges of the wound are strongly retracted by means of hooked forceps.

Fig. 82 shows the exterior aspect of the region of the cribriform fascia and the external inguinal orifice. It will be noticed that the external inguinal orifice and the spermatic cord are only separated from the crural orifice by the external pillar of the inguinal ring.

Fig. 83 represents the crural orifice. A curved forceps, introduced into the orifice, shows the union below of the falciform ligament of Gimbernat to the ileo-pectineal eminence.

Fig. 84 shows the first ligature in position to close the ring when the sac has been removed.

Fig. 85 shows the second suture, which should pass below almost in contact with the femoral vein.

Fig. 86 shows the completion of the operation.

### F. Lumbar, Ischiatic, or Obturator Hernia.

These hernias are recognized by the presence of a soft tumour, reducible with a gurgling sound, which are reproduced on the least effort. Operation is easy, and is carried out in following the technique already described. The following stages are observed: exposure of the hernia, isolation of the sac, reduction of the contents, ligature of the neck, suture of the ring, suture of the skin and drainage.

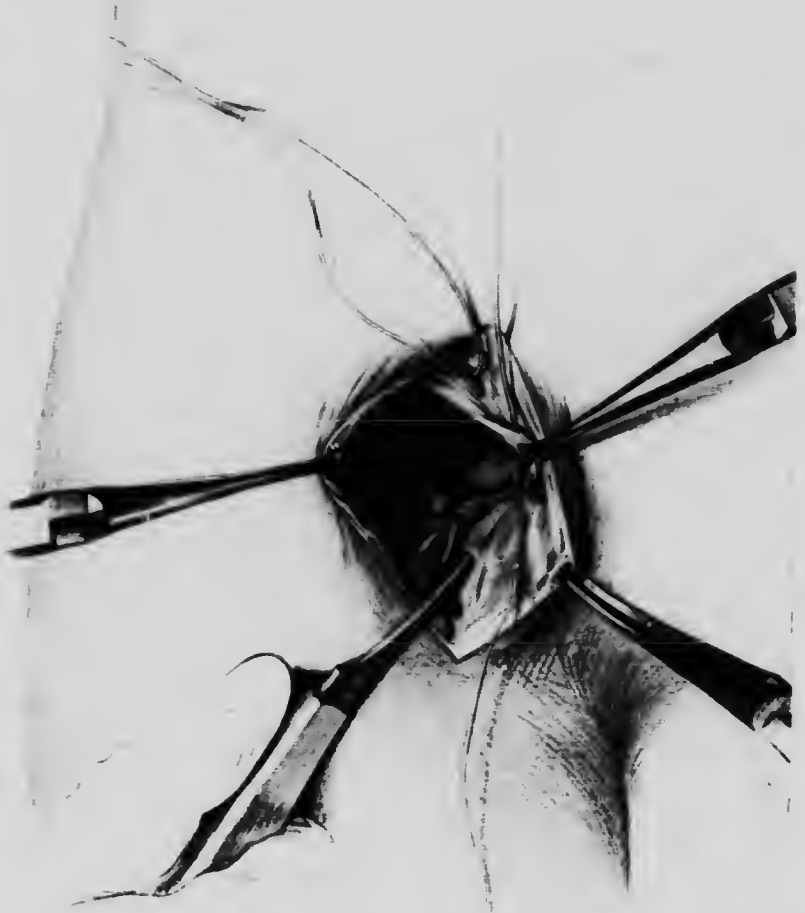


FIG. 85. — THE INTERNAL END OF THE CRIERAL ARCH IS DRAWN UPWARDS. A SECOND SUTURE SECURES THE PECTINEAL BAND CLOSE TO THE FEMORAL VEIN.



FIG. 86.—CLOSURE OF THE CRURAL ORIFICE WITH TWO SILK SUTURES.

### G. Diaphragmatic Hernia.

This hernia can only be discovered in the course of a laparotomy. It should be reduced and the neck of the sac sutured with a purse-string suture.

### LIPOMATOSIS OF THE ABDOMINAL WALL.

This condition is not exceptional, especially in fat women and those who have borne many children.

The skin of the abdomen may become distended to such a degree that it falls in the form of an apron in front of the thighs. This fatty apron may contain as much as 1,500 or 2,000 grammes of fat. The resulting infirmity is very trying to the patient, and besides being complicated with intertrigo, can cause great suffering. This acquired deformity of the abdominal wall is treated by transverse excision of the skin and exuberant fatty tissue.



FIG. 87. OPERATION TO REMOVE EXCESS FAT FROM THE ANTERIOR ABDOMINAL WALL. RESECTION OF A LARGE UMBILICAL FOLD AND SERACENT FAT. THE FIRST DEEP SUTURE IS PLACED IN POSITION.

**Operation**—FIRST STAGE: *Incision of the Skin.*—The fatty apron is circumscribed by a double transverse incision passing by the upper and lower cutaneous folds. It is traced so as to afford a wide resection of the redundant tissues.

SECOND STAGE: *Resection of the Fatty Tissue.*—The adipose mass should be cut through clearly, and removed as far as the aponeurosis. Bleeding vessels are then caught.



FIG. 88. —OPERATION TO REMOVE EXCESS FAT FROM THE ANTERIOR ABDOMINAL WALL. RESECTION OF A LARGE PANNECULUS FOLD AND SUBJACENT FAT. THE FIRST DEEP SUTURE IS PLACED IN POSITION. THE FIRST SUTURE IS DRAWN TIGHT AND KNOTTED.



FIG. 89. PLACING THE FIRST SUPERFICIAL SUTURES.



**THIRD STAGE: Repair.**—The fat is reunited by means of separate silk sutures. The skin is reunited by means of separate silk sutures and metal clips. Drainage. This operation gives remarkable plastic results as long



FIG. 90.—ANOTHER CASE. VIEW OF THE LINE OF UNION AFTER APPLICATION OF METAL CLIPS.

as the musculo-aponeurotic abdominal wall is not greatly relaxed. Enough skin must be removed for the tissues which remain to be slightly stretched. The cicatrice which is situated in the neighbourhood of the pubis and the crural arches is hardly visible.

## TUMOURS.

### BENIGN TUMOURS.

#### Lipoma.

Subcutaneous lipoma of the abdominal wall is not rare. It frequently develops in the neighbourhood of the antero-superior iliac spine and may attain considerable volume. At times it is pedunculated. Operation consists in its extirpation followed by suture of the skin.

#### Molluscum Fibrosum.

Molluscum pendulum can also develop in the same region.

There are no particular indications in the operation for this condition. The same may be said for all other benign subcutaneous tumours of the abdominal wall.

### Subcutaneous Lymphangloma.

Telangiectatic dilatation of the subcutaneous lymphatic channels of the abdominal wall is sometimes observed. This rather rare affection occurs early in life, and is characterized by the appearance of a varicose condition of the subcutaneous lymphatic vessels. These lymphatic varices communicate with dilated lymph spaces in the subcutaneous adipose tissue. The tissue between these lymph spaces becomes transformed into fibrous tissue. Large lymphatic varices become transversed by a network of fibrous cords in a way which is characteristic of the venous sinuses of the dura mater. The author observed one of these fibrous telangiectatic tumours of lymphatic origin in a girl of sixteen. The principal mass occupied the lumbar region to a height of 12 centimetres: it was prolonged in front along the groin as far as the femoral lymphatic glands. Enormous collecting trunks served for communication between lymphatics of the crural canal and the centre of the tumour. This lymphatic tumour had been declared inoperable by several surgeons, and was presented as such at the Société de Chirurgie.

The vertical dimensions of the lumbar mass hardly gave out hope that a union of the teguments was possible. The author completely excised the tumour, which, to the touch, could be clearly distinguished from loose adipose tissue. It was necessary to prolong the incisions on either side as far as the crural canal in order to enucleate the external and anterior prolongations of the lumbar tumour.

This operation was followed by a complete cure, the only peculiarity being an abundant leakage of lymph during the first eight days. The cure is confirmed and there has been no relapse.

### Fibroma of the Abdominal Wall.

Fibroma of the abdominal wall develops either in the neighbourhood of the linea alba or close to the antero-superior iliac spine.

#### *Fibroma of the Linea Alba.*

This tumour develops in the sheath of the rectus muscle. It is always unilateral, and may, when it is fused with the deep aponeurosis, encroach upon the linea alba. Generally these fibromas are fused with the deep aponeurosis and the peritoneum, so that the deep aponeurosis and the serous membrane must be cut away for a certain distance. This peculiarity should be taken into consideration with regard to the suture of the wound, this stage of the operation being very difficult when the above resection has caused considerable loss of substance.

**Operation—FIRST STAGE:** *Longitudinal Cutaneous Incision.*—Incision of the superficial aponeurosis and exposure of the tumour.

**SECOND STAGE:** *Dissection of the Tumour.* which should be entirely removed with those parts of the aponeurosis to which it is firmly attached.



**THIRD STAGE: Hemostasis and Suture of the Wound.**—The peritoneum and the deep aponeurosis should be united by a strong silk interrupted suture, followed by suture of the superficial aponeurosis.

#### *Fibroma of the Inguinal Region.*

These lateral fibromata are subaponeurotic, and almost invariably adherent to the periosteum of the antero-superior iliac spine. Their removal presents no difficulty.

### MALIGNANT TUMOURS.

#### **Cutaneous Epithelioma.**

This condition is fairly frequent. It often develops in the depths of the umbilical cicatrix, which in some persons is a receptacle for epidermal debris and all kinds of germs. The cells, as a result of chronic irritation, become inoculated with the disease, just as cancer of the tongue develops, irritated by syphilis or defective teeth.

Epithelioma of the umbilicus must be treated as quickly as possible, either by excision or by thermo-electric coagulation.

**Operation—FIRST STAGE.**—The umbilicus is circumscribed by two horizontal curvilinear incisions.

**SECOND STAGE.**—Resection of the umbilical cicatrix, keeping a distance of 8 to 10 millimetres from the epithelioma. The state of various fibrous cords which are found here must be examined, especially the hepatic vein, which is not always completely obliterated.

**THIRD STAGE: Hemostasis.**—Peritoneo-aponeurotic suture and thermo-electric bath.

**FOURTH STAGE.**—Suture of the skin and drainage.

*Thermo-Electric Coagulation.*—Should the lesion be not localized, *thermo-electric coagulation* is the best procedure. The author recommends its use in all cases without exception: it is far more valuable than operation where the cancer cells become re-inoculated in the wound.

#### **Melanotic Sarcoma.**

Melanotic sarcoma of the abdominal wall may arise in an old pigmentic patch. As soon as the tumour develops a large number of miliary nodules spread around which give rise to a most virulent and rapid generalization. This affection is already as a rule beyond the reach of surgical intervention.

As soon as possible electro-coagulation should be practised.

#### **Sarcoma of the Abdominal Wall.**

This may arise from the muscles or from the aponeuroses of the abdominal wall. The cases which have come under the observation of the

author have been aponeurotic sarcomas in the neighbourhood of the linea alba. This neoplasm, though not very malignant, recurs with great obstinacy, and at the same time it is practically impossible to make a sufficiently wide resection of the deep aponeurosis and the peritoneum, which are invaded by the tumour.

Operative treatment is the same as for fibromata of the deep aponeurosis, from which they differ only in their histological structure and their tendency to recur. The operation wound is treated with thermo-electric bath at 60°, to prevent recurrence. These tumours occasionally contain cystic cavities and myxomatous nodules.

### OPERATIONS ON THE PERITONEUM.

Operations on the peritoneum should be the subject of a special chapter.

Traumatic lesions are omitted. They have been discussed, in the description of operations on the abdominal wall. Traumatic lesions of the abdomen are only of grave import when they are complicated by the phenomena of infection. Indeed, the peritoneum can reabsorb even large hæmatomata, provided only they be aseptic.

### SURGICAL TREATMENT OF ACUTE PERITONITIS.

#### Etiology of Acute Peritonitis.

Acute peritonitis can be produced either by *direct* or by *indirect* infection. Where the infection is *indirect* it is carried either by the lymph or blood stream, and is as a rule, due to a single micro-organism.

Peritonitis varies in gravity, the least innocuous being that due to the pneumococcus, which is often met with in children, where it is caused by pneumococci which traverse the diaphragm. Puerperal peritonitis, which is the gravest form of acute peritonitis known, is caused by the streptococcus.

Among the causes of acute peritonitis by *direct infection*, peritonitis following upon laparotomy should have a first place in our consideration. These infections are often due to a single micro-organism. The pathogenic microbe is very frequently the *Staphylococcus aureus* and at times the streptococcus or gonococcus. Peritonitis following on a penetrating wound of the abdomen or from perforation of an abdominal viscus is more often polymicrobial in origin. On the other hand, perforation of the gall-bladder, which may contain only a single pathogenic element, will give rise to a peritonitis in which only that microbe is found. The same may be said of the inflammation of the peritoneum following the intraperitoneal bursting of a liver abscess, an abscess of the spleen, or suppuration of the Fallopian tubes, which directly infect the serous cavity.

Peritonitis following lymphangitis in an imperforated appendix may also be caused by a single microbe, but when caused by perforation of the appendix or of the intestinal tract peritonitis is always a polymicrobial infection containing a number of anaerobic micro-organisms.

**Symptoms and Localization.**—The symptoms of peritonitis are disconcerting in their variability. To give instances, peritonitis following perforation of the stomach is the most rapid owing to the irritating action of the gastric juice. Perforation of the suppurating gall-bladder, hydatid cysts of the liver, or liver abscess, give rise to very acute inflammation. Malignity of the peritonitis becomes less accentuated when it originates lower in the abdomen. Purnulent encysted peritonites also occur rather when their origin lies in the right iliac fossa and the pelvis, where they become localized by the prompt formation of adhesions.

#### ENCYSTED PERITONITIS.

##### A. Subphrenic or Perigastric Abscess.

Subphrenic abscess, as already indicated, is sometimes subperitoneal. More often it is a true localized peritonitis where suppuration progresses very slowly after adhesions have been formed. The most frequent cause is perforating ulcer of the lesser curvature of the stomach.

In the author's experience several cases of subphrenic and perigastric encysted abscess have occurred where the determining cause was perforation of the stomach by fish-bones or needles at the level of the gastrocolic omentum. In some cases the suppuration reached the posterior omental cavity.

##### B. Perivesicular Peritoneal Abscess.

Slowly progressing inflammation of the gall-bladder produces as a rule numerous adhesions uniting the viscus to the gastrohepatic omentum, gastrocolic omentum, and the colon. An encysted suppurative peritonitis can arise even where no perforation has taken place, infection being carried by means of the lymph channels.

##### C. Peritoneal Abscess of the Iliac Fossa.

This condition is confined almost exclusively to the right side, the originating factor being appendicitis. It has been observed on rare occasions to be due to a localized gangrene of the caecum following a violent contusion of the abdomen.

##### D. Encysted Pelvic Peritonitis.

This is seldom seen in the male, except as a complication of inflammation in an abnormally placed appendix, or as a result of a perforation of the

intestine by a foreign body. The foreign body is eliminated occasionally by the bladder after an intermediary abscess has formed between the two organs.

Encysted pelvic peritonitis is far more common in the female subject, where it arises as a rule from infection of the internal genital organs.

**Thoracic Complication.**—The author would draw attention to the frequent presence of a right-sided pleurisy as a complication of suppurating appendicitis. In one instance which came under observation suppuration occurred in the left pleura, the right pleura being unaffected. In another case the purulent pleurisy was bilateral.

**Diagnosis and Indications for Operation.**—The diagnosis of encysted peritoneal suppurations as a rule presents no difficulty. The onset is at times insidious, at others it is intense and rapid. It is intense when general infection of the peritoneum precedes the formation of adhesions. It is unnecessary to dwell upon the general symptoms, pain, fever, the state of the pulse, nausea, etc. A very perceptible puffiness is produced, which allows of confirmation of the diagnosis and of timely intervention.

As soon as the presence of an encysted peritoneal suppuration is certain, preparation must be made for immediate intervention. When the symptoms are not grave, and if the collection of pus is very deep, ice-bags should be applied, and a waiting policy should be adopted to allow the pus to migrate towards the surface, so that intervention may not necessitate opening the great serous cavity. But if the symptoms become urgent, operation must be performed without delay.

The general technique of operations for the opening up of encysted peritoneal suppurations varies according to their position. Whereas they may sometimes travel towards the abdominal walls, and thus become superficial, at other times they remain deeply situated, and cannot be reached without traversing the peritoneal cavity.

#### *Collections Adherent to the Wall.*

The incision corresponds to the most accessible portion of the inflammatory mass. Should this be lateral or iliac, the incision is made on its external limit, in order to facilitate drainage.

**Operation**—**FIRST STAGE.**—Incision of the skin and abdominal wall as far as the peritoneum.

**SECOND STAGE.**—The most accessible point is looked for, and incised layer by layer. If superficial adhesions are found, without opening the serous cavity, it is easy to perforate the mass with a curved forceps. The orifice is enlarged by divulsion, the suppurating focus is evacuated and its toilet is effected with aseptic compresses. Foreign bodies are searched for where suspected, and removed, and the cavity is plugged.

**THIRD STAGE.**—Partial suture of the ends of the incision above and below the plugs. Flat dressing. Injections of mycolysine.

*Deep Collections.*

**Operation—FIRST STAGE.**—Incision as above as far as the peritoneum.

**SECOND STAGE.**—A small buttonhole incision into the serous membrane will show that it is free from adhesions. The opening is widened by divulsion, and the peritoneum is fixed on either side to the edges of the wound by means of hooked forceps. The surgeon now raises the inner edge of the wound, and introduces one or two sterilized compresses under the abdominal wall, seizing the end of each compress in a hooked forceps; other compresses are also placed below and above when necessary.

**THIRD STAGE.**—The deep adhesions which limit the collection of pus are now examined, and dissociated either with the finger, protected with a rubber glove, or with a curved forceps. The peritoneal compresses protect the whole of the periphery of the field of operation. When pus makes its appearance the opening is widened by divulsion. The focus is swabbed and temporarily plugged, and the compresses which protect the peritoneum, and which are soiled with pus, are changed. The compress plugging the purulent focus is now removed, and the focus is examined in order to ensure that an effective toilet has been made. It will then be decided whether a simple plugging of the focus is all that can be accomplished, or whether a deep repair of the peritoneum, or any other manœuvre called for by the particularities of the case, can be carried out.

**FOURTH STAGE.**—Partial suture of the extremities of the incision, flat dressing. The technical details of operation for the principal types of encysted peritonitis will be described in the various regions in which they occur.

## DIFFUSE PERITONITIS.

This condition supervenes where no early adhesions are formed. In some patients adhesions are not formed, either because the infection of the serous cavity is from the onset very extensive, as in perforative peritonitis, or because the peritoneum is incapable in these individuals of any protective resistance. The most dangerous cases of peritonitis are those which follow operation. The serous surface becomes congested and viscons, without any sign of pus formation. Death supervenes rapidly owing to heart failure; occasionally intestinal distension is very slight and no vomiting occurs. In this form of acute peritonitis an abundant hæmatemesis may occur due to the intense congestion of the gastric mucous membrane.

Spontaneous peritonitis is less malignant as a rule; it remains localized at first and does not become generalized before the third or fourth day. Relative paralysis of the intestine immobilizes the intestinal loops in the neighbourhood of the initial seat of infection, and a veritable intrascrous localization may be produced between the distended and paralyzed loops, without the formation of real adhesions. This phenomenon of localized peritonitis, not truly encysted, is very interesting. False membranes are

produced at the border of the infected region, generally placed low down in the pelvis or iliac fossa. As the collection of pus increases in amount, an abundant serous exudation is poured out above the original seat of infection. This exudate is almost free from micro-organisms, and only becomes infected after twenty-four to forty-eight hours. In such conditions the pus is very thick in the pouch of Douglas, while in the iliac fossa the exudate is practically serous in character. The rest of the peritoneal cavity remains unaffected for several days. Surgeons, then, are in error in naming these partial peritonites as generalized peritonites. They are indeed only the first stage of a generalized peritonitis, and are readily curable by iliac incision and draining by means of plugs, whilst true generalized peritonitis where the infection reaches the concavity of the diaphragm is as a rule a mortal disease.

#### Diffuse Peritonitis Localized in the Pelvis.

**Operation—FIRST STAGE: *Skin Incision.***—In a case presenting signs of diffuse peritonitis, with no obvious localizing signs, in which region should the incision be made? Putting aside certain exceptional cases, where a previous history of a calculous cholecystitis or a gastric ulcer allows the surgeon to presume that a perforation of either viscus has occurred, appendicitis is almost always the causative factor. The site of the greatest pain is not a sufficient indication. In perforation of the appendix for example, the most painful spot may be found in the left flank, whilst the region of McBurney's point is not remarkably tender. Incision in the right iliac region presents above other incisions (median laparotomy and incision of the rectus sheath) this advantage: that it facilitates rapid examination of the cæcum, the appendix, and the pelvic cavity, where as a rule the thickest inflammatory exudate is to be found.

**SECOND STAGE: *Exploration and Toilet of the Peritoneum.***—The peritoneum being opened above the crural arch, the membrane is fixed to the edges of the wound with several hooked forceps. The inner edge of the wound is raised to allow of the introduction of one or two sterilized compresses, to the angle of each of which is fixed a hooked forceps. At this moment a certain quantity of purulent serous fluid escapes. This is immediately sponged away, and a second compress is introduced at the top of the incision and along the ascending colon. The peritoneal cavity being protected on the inner side and above, the lower part of the iliac fossa is now explored. This is swabbed in its turn, and the pelvic cavity is submitted to the same process. In the region of the iliac incision a serous almost limpid fluid is obtained, whilst that which is found in the pouch of Douglas is veritable pus. This is methodically swabbed away with sterilized compresses. Specimens of the pus are put aside for bacteriological examination. Toilet of the pouch of Douglas is then carried out, and it is plugged with one or two large compresses. The upper compress which lies along the cæcum is now removed, and the surface between the ascending colon and the abdominal wall is carefully sponged: here a secondary purulent

collection is often found. A fresh sterilized compress is placed at this point, and the compress on the inner side is now removed. The abdominal wall is raised by means of a gynecological retractor, and, using small sterilized compresses mounted on a curved forceps, first the umbilical region and then the left iliac fossa are explored, followed where it is necessary by the rest of the peritoneal cavity, region by region, as far as the concavity of the diaphragm. Almost without exception it will be found that, although adhesions are completely absent, all the regions are quite healthy. Twenty years ago, when the author first met with and remarked on this condition, he was impressed with the way in which the serous membrane was able to defend itself against dissemination of the infection, even in the absence of adhesions, and he came to the conclusion that many surgeons erroneously published records of cures of these cases of partial peritonitis in denominating them as diffused or generalized peritonitis.

It should be remarked that the author's method for the peritoneal toilet, which, commencing at the focus of infection, each region is methodically explored as described above, has this advantage, that it permits of examination of the whole serous cavity without risk of disseminating the infection. These manoeuvres occupy a few moments at the most if done in a methodical manner.

**THIRD STAGE: Accessory Manipulations.**—It has already been stated that appendicitis is the condition usually found. The state of the appendix must always be ascertained in these cases, and should it be the cause of the peritonitis, resection of the organ is not difficult. The technique of this operation will be described later on. If the caecum is much inflamed, and plugging of the iliac fossa is found to be necessary, it is useless to bury the ligature of the appendix with a double purse-string suture, as is recommended in the operation for appendicitis during the period of quiescence.

**FOURTH STAGE.**—Compresses intended for drainage are placed in position, and the incision is partially closed, when it is extensive, to avoid all risk of a hernia of the intestine in case vomiting should occur. External compresses are then placed in position, and a flat dressing is applied. Drainage-tubes are rarely necessary.

#### **Diffuse Peritonitis with Multiple Seats of Suppuration.**

When an operation is performed late, either the patient dies from generalized peritonitis or the lesion tends to localize itself at various points. These secondary localizations may occur in the left iliac fossa, the posterior omental sac, in the neighbourhood of the spleen, or even between the loops of the small intestine, which become agglomerated to form the walls of an abscess cavity. Should there be much pus in the subhepatic region, the iliac incision must be extended as far as the ribs. By this means the subhepatic region and the foramen of Winslow can be explored and drained. When pus is found in the splenic region a counter-opening must be made 8 to 10 centimetres long at the lowest point, in order to complete the peritoneal toilet and to plug the left flank. Pus in the left iliac fossa requires

an iliac incision on the same side. Purulent encysted collections between intestinal loops require median incision, from the pubis to a point just above the umbilicus.

*Danger of Washing Out the Peritoneum.*

Lavage of the peritoneal cavity should be absolutely proscribed. Isotonic saline solution at the temperature of 38° to 39° serves solely to disseminate infection. An immediate phagolysis is also produced, which accelerates a fatal issue.

*Partial Lavage of the Intestine after Exteriorization.*

On the other hand, the most inflamed intestinal loops can be washed outside the abdomen, when compresses have been tightly packed around the incision. Great care must be taken that the solution does not penetrate into the serous cavity. When the washed intestinal loops are returned into the serous cavity, they are left in the neighbourhood of the incision, which is tamponed to their level. [The author employed Ringer's solution exclusively in recent years.—H. S. B.]

*Artificial Anus.*

In cases where the general symptoms do not yield to toilet and drainage of the peritoneum, and when the distension increases, it may be useful to combat the intestinal paralysis and the inconveniences following antiperistaltic movements by forming an artificial anus.

This artificial anus should be made in the *left flank at the upper part of the jejunum*. If for any particular reason two orifices are created, one in the upper part of the jejunum and the other in the lower part of the ileum, the former opening only will pass an abundance of intestinal contents.

*General Treatment.*

As soon as the diagnosis is made the patient should receive every two or three hours subcutaneous injections of mycolysine, each injection containing 10 c.c. When under chloroform another large dose (up to 50 c.c.) is given. When purulent peritonitis declares itself, intraperitoneal injections of mycolysine are not indicated. An intraperitoneal injection at this stage may cause a temporary phagolysis, and so enfeeble the defensive reaction of the serous membrane.

The abdomen should be covered with long ice-bags, and injections are given of isotonic salt solution. Camphorated oil, spartein, and if necessary an oily solution of digitalin, are also injected.

When the affection follows a favourable course the distension diminishes, and the pulse loses its peritoneal character. The subcutaneous injection of mycolysine must be continued as long as the patient is not out of danger.



*After-Treatment following Operation.*

The superficial dressing must be changed daily. Frequently the discharge coming from the compresses which plug the wound is very scanty. It is a curious fact that a diffuse sero-purulent peritonitis with abundant exudation is transformed into a dry peritonitis after a careful peritoneal toilet has been made with dry compresses.

If the condition continues to improve, the plugs are left in position for four or five days. If, on the other hand, the condition of the patient becomes worse, the sutures holding the incision together are cut, and the compresses are removed in order to explore the deeper structures. This exploration can be carried out very well by means of lateral incisions. The median incision, if one has been made, should be closed, and the lateral incisions left open, these being more suitable for drainage purposes. To explore the deep structures by means of one of these incisions the inner edge of the abdominal wall is raised with a short retractor, and the left index finger, covered with a rubber glove, is introduced into the serous cavity; following this a dry compress mounted on a curved forceps may be used.

In very severe cases, which nevertheless are followed by cure, the surgeon may be obliged to search, after an interval of two or three weeks, for one or several intraperitoneal localized areas of infection. These encysted collections may be produced where the infection has been originally most virulent.

## AUTOPLASTIC REPAIR OF THE PERITONEUM.

Numerous operations on the abdominal viscera necessitate extensive stripping up of the peritoneum. It was remarked by the author when performing his first laparotomies in 1887 that loss of peritoneal substance, if repair was neglected, exposed the patient to the risk of grave complications. Indeed, the denuded areas where there is loss of serous surface become the seat of abundant sero-sanguineous exudation, and microbial infection readily supervenes. If the patient escapes peritonitis, adhesions are inevitably produced at these points, which unite the viscera, notably the intestine to the abdominal wall. The same complication is produced when the visceral layer of the peritoneum has been the seat of chronic inflammation; the separation of intestinal adhesions, for instance, leave bleeding surfaces which become the starting-point of an adhesive peritonitis. To avoid this complication, it is necessary to repair the surface deprived of peritoneum by means of sero-serous sutures, after the arterioles which bleed are either cauterized or ligatured. The rules for the repair of visceral and parietal peritoneum were laid down by the author in the period from 1887 to 1895. These original procedures, which were the subject of communications to various congresses, were published later under the term "peritonization." The nomenclature alone was new, and the various procedures which were described under this title differed in no respect

from those described in the course of lectures which were given to surgeons following the author's courses.

The term "peritonization" being now consecrated by use, the author will describe under its name the original procedures for repair of the peritoneum which were invented by him from 1887 to 1895. These procedures were sufficiently perfected at that time, now long distant, and no modification has been found to be necessary during the interval which has elapsed.

*Peritonization* is the repair of the parietal or visceral peritoneum when it has been torn during an operation. Besides this repair of tears and loss of substance of the serous membrane, it is frequently necessary to *exclude* from the serous cavity a more or less extensive surface. This will be described under the head of compartmenting of the peritoneum.

The repair of the visceral and parietal peritoneum will be described in turn.

#### Repair of the Visceral Peritoneum.

This repair is made *en surjet* with No. 1 silk and intestinal needles. In the case of the liver or the spleen care must be taken not to tear their tissue, which is very friable. In these cases a dry compress is placed in contact with the sutures to act as a tampon. Bleeding surfaces of the stomach, the intestine, and the mesentery are easily repaired. The bleeding surface is excluded after hæmostasis, by means of a suture, using No. 1 silk. Folding of the mesentery is no inconvenience. Bleeding surfaces at the periphery of the intestine, should they not be too extensive, are also repaired with fine silk *en surjet*. A transversely placed suture is preferable, since this produces an artificial valve without narrowing the calibre of the intestine, as will happen when a suture is longitudinally placed. When the loss of peritoneal substance is great the serous membrane must be repaired without paying attention to the narrowing of the segment in question, and an anastomosis is effected afterwards between the loop above and the loop below. The segment also, if necessary, can be resected in its entirety (see below). Very small bleeding intestinal surfaces are repaired very quickly by the application of a purse-string suture or a longitudinal single plane suture.

#### Repair of the Parietal Peritoneum.

##### CLOSURE, SHUTTING OFF OF PERITONEUM AND PERITONIZATION.

It was observed in the early laparotomies (in 1887) that, besides the repair of loss of peritoneal substance, it was often necessary to isolate certain portions of the peritoneum from the rest of the peritoneal cavity, in order to prevent, for example, the spread of a local inflammation. The manoeuvres which are intended for the *partitioning of the peritoneum* being inseparable from those directed towards the repair of the peritoneum or *peritonization*, will be described at the same time.

The author studied at first the closure of the lower peritoneum, in the operation for total abdominal hysterectomy. Long experience proved

that it was indispensable to suppress the pouch of Douglas entirely, and to partition off the upper pelvic outlet. This method of partition was afterwards applied to other regions of the abdominal serous cavity.

#### *A. Region of the Pylorus and Gall-Bladder.*

Inflammations of the gall-bladder rapidly provoke adhesions in the neighbourhood of the first part of the duodenum and transverse colon. When these adhesions become extended they obstruct the foramen of Winslow and reach the lesser curvature of the stomach. In the course of extensive operations on the gall-bladder and the pylorus the author has sought to realize this defensive procedure on the part of nature.

In the approach to the deeply seated bile-passages, and the operation for the resection of the pylorus, considerable damage is done to the peritoneum. The author's procedure is as follows: In front of the deep visceral sutures the very loose peritoneal folds of the gastro-hepatic omentum are united to the folds of the gastro-colic omentum and to the right upper part of the great omentum. Two purse-string sutures or two superimposed sutures are employed. These sutures cover in the deeply placed sutures which are excluded from the general cavity. If the operation is aseptic, as, for instance, after pylorotomy, the abdomen is closed completely. But where drainage of the deep bile-passages is necessary, the gastro-colic omentum and the upper orifice of the great omentum are sutured to the peritoneum at the upper border of the parietal incision, and the depths of the wound are tamponed. This partitioning, which may be practically complete, assures the rapid formation of adhesions and prevents all effusion of bile or fluids from the wound into the serous cavity.

#### *B. Splenic Region.*

The disposition of the peritoneum is complicated in this region, the posterior half of the internal surface of the spleen forming part of the posterior epiploic cavity. Besides this, below the inferior pole of the organ a semilunar peritoneal fold is found which is at times very accentuated (*sustentaculum lienis*).

Interventions for wounds caused by firearms are not rare in this region, the shot being aimed below the heart. In one of these cases operated on by the author the ball had perforated the gastric hepatic omentum close to the lesser curvature of the stomach, and had reached the splenic region in an oblique direction. After observing that the region of the stomach was intact, and after toilet of the posterior omental cavity, a wound of the spleen was found, whence blood was flowing towards the pelvic cavity. As the surface hemorrhage could not be completely arrested, the peritoneum below the spleen was partitioned off by uniting first the *sustentaculum lienis* to the subsplenic meso-colon, and afterwards the upper edge of the great omentum to the abdominal wall. This suture was completely water-tight. The wound was plugged by an anterior incision, and the patient recovered from his wound.

*C. Pancreatic Region.*

The approach to the pancreas is realized by breaking through the gastro-colic omentum or the transverse meso-colon. The preferable route is the inter-gastro-colic; it is the most direct, and preserves the vascularization of the transverse colon.

The posterior cavity is reached. Then it is quite easy to obtain complete isolation from the general peritoneal cavity by means of "marsupialization." The edges of the incision of the meso-colon are sutured to the parietal peritoneum at the edges of the abdominal incision. A perfectly isolated partition is thus obtained.

*D. Region of the Ascending Colon.*

Interventions on the colon are frequent. The approach to and resection of the ascending colon can be obtained from an iliac incision, which is prolonged upwards towards the false ribs. Resection of the cæcum is generally carried out at the same time as that of the ascending colon. When the operation is finished a large breach remains in the meso-colon and mesentery, reaching from the terminal extremity of the ileum to the transverse meso-colon. These mesenteric folds contain fat, and to leave them in the peritoneal cavity exposes the patient to the risk of septic infection. Infection of the mesentery is specially to be feared in cases of ulcerated cancerous tumours, with infection of the corresponding lymphatics. Since 1895 the author has repaired this mesenteric breach, by bringing it wholly in contact with the parietal incision by means of two or three purse-string sutures. Several sero-serous sutures prevent all danger of infection. The stump thus formed is rarely more than 5 or 6 centimetres in extent. An aseptic compress is placed in contact and the abdominal wall is sutured above and below the compress, which is removed on the fifth or sixth day.

*E. Region of the Descending Colon.*

The extirpation of the descending colon and sigmoid flexure may be followed by a similar repair. If the mesentery be not free enough to allow the whole of the cut surface to be brought together in a narrow stump, it can be fixed along the edges of the lateral abdominal wound. Above and below, the sutures uniting the upper and lower ends of the large intestine can be buried under two folds of sero-serous sutures. End to end and lateral anastomosis of the upper and lower ends of the descending colon do not give good results.

The preferable course is to close the upper and lower ends, and then to form an anastomosis between the lower extremity of the ileum and the first part of the rectum.

*F. Mesenteric Region.*

In cases where a large peritoneal lipoma has been removed, or a hydatid cyst which has developed between the layers of the mesentery, a wide bare surface is left which it is wise to plug. If the tumour extends backwards as far as the outer side of the square lumbar muscle, a large counter-opening can be made on the outer side of this muscle, which will serve for the passage of drains and compresses which are used to plug the wound. If the cellular compartment is medially placed, the orifice of the posterior compartment is narrowed and sutured to the parietal peritoneum, and tamponing is effected from the front.

*G. Pelvic Region.*

Since the year 1894 the author has made it a general rule that, after total removal of the rectum in the male or female subject, and also after total abdominal hysterectomy, the peritoneal cavity shall be shut off at the level of the superior outlet. The technique of this closure comprises, first, the union of the caecum or subcaecal peritoneum to the peritoneum which lies along the inner border of the psoas muscle, and to the vesical peritoneum. The technique of the suture varies according to the laxity of these various regions of the serous membrane.

Where the laxity of the peritoneum is at fault the caecum is drawn down, and this organ must be sutured to the bladder without hesitation. On the right side of the promontory is a deep sinus; the serous membrane is seized at this point with a pair of toothed dissecting forceps, and drawn upwards and forwards. A serous fold is thus obtained which is sutured to the caecum and the bladder. The middle line is thus reached behind the rectum. The sero-serous suture is now continued, uniting the bladder with the anterior wall of the rectum. The surgeon now reaches the peritoneal sinus, which corresponds with the left sacro-iliae articulation. Here it is easy to form a new serous fold, which is united, following the outline of the sigmoid flexure, to the left extremity of the upper edge of the bladder. The suture is finished off with a triple-knot. If this suture has been carefully performed, no trace of liquids which may exude in the pelvis can penetrate into the peritoneal cavity. The cavity of the pelvis is plugged with a large compress and two or three glass drains are placed in position, which in man drain the peritoneo-anal wound and in woman the vagina.

*H. Postero-Anterior Partitioning.*

In certain operations where it is indispensable to close the general peritoneal cavity at the level of the superior outlet, it may occur that perivesical lesions have caused the bladder to lose all its laxity. In such a case, both in the male and the female, the author closes off the peritoneum first on the median line in front of the promontory, by uniting the caecum to the extremity of the great omentum, and then to the rectum, the iliac

meso-colon, and the sigmoid. When this median partition is completed, the cæcum is sutured, from its external serous sinus, as far as its most anterior part, to the peritoneum lining the lateral wall of the abdomen. To the left the sigmoid meso-colon and the sigmoid itself are united to the lateral abdominal wall so as to obtain a perfect partition. It is then easy to place, 5 or 6 centimetres below the umbilicus, two or three stout silk interrupted sutures, which close the abdominal wall in front. The whole of the upper part of the incision is united, and the lower part is left open, through which pass the large compresses which serve to tampon the pelvis, the iliac fossa, and the suprapvesical region.

## OPERATIONS ON THE LIVER AND BILE PASSAGES.

### SURGICAL ANATOMY OF THE LIVER AND BILE PASSAGES.

#### Shape and Relations of the Liver.

A very imperfect description has hitherto been given of the shape and anatomical relations of the liver, particularly with regard to the relations of the lower portion of the organ with the right postero-anterior horizontal segment of the colon, which, before the author's description, had never been referred to by anatomists. For a complete study of the topographical anatomy and relations of the liver the reader should consult the plans in the author's anatomical atlas (Maloine, 1911). The following is a brief résumé of the most important features.

In Fig. 91, a frontal section passing through the mid-axillary line, the relations of the liver are shown. Here the right lobe is practically normal. Below will be observed the facets for colon, gall-bladder, and duodenum. The left lobe is more developed than is usual; often it terminates at the level of the upper extremity of the spleen. When the left lobe is greatly developed, as in Fig. 91, it presents on its posterior surface a well-marked gastric facet. The anterior inferior edge of the right lobe in the sagittal maxillary plane corresponds as nearly as possible with the chondro-costal border. In the middle line this edge of the liver corresponds practically with the central part of the xiphoido-umbilical space.

In a subject properly fixed, if a vertical section of the right flank is made between the horizontal sections, making a sagittal section which passes by the mammillary line, it is seen that the liver is polyhedral in its inferior portion. From behind forwards, facets for the kidney, colon, and gall-bladder are found. In Fig. 92 it will be seen that no decisive anterior border exists in this place. The dihedral angle which unites the anterior and inferior surfaces is, in fact, an obtuse angle of about 100 degrees. This disposition is well shown in Figs. 92 to 95.

In examining Figs. 94 *et seq.* it is seen that the upper extremity of



FIG. 91.—RELATIONS OF THE LIVER. FRONTAL SECTION PASSING THROUGH THE BI-AXILLARY LINE. A CATHETER IS PLACED IN THE SECOND PORTION OF THE DUODENUM, BELOW THE HEAD OF THE PANCREAS.

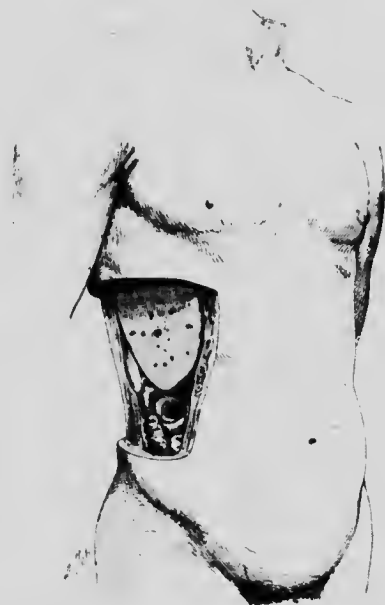


FIG. 92.—PARTIAL SAGITTAL SECTION IN THE RIGHT MAMMARY PLANE, SHOWING THE LOWER RELATIONS OF THE RIGHT LOBE OF THE LIVER, WITH THE RIGHT POSTERO-ANTERIOR SEGMENT OF THE COLON.

the ascending colon is in close relation with the hepatico-renal angle, whilst the transverse colon commences close to the anterior abdominal wall below the gall-bladder. There therefore exists between the upper angle of the ascending colon and the commencement of the transverse colon a right horizontal postero-anterior colon, or a right subhepatic colon, which is 12 to 15 centimetres in length. The gall-bladder is in relation with this portion of the colon, into which it may open in cases of suppuration and when it occupies a pronounced external situation as in Fig. 94. In other cases, however, the gall-bladder is almost in the middle line, and may open

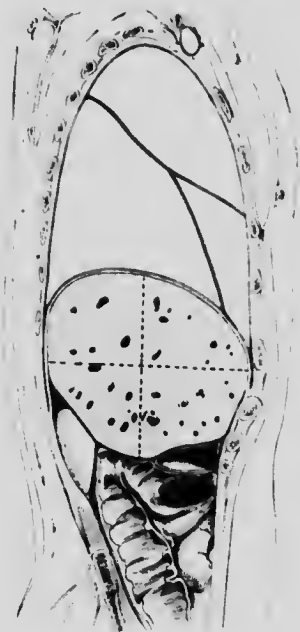


FIG. 93.—SAGITTAL SECTION SHOWING THE PULMONARY DIVISIONS, THE DOME OF THE DIAPHRAGM, THE RIGHT LOBE OF THE LIVER DIVIDED DIAGRAMMATICALLY INTO FOUR SEGMENTS, AND THE RELATIONS OF ITS LOWER SURFACE.

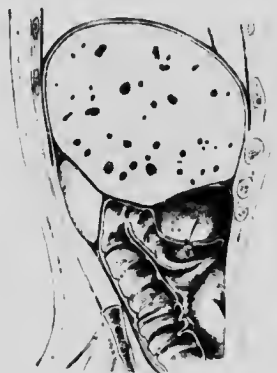


FIG. 94.—SUPPURATIVE CHOLECYSTITIS. ADHESIONS BETWEEN THE GALL-BLADDER AND THE SUBHEPATIC COLON. CHOLECYSTOCOLIC FISTULA.

into the duodenum. The gall-bladder may be displaced by a pathological deformation of the liver (Fig. 95), in such a way that it can open into a loop of the small intestine outside the mammary sagittal plane. This Fig. 95 also demonstrates clearly the danger attending puncture of the liver in cases where the stomach or intestine are interposed between the right lobe and the anterior abdominal wall. These cases are not rare.

The situation of the stomach and the small intestine in front of the liver which is shown in this figure has been drawn according to a section in the author's atlas of surgical anatomy. Hydatid cysts and abscesses in



the right lobe of the liver may occupy either of the four segments shown in Figs. 96 to 99: (1) Antero-inferior; (2) Postero-inferior; (3) Antero-superior; (4) Postero-superior. Their localization is worked out schematically in Figs. 96 to 99.

It will be observed in examining Figs. 97 and 104 that antero-inferior collections should be approached by anterior or lateral laparotomy, whereas

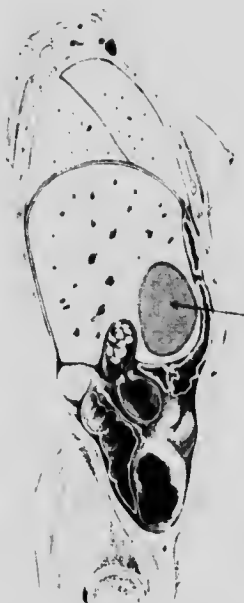


FIG. 95. AN ABNORMALLY PLACED BLADDER OPENS INTO AN INTESTINAL LOOP ON THE OUTER SIDE OF THE MAMMARY SAGITTAL PLANE. DANGER OF PUNCTURE OF LIVER ABSCESS IN THE PRESENCE OF INTERPOSITION OF INTESTINE BETWEEN THE LIVER AND ANTERIOR ABDOMINAL WALL.

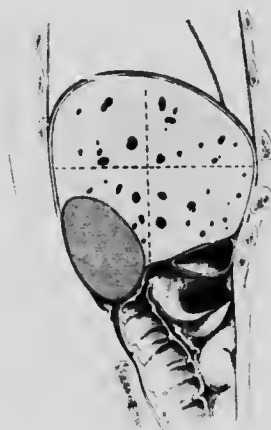


FIG. 96.—SAGITTAL SECTION IN THE MAMMARY LINE. RELATIONS OF A COLLECTION OF FLUID IN THE POSTERO-INFERIOR SEGMENT.

postero-inferior collections must be reached by the abdomino-lumbar route.

Collections on the convex portion of the liver are reached preferably by transpleural incision.

Cysts and abscesses of the left lobe are comparatively rare.

In Fig. 100 it will be observed that, in the middle line, the anterior border of the liver is constituted by a dihedral angle which is very acute



FIG. 97.—SAGITTAL SECTION IN THE MAMMARY LINE. RELATIONS OF A COLLECTION OF FLUID IN THE ANTERO-INFERIOR SEGMENT.

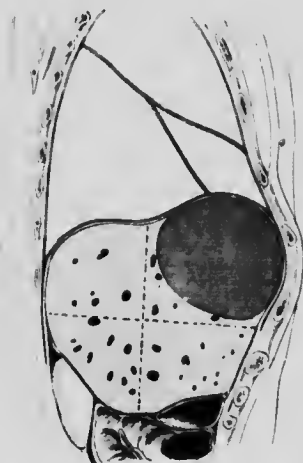


FIG. 98.—SAGITTAL SECTION IN THE MAMMARY LINE. RELATIONS OF A COLLECTION OF FLUID IN THE ANTERO-SUPERIOR SEGMENT.

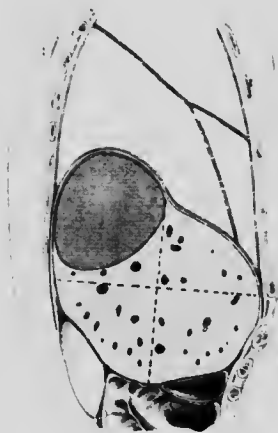


FIG. 99.—SAGITTAL SECTION IN THE MAMMARY LINE. RELATIONS OF A COLLECTION OF FLUID IN THE POSTERO-SUPERIOR SEGMENT.

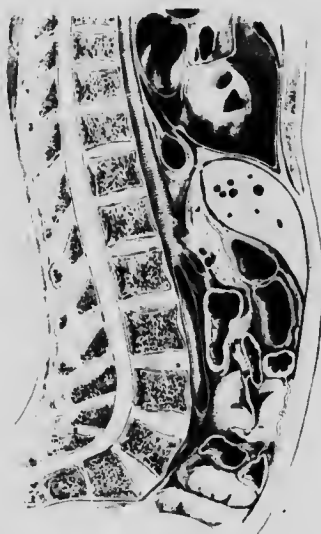


FIG. 100.—MEDIAN SAGITTAL SECTION SHOWING THE RELATIONS OF THE ANTERIOR BORDER OF THE LIVER IN THE SUBXIPHOID REGION.

This section passes 1 centimetre to the right of the umbilicus.

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—the true prominent edge of the liver. The organ descends in the middle line generally 6 to 8 centimetres below the xiphoid cartilage. This is easily verified in the course of supra-umbilical laparotomies for gastric surgery.

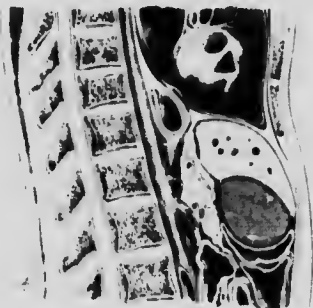


FIG. 101. COLLECTION ON THE INFERIOR SURFACE OF THE LEFT LOBE ENCROACHING ON THE MIDDLE LINE.

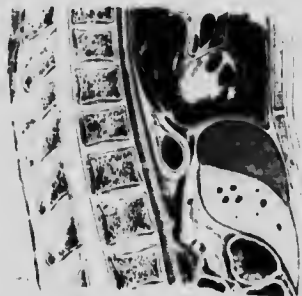


FIG. 102. COLLECTION ON THE UPPER FACE OF THE LEFT LOBE ENCROACHING ON THE MIDDLE LINE.

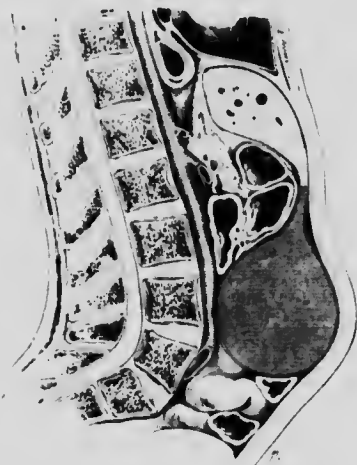


FIG. 103. MEDIAN SAGITTAL SECTION. PEDUNCULATED HYDATID CYST OF THE LEFT LOBE WHICH WAS VERY MOBILE AND GAVE THE IMPRESSION OF AN OVARIAN CYST.



FIG. 104. SAGITTAL SECTION IN THE RIGHT STERNAL LINE. COLLECTION OF FLUID ON THE ANTERO-INFERIOR SURFACE OF THE LIVER COMPRESSING THE PORTAL VEIN.

Collections in the left lobe encroach, for the most part, on the median sagittal plane (Figs. 101 and 102).

They are placed either in the upper or lower segments. Fig. 103 represents an exceptional case of a pedunculated hydatid cyst of the left lobe



FIG. 105. CHONDRO-COSTAL APPROACH TO THE LIVER. INCISION OF THE SOFT PARTS.

of the liver. This cyst was so freely movable that it was diagnosed as an ovarian cyst.

Fig. 104 shows a hydatid cyst anterior to the lower surface of the liver and compressing the trunk of the portal vein behind and above.



FIG. 106. CHONDRO-COSTAL APPROACH TO THE LIVER. SECOND STAGE: OPENING OF THE PERITONEUM AND SECTION OF THE TENTH, NINTH, AND EIGHTH COSTAL CARTILAGES.

**Surgical Approach to the Hilum of the Liver by the Chondro-Costal Route.**

Subchondro costal incisions, be they vertical, oblique, or bayonet-shaped, do not allow of an easy approach to the inferior surface and hilum of the liver. But it is easy to obtain a very free access if a vertical incision



FIG. 107. CHONDRO-COSTAL APPROACH TO THE LIVER. EXPOSURE OF THE SEROUS CAVITY BY MEANS OF TWO STRONG HOOKED FORCEPS.

is made which enroaches upon the three last costal cartilages above (tenth, ninth, and eighth).

**Operation**—FIRST STAGE: *Incision of the Soft Parts.*—A vertical incision 12 to 15 centimetres long is made slightly to the inner side of the mammary



FIG. 108. CHONDRO-COSTAL APPROACH TO THE LIVER. EXPOSURE OF PART OF THE CONVEX SURFACE OF THE LIVER BY DRAWING ON THE EXTERNAL RETRACTOR.

line (Fig. 105). This incision commences over the prominence of the eighth costal cartilage and extends as far as the umbilicus.

*SECOND STAGE: Opening of the Peritoneum; Section and Resection of the Costal Cartilages.* The serous cavity is opened below the cartilage of the



FIG. 109. —EXPOSURE OF THE HILUM OF THE LIVER BY DRAWING ON THE INNER RETRACTOR. EXPOSURE OF THE ORGANS OF THE HILUM OF THE LIVER.

tenth rib, and the cartilages of the tenth, ninth, and eighth ribs are incised vertically (Fig. 106) which can be accomplished without danger of wounding the pleural sinus. The liver is thus exposed. A certain length is retracted from the exposed ribs. By placing two strong hooked forceps right and



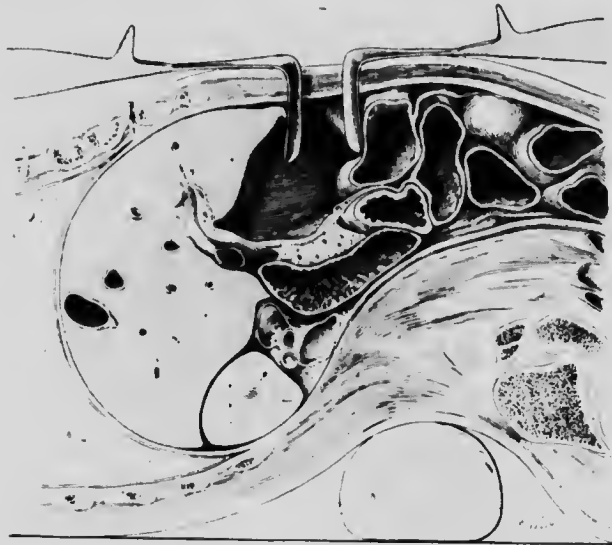


FIG. 110.—APPROACH TO THE HILUM OF THE LIVER. TWO SHORT VAGINAL HYSTERECTOMY RETRACTORS ARE INTRODUCED TO EXPOSE THE HILUM.

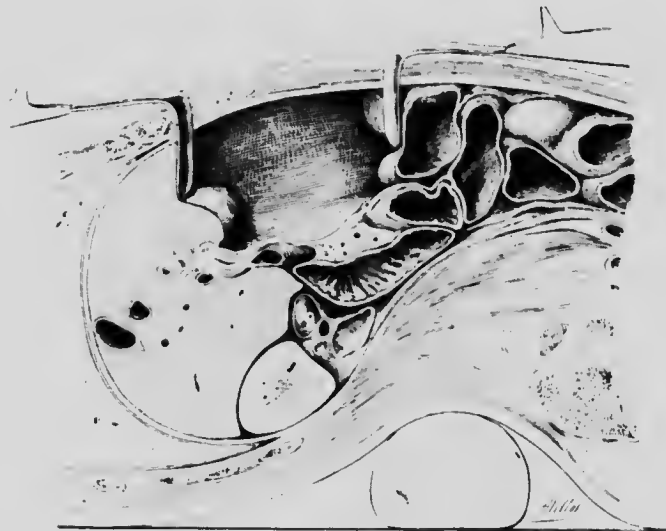


FIG. 111.—THE SAME OPERATION. THE LIVER IS SWUNG UPWARDS AND BACKWARDS UNDER THE ACTION OF THE RETRACTORS.

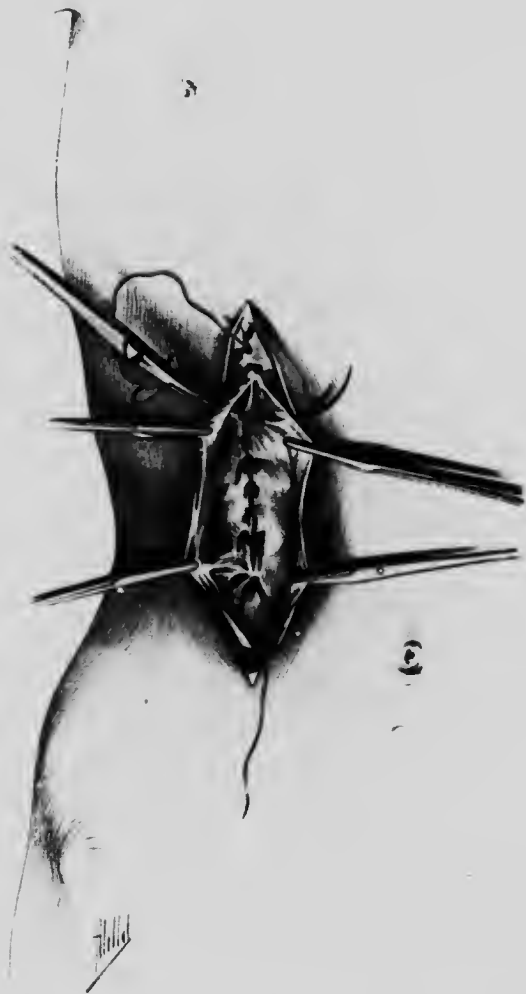


FIG. 112. THE SAME OPERATION. SUTURE IN LAYERS COMPRISING SUCCESSIVELY PERITONEUM AND MUSCULO-APONEUROTIC LAYERS.

left on the edges of the wound a means of access to the deeper parts is obtained, which is conveniently wide. Figs. 107 to 109 show how the simple vertical incision is transformed into a lozenge-shaped opening by means of the tractors.

**THIRD STAGE: *The Approach to the Hilum.***—It has now become possible to recognize the gall-bladder, the cystico-colic ligament, the orifice of the foramen of Winslow, and the hilum of the liver. Fig. 109 shows the principal organs in the hilum of the liver; from right to left are the portal vein, the hepatic artery, and the bile-duct raised on a curved forceps, which has perforated the gastro-colic omentum near the middle line and emerges outside and to the right by the foramen of Winslow.

**FOURTH STAGE: *Operations on the Liver and the Bile Passages.***—These manoeuvres vary according to the different indications presented by each pathological condition.

**FIFTH STAGE: *Displacement of the Liver Upwards and Backwards.***—It is now necessary to undertake a manoeuvre to expose the hilum of the liver. Two Doyen's retractors for vaginal hysterectomy of appropriate dimensions are placed in the wound as shown in Fig. 109. Traction is made on the upper and lower retractors in such a way that the upper instrument retracts the edge of the liver until it comes in contact with the cartilage of the eighth rib, whilst the lower retractor draws the transverse colon downwards. Fig. 110 shows the extent of the field of operation obtained by this method.

**SIXTH STAGE: *Repair of the Wall.***—The author prefers to suture the abdominal wall in musculo-aponeurotic layers, using interrupted silk sutures, since the tension in the subchondro-costal region is generally pronounced. A gap is generally left for the passage of an aseptic compress, which serves to tampon the peritoneal region, which has been shut off from the general peritoneal cavity by means of deep sutures.

## TRAUMATIC LESIONS.

### Wounds of the Liver by Stabbing or Cutting Instruments.

Simple wounds of the liver discovered in the course of urgent operation for a penetrating wound of the abdomen can be treated either by suture or by plugging. Suture succeeds well, provided that the sutures are placed at a depth of 2 to 3 centimetres, and are not drawn tight enough to cut through the liver tissue. Should the wound appear to be infected plugging is the preferable course.

Toilet of the peritoneum should be effected by means of sterilized compresses. This should extend as far as Douglas's pouch, either through the principal incision, which is prolonged above the crural arch, or by a second right inguinal incision.

### Gunshot Wounds of the Liver.

Gunshot wounds of the liver by bullets of small calibre may possibly heal spontaneously or may be cured by surgical intervention. Wounds of the organ caused by bullets of small calibre and hard external casing are all the more likely to get well since a projectile which is less than 8 milli-

metres in diameter is likely to be aseptic and passes completely through the individual. Since the year 1881 a certain number of wounds of the liver caused by fire-arms at point-blank range have been described, which have been cured by simple repose during two or three weeks.

It is otherwise the case with lead revolver bullets, shrapnel, and fragments of shell. They are frequently covered with a layer of grease etc., which is infected with septic organisms. These projectiles remain in the wound, owing to their feeble velocity, whatever be the weapon employed. The wounded person falls into a state of syncope immediately after being wounded. Internal hæmorrhage, however, is not excessive, provided that no large vascular trunk is perforated by the projectile.

Laparotomy should be performed as soon as the patient's condition revives from the post-traumatic syncope. If the projectile has completely traversed the body, the duty of the surgeon confines itself to the toilet of the peritoneum, and to ligature or suture of the vascular or intestinal wounds. If necessary, a counter-opening can be made, and a gauze drain placed at the level of the wound of exit. When no wound of exit exists, and above all when a septic lead bullet is in question, laparotomy is all the more urgent, inasmuch as the evolution of these wounds is very insidious. The state of the patient when he has recovered consciousness is often in a fairly satisfactory condition, and the temperature remains in the neighbourhood of normal during four, five, six, or seven days; there is, however, a slight rise of several tenths of a degree in the evening temperature. All at once infective peritonitis declares itself, and the patient succumbs. Death supervenes generally between the eighth and the twelfth day.

Called in to operate *in extremis* in several of these cases where the preliminary amelioration of the symptoms has been wrongly interpreted in a favourable sense, the author has found in the flanks and pelvic cavity several hundred grammes of very fetid sero-purulent fluid.

Immediate laparotomy alone can save these cases.

**Operation.**—The anterior peritoneal orifice is exposed by means of a vertical incision, and the toilet of the peritoneum is carried out. Should the first incision be insufficient, the toilet of the peritoneum may be completed by means of a subumbilical laparotomy or a right iliac incision. The direction of the ball is made out by means of a blunt stylet or a straight forceps, which is introduced into the hepatic orifice. If the projectile is found, it is extracted either with bullet forceps or by means of a uterine curette. If the projectile has traversed the liver, the posterior wound of this organ is recognized with the finger, after making sure that a compress becomes stained with blood in the course of a careful examination. The presence of the projectile in the thickness of the posterior abdominal wall is easily determined and localized by radiography. A precise image of a small projectile lodged in the midst of the substance of the liver, is, however, not so easily obtained. Should the projectile escape discovery, a very wide posterior incision is made in order to assure drainage by means of an aseptic compress, and the toilet of the peritoneum is completed. Partial suture of the incision is then carried out, care being taken to leave compresses

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at the points where infection is threatening. The patient must be kept carefully under observation, for a localized suppuration may supervene; which complication would necessitate a second intervention.

### Wounds of the Bile Ducts.

Wounds of the bile ducts inflicted by cutting instruments are less grave than those caused by fire-arms, whose projectiles always cause a certain loss of substance.

**Treatment.**—Immediate laparotomy.

Wounds of the bile ducts are characterized by the presence of bile on the compresses, in the course of the toilet of the peritoneum. The toilet of the peritoneum is rigorously carried out, and, according to the indications of the traumatism, an attempt is made to suture the wound, or if this is not possible, the wounded focus is isolated by means of epiploic sutures, in order to drain the bile outwards by means of drains combined with plugs.

### Wounds of the Great Venous Trunks.

These wounds always cause immediate death. Should the patient survive long enough to undergo laparotomy, suture of the vein should be attempted where the bleeding is profuse. This is aided by digital compression or the application of two elastic forceps, above and below the vascular tear.

### Tearing of the Liver.

A tear of the liver produced by a contusion of the abdomen may be suspected by the gravity of the symptoms of the collapse. Immediate laparotomy alone can save the patient. A superficial tear of the liver can be successfully treated by suture or plugging. Careful toilet of the peritoneum must be carried out.

## INFLAMMATORY LESIONS.

### ACUTE INFLAMMATORY LESIONS.

#### Abscess of the Liver.

Whatever their etiology, liver abscesses are characterized by the symptoms of general infection, together with local pain and enormous enlargement of the volume of the hepatic mass.

Pain is frequently referred to the point of the scapula. Radioscopy and radiography are of excellent service in recognizing the limits of the abscess, which may push up the diaphragm as far as the nipple.

A first proof is taken, the patient lying on the back or prone; and then a second proof is taken, the patient reclining on the right side to ascertain if the abscess is anterior or posterior.

Laparotomy should be performed when the diagnosis is probable. All punctures, even of an exploratory nature, are dangerous; the pus may not be recognized, as it is often very thick, and even if it should be it may infiltrate in the track of the exploring needle. This would be followed



FIG. 113. SCHEMATIC SECTION OF AN ENORMOUS MULTICULAR LIVER ABSCESS, WHICH NECESSITATED THE OPENING AND DRAINAGE OF THE ENORMOUS COLLECTIONS, ONE IN THE RIGHT SUPERIOR, THE OTHER IN THE INFERIOR RIGHT SEGMENT, AND A THIRD IN THE LEFT LOBE.

by contamination of the peritoneum. The operation is performed either by the antero-lateral or by the transpleural route. Laparotomy is preferable when the abscess forms a prominence in the epigastrium.

The transpleural route is the most direct means of reaching an abscess in the upper part of the right lobe.

The purulent collection at times reaches 1 or 2 litres or more; it is as a

rule single, but may present several compartments communicating by rather narrow orifices. This conformation may lead to incomplete evacuation of the deep diverticula, and so cause relapse.

#### I. MEDIAN OR ANTERO-LATERAL LAPAROTOMY.

##### *Superficial Abscess.*

**FIRST STAGE.**—A vertical incision is made, either median or in a right lateral region over the most prominent part of the tumour. The incision should be carried beyond the inferior border of the hypertrophied liver, in order that its under surface may be examined.

The liver is generally hypertrophied and purple in colour.

**SECOND STAGE.**—If the abscess is superficial the thinning of its anterior wall will immediately be observed. The peritoneum is protected by means of large compresses, and the liver is punctured with a straight forceps. When the pus escapes a small quantity is collected, with aseptic precautions, for bacteriological examination, and the orifice is enlarged by divulsion in order to complete the evacuation of the cavity. It may be useful to turn the patient on to his right side.

**THIRD STAGE.**—When the cavity is practically evacuated it is tamponed with three or four long compresses.

**FOURTH STAGE.**—The liver is sutured to the parietal peritoneum, around the whole circumference of the orifice thus stuffed with compresses, interrupted silk sutures being used. Care must be taken to avoid cutting through the liver tissue by drawing the threads too tight. The threads should be deeply placed. The lower part of the abdomen wound is then sutured, and afterwards the skin.

The compress plugging the wound should remain in position during five to eight days.

Cicatrization is very slow.

##### *Deep Abscess.*

If the abscess be very deeply placed, its approach is a much more delicate undertaking.

**FIRST STAGE.**—The incision in the abdominal wall must be carried downwards to a sufficient level.

Deep palpation of the liver will reveal the locality of the abscess. A deep abscess of the liver gives a sensation of a resistant mass whose consistency is firmer than the surrounding glandular tissue.

**SECOND STAGE.**—The abscess having been localized, the peritoneum is protected with compresses. The abscess cavity is perforated with a straight narrow-nosed forceps. The wall of the abscess may be met with at a depth of 10 to 12 centimetres. The extremity of the forceps meets with a marked resistance, and a sharp push is necessary to perforate the abscess wall; the pus is then seen flowing along the forceps. The orifice is enlarged by divulsion, and the pus is evacuated by pressing laterally on the abdomen the patient being turned on to his right side.

**THIRD STAGE.**—As soon as the pus is evacuated, long sterilized compresses are introduced, filling the cavity. The wall of the abscess may bleed, and a risk may arise of the irruption of blood or pus into the peritoneal cavity after the abdomen has been closed. The following artifice, therefore, should be adopted: the wound in the liver is sutured by two or three separate deep points of suture which tighten the tamponing compresses, and prevent all issue to the contents of the abscess. These hepatic sutures are passed by means of the large curved needle, 3 or 4 centimetres deep.

**FOURTH STAGE.**—The anterior surface of the liver is then sutured to the parietal peritoneum, and the circumference of the wound is tamponed at this point: the closure of the lower portion of the abdominal incision is then proceeded with. The hepatic sutures which surround the plug are not removed before the sixth, eighth or even the tenth day. The abscess cavity, which is almost entirely evacuated by the operation, does not fill rapidly. When the plugs are removed the cavity is explored with a long curved forceps, and long wide rubber drainage-tubes are placed in position. These drains carry a safety-pin at their anterior extremity. The drains should be left as long as they are not pushed out by the cicatrization: they are shortened centimetre by centimetre.

The cavity is washed out once or twice a day, using boiled water, peroxide of hydrogen at 20 per cent, or Labarraque's fluid at 1 to 5 per cent. Cicatrization may occupy several months. If an eventration of the abdominal wall persists, this is remedied by a later intervention.

## 2. LATERO POSTERIOR OR ABDOMINO-LUMBAR LAPAROTOMY.

Abscess of the postero-inferior part of the liver should be approached, for preference, by the postero-lateral route—*i.e.*, on the posterior axillary line. To reach the lesion the skin and the musculo-aponerotic layers must be cut through, from the tenth rib as far as the neighbourhood of the iliac crest. As soon as the peritoneum is opened the position of the abscess and the relations of the liver are made out. The abscess is perforated with a blunt forceps, after the peritoneum has been protected with large aseptic compresses, the cavity is evacuated, and the abscess cavity is treated by marsupialization and plugging.

## 3. TRANSPLEURAL OPERATION.

This operation can be carried out when the abscess is high up in the right lobe, and mounts under the thoracic wall.

**FIRST STAGE.**—A lateral oblique incision is made from before backwards, and from above downwards, or it may be almost horizontal, and of 12 to 15 centimetres length. The incision commences 6 to 7 centimetres below the nipple.

**SECOND STAGE.**—Extirpation of the ninth, eighth, and seventh ribs for a length of 8 to 10 centimetres (see Vol. II.). The diaphragm, compressed upwards, applies itself exactly to the parietal wound.



**THIRD STAGE.**—Incision of the diaphragm, and suture of the upper edge of the diaphragmatic incision to the parietal pleura in such a way as to shut off the pleural cavity above and behind.

**FOURTH STAGE.**—Exploration of the liver. Aseptic compresses protect the peritoneum; puncture of the abscess with blunt forceps, enlargement of the orifice by division and evacuation of the pus.

**FIFTH STAGE.**—Plugging of the cavity, and partial suture of the wound. A wide opening should be left to facilitate treatment of the cavity by plugging until the surface is granulating freely, and ready to cicatrize. It is then plugged more loosely, and after several weeks have elapsed it is sufficient to introduce rubber drains.

#### CHRONIC INFLAMMATORY LESIONS.

##### Chronic Infectious Hepatitis.

Chronic inflammations of the liver rarely give rise to localized purulent collections. The same technique is followed for slowly developing suppurations of the liver, as has already been described in treating of acute suppurations. Diffuse chronic infectious hepatitis is treated by drainage of the bile passages.

##### Infective Cholecystitis. Drainage of the Gall-Bladder.

Acute and febrile cholecystitis produced by the development of pathogenic bacteria in the bile ducts is a serious disease. The infection may be rapidly followed by destruction of the liver by disseminated miliary abscesses, and death from purulent infection.

The best treatment is the early drainage of the bile ducts. This operation is rendered all the more easy by the fact that there is no obstruction to the flow of bile in these cases. It is therefore sufficient to drain the gall-bladder.

**Operation**—**FIRST STAGE.**—Vertical cutaneous incision on the right side 10 centimetres long on the mammary line commencing at the costal margin. Incision of the muscles, and haemostasis when necessary, followed by incision of the deep fascia and peritoneum.

**SECOND STAGE.**—Exposure of the gall-bladder, which may be partially retracted, and covered by the lower border of the liver. The peritoneum is protected by aseptic compresses, and the most accessible part of the gall-bladder is fixed to the parietal peritoneum by means of sero-serous sutures. The peritoneum is then sutured below the gall-bladder.

**THIRD STAGE.**—The peritoneum of the gall-bladder is incised at the most accessible point, and the mucous membrane is uncovered. Puncture of the gall-bladder with a bistoury; evacuation of the contents, which are collected aseptically for bacteriological examination, and tamponing of the viscus with an aseptic gauze mesh.

**FOURTH STAGE.**—Suture of the parietal peritoneum, of the gall-bladder to the anterior aponeurosis of the rectus, and suture of the mucous membrane of the skin.

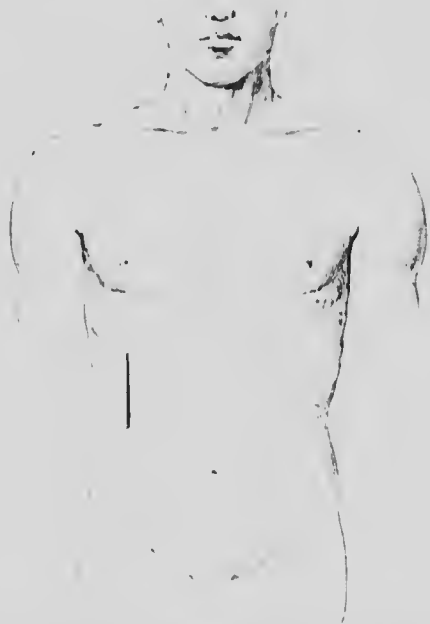


FIG. 114.—VERTICAL INCISION IN THE MAMMARY LINE TO EXPOSE THE GALL-BLADDER.

**FIFTH STAGE.**—Suture of the lower part of the abdominal wound. The bile escapes by capillary attraction. The mesh is removed after six to eight days, and a drain is introduced.

**Cholecystitis due to Calculus. Calculus of the Cystic, Hepatic and Common Bile Ducts.**

**INDICATION FOR OPERATION.**

Accidents which occur in biliary lithiasis often require surgical intervention, either because their gravity calls for immediate action, or because their persistence, and their incurability in the hands of the physician, constitute at the same time a chronic pathological state and a menace for the future. We need not here discuss the symptoms which lead to a diagnosis of biliary lithiasis in cases where there has never been jaundice. It is sufficient to observe that the presence of calculi in the gall-bladder and the cystic duct alone is by no means rare, and that in such cases it is possible that no vesicular tumour exists. On the other hand the gall-bladder,

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inflamed and retracted on the calculi, is often found buried below the under surface of the liver in the midst of numerous adhesions to the colon and duodenum. Three clinical examples may present themselves:

1. There has never been any jaundice.
2. There is a history of one or several attacks of temporary jaundice.
3. The jaundice is persistent.

These cases will be discussed successively.

1. When there has never been any jaundice the presence of calculi in the gall-bladder and cystic duct almost always betrays itself by local persistent pain. When the bladder contains much fluid a tumour is easily discovered by palpation. It may reach in some cases the size of a closed fist, or be even larger.



FIG. 115. FIRST STAGE OF SUTURE OF THE VISCERAL PERITONEUM TO THE PARIETAL PERITONEUM ON THE OUTER AND INNER SIDE.

2. Repeated attacks of jaundice, with hepatic colic, indicate the presence of calculi free in the gall-bladder. Often 200 to 400 small stones may be extracted from these gall-bladders. Should the operation be performed in the absence of an icteric period, catheterization of the cystic duct is useless.

3. Obstruction of the bile ducts is a serious accident. Operation should be performed early if all conditions ensuring success are to be realized. Indication for operation is imperative, and must be taken into consideration after the fifth or sixth week.

The indication to operate is still stronger when obstructive jaundice has already existed for several months.

Here the question becomes a delicate one. Several confrères, indeed, have, at their leisure, complicated the nomenclature of possible operations on the bile ducts as if their barbaric neologisms could be the key to the solution to difficult cases. We will set aside "choledocholithotripsy," and all such barbarisms, to study, in a practical manner, the procedure of a surgeon in the presence of a case of biliary lithiasis.



FIG. 116.—THE SUTURE OF THE GALL-BLADDER TO THE PARIETAL PERITONEUM IS FINISHED, THE PERITONEUM ALSO IS CLOSED ABOVE AND BELOW. INCISION OF THE VISCERAL PERITONEUM AND EXPOSURE OF THE MUCOUS MEMBRANE.

No one can diagnose in advance adhesions in an ovarian cyst. Surgery of the bile ducts is yet more pregnant of surprises, and it would be idle to discuss before an operation what should be done.

The abdomen should be opened vertically at the level of the painful spot, or of the tumour should it exist. The liver is exposed, and the gall-bladder, should it be accessible,

*First Condition—No Jaundice is Present.*

A. *The gall-bladder is free from adhesions.* The field of operation is surrounded with sterilized compresses and the gall-bladder is incised. The operative procedure reduces itself to the evacuation of the vesicle and the extirpation of the stones from the cystic duct, followed or not by the catheterization of the common bile duct.

The gall-bladder may either be sutured with a simple purse-string suture or partially resected after crushing and ligation *en masse* or extirpation. The author prefers extirpation of the gall-bladder, which operation he has rendered practically inoffensive by his own subperitoneal method. This method allows the peritoneal collar to be fixed at the level of the parietal suture, and avoids therefore all danger of bile leaking into the peritoneal cavity.

B. *Where perivesicular inflammatory lesions are found.* If the gall-bladder is surrounded with inflammatory adhesions, the adhesions are detached with the finger, and the operation is continued as described above.

The most difficult cases are those in which the gall-bladder is retracted on the inferior surface of the liver, or where it is buried in the midst of an enormous mass of inflammatory adhesions. The author has obtained excellent results in several of these cases, by avoiding a too extensive detachment of adhesions, and in ,strating directly what remains of the gall-bladder by a transhepatic puncture. This manoeuvre is not dangerous in the hands of a surgeon who possesses the necessary experience.

*Second Condition—With Coexistent Chronic Jaundice.*

A. Extraction of large calculi from the bile duct, where no old adhesions exist, is an easy operation. It is accomplished by incising the bile duct directly over the calculus. If this operation is carried out before secondary cirrhotic changes have attacked the liver, the prognosis is not grave.

B. Anastomosis of the gall-bladder with the duodenum is only indicated in those rare cases where there is obstruction of the common bile duct, and where it is impossible to relieve it (cancer of the head of the pancreas).

We consider the following two observations of cases interesting, as they are epoch-making in the history of the surgery of the bile ducts.

*Observation I.: Application in Cholecystotomy of the Same Technique as employed in Intestinal Surgery (Crushing and Purse-String Suture).—*Madame X., aged forty years, having suffered from several attacks of hepatic colic, came to me for examination. No jaundice was present, but the gall-bladder was large and painful. The probable diagnosis was that of gall-stones in the cystic duct with cholecystitis.

Laparotomy was practised, using a vertical incision 8 centimetres from the middle line, over the most painful spot. The gall-bladder, which was easily accessible, was isolated with sterilized compresses. It was incised, the purulent mucus and gall-stones which it contained were evacuated, and I then proceeded to evacuate the cystic duct.

Several calculi were extracted with a curette, and by means of a long curved forceps, using the index finger as a guide, the finger being introduced into the abdomen on the under surface of the liver. As soon as the catheterization of the cystic duct could be carried out in a satisfactory manner, I proceeded to the closure of the gall-bladder. Before this date I had always carried out this part of the operation as follows: the edges of the section were invaginated by means of a double sero-serous continuous suture, this suture being completed by a purse-string suture, which was fixed to the abdominal wall at the level of the incision.

The remarkable results which I had obtained in gastro-intestinal surgery from ligature *en masse* after crushing led me naturally to employ this method to close the vesicle. I had intentionally made the incision at a certain distance from the liver in order to apply the *écraseur*.

The circumference of the incision was seized in a ringed forceps, and the gall-bladder was crushed between this forceps and a long curved forceps placed in contact with the liver. A silk ligature was placed in the groove formed by the *écraseur*, and 3 or 4 millimetres from this ligature all that had to be suppressed of the summit of the gall-bladder was resected. No trace of mucous membrane remained at the level of this small pedicle, which was invaginated by two purse-string sutures. The vesicle was reduced into the abdomen, care being taken to fix the last suture to the parietal peritoneum at the level of the incision and the abdomen was closed.

This method of closing the gall-bladder after cholecystotomy is certainly not applicable in all cases, for the organ may not be prominent enough to allow room to apply the *écraseur*. If crushing is not practicable with the usual instrument, the lips, at least of the incision can be crushed with the smaller model which M. Collin has made for me. If crushing is impossible from the retraction of the gall-bladder, the orifice should be closed by two or three superimposed purse-string sutures. We thus obtain by this new procedure a much more certain closure of the vesicle than could be accomplished with the interrupted or continuous suture which has been employed hitherto.

This application of the method of crushing and purse-string suture is all the more interesting since it is a new application of the method I generally employ for closing fistulous orifices and the intestinal tube or stomach, by simple purse-string suture or after crushing and ligature *en masse* (French Surgical Congress, October, 1898).

*Observation II. : Extraperitoneal Resection of the Gall-Bladder by Subserous Decortication.*—Madame X., thirty-five years of age, suffering from hepatic colic. The gall-bladder was voluminous and very painful on palpation. The patient was acutely jaundiced. Operation was performed on April 6, 1899. A vertical incision was made to the right of the middle line at the level of the gall-bladder, which, when exposed, was found to be full of gall-stones. The number was calculated to be about three or four hundred. The field of operation being surrounded with aseptic compresses, the organ was incised. It was remarked in making the incision that the peritoneum seemed easily detachable from the wall of the gall-bladder. Decortication was commenced at once, the idea being to prolong the subserous decortication as far as the cystic duct, in order to arrange for an extraperitoneal extirpation of the organ. The tension of the walls rendered this decortication difficult; so the muscular and mucous coats were incised and the calculi were removed with a long curette. After this the subperitoneal decortication became quite easy as far as the cystic duct, which was crushed in a pair of short-nosed forceps and ligatured with silk ligatures.

Not a trace of mucous membrane remained at the level of this small pedicle, which was cauterized with care. The ligature was thus situated at the bottom of a peritoneo-hepatic infundibulum, whose orifice was fixed to the abdominal wall. A small glass drain was introduced, and convalescence followed, uncomplicated with fever.

Subperitoneal decortication and the application of this method of crushing

to the cystic duct is an improvement on the technique, already employed, of ligation of the cystic duct *en masse*, which left mucous membrane in the centre of the stump and risked a leakage of bile into the peritoneum when the suture commenced to be eliminated. Ligation as here performed, after crushing of the cystic canal, practically avoids this accident, since the ligation is applied only to fibro-cellular tissues, which are eminently prone to unite. The artifice just described, subperitoneal decortication of the gall-bladder, unquestionably avoids the eventual leakage into the peritoneal cavity; ligation of the cystic duct, with attempts, more or less happy, at isolation by intraserosus tamponing, was often powerless to prevent the evolution of septic peritonitis. This accident is no longer to be feared in following the above technique, which is the invention of the author.

This operation, hitherto so dangerous, of resection of the gall-bladder and rendering it inoffensive in the future, is rescued from the complete obscurity in which it has rested, thanks to this new technique which has rendered it practically free from danger.

#### Etiology of Biliary Lithiasis.

**Operative Technique.** Biliary lithiasis is generally infective in origin. The *B. coli*, *streptococcus*, or the *staphylococcus* are frequently met with in the bile passages. Biliary calculi form as a rule in the gall-bladder whence



FIG. 117. SCHEMA OF THE SUTURE OF THE VESICULAR PERITONEUM TO THE PARIETAL PERITONEUM.

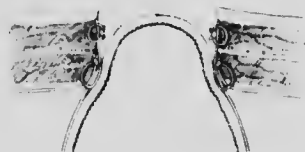


FIG. 118. SUTURE OF THE PERITONEAL FLAP, DETACHED FROM THE MUCOSA MEMBRANE AND UNITED TO THE MESO-EPONEUROTIC LAYER.



FIG. 119. THE SAME. THE MUCOSA MEMBRANE HAS BEEN INCISED AND ITS UPPER EDGE IS SUTURED TO THE SKIN (SAGITTAL SECTION).

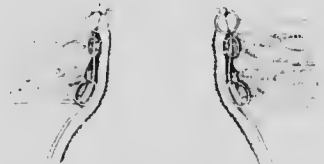


FIG. 120. THE SAME. THE SUTURE OF THE VESICULAR MUCOSA MEMBRANE TO THE SKIN IS COMPLETE.

they pass by the cystic duct towards the duodenum. Formation of biliary calculi in the hepatic duct itself or in its first ramifications is quite exceptional, and is never observed except in cases of retention of bile.

Surgery of biliary lithiasis consists of: the extirpation of calculi from the gall-bladder, the cystic duct, from the junction of the cystic and hepatic ducts with the common bile duct, and from the common bile duct. The following procedures will now be described in order: cholecystotomy with buried sutures, or ideal cholecystotomy, the extirpation of the gall-bladder, the removal of calculi impacted in the deeper bile passages, and the drainage of the hepatic duct.

No operation is so pregnant of surprises as that for biliary lithiasis. The conduct of the surgeon, however, can be determined in advance, or nearly so, according to whether, at the time of the operation, biliary retention is present or absent.

If the bile flow is normal, intervention will be confined to the bladder and cystic duct. If the patient is suffering from chronic jaundice, it will be necessary to reach the hilum of the liver and the region of the bile duct.

When the bile flow is normal operation is limited as a rule to the opening of the gall-bladder, extraction of stones and closure of the organ. This operation has received the name "Ideal Cholecystotomy."

#### A. THERE IS NO RETENTION OF BILE.

In such cases the calculi are confined to the gall-bladder and cystic duct. Operation consists in removal of the calculi. This may be followed by extirpation of the gall-bladder in order to prevent their reproduction.



FIG. 121. IDEAL CHOLECYSTOTOMY. THIRD STAGE. THE VESICULAR PERITONEUM IS SEIZED IN A FORCEPS TO STEADY THE GALL-BLADDER DURING EVACUATION.

#### IDEAL CHOLECYSTOTOMY.

**Doyen's Operation** FIRST STAGE.—Cutaneous vertical incision 10 centimetres long over the most prominent part of the vesicular tumour, which is generally quite appreciable. Incision of the wall and peritoneum.



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SECOND STAGE: *Exposure of the Gall Bladder.*—Should the gall-bladder not be readily accessible, the incision is prolonged, either upwards incising the tenth, ninth, and eighth costal cartilages, or downwards towards the crural arch. The position of the gall-bladder may indeed vary notably.



FIG. 122. IDEAL CHOLECYSTOTOMY. FOURTH STAGE: CIRCULAR LIGATURE OF THE CIRCUMFERENCE OF THE ORIFICE. PLACING THE FIRST PERSE-STRING SUTURE.



FIG. 123. IDEAL CHOLECYSTOTOMY. THE FIRST PERSE-STRING SUTURE IS COMPLETED. PASSING THE REINFORCING SUTURE.

The peritoneum is immediately protected by large sterile compresses. When voluminous, the gall bladder is easily brought outside the wound. When retracted below the liver, the latter must be swung upwards and backwards, in order to give direct access to the hilum.

**THIRD STAGE: Opening of the Gall-Bladder and Extraction of Calculi.**—First condition, Dropsy of the gall-bladder. A small puncture is made with the bistoury, great care being taken that not a drop of fluid can enter the peritoneal cavity. The orifice is enlarged by divulsion and the liquid is evacuated. Several cubic centimetres of the liquid are collected aseptically for bacteriological examination.



FIG. 124. RESECTION OF THE EXTERIOR WALLS OF A DILATED GALL-BLADDER BY THE METHOD OF PRELIMINARY CRUSHING. VIEW OF THE GROOVE FORMED BY THE ÉCRASEUR.

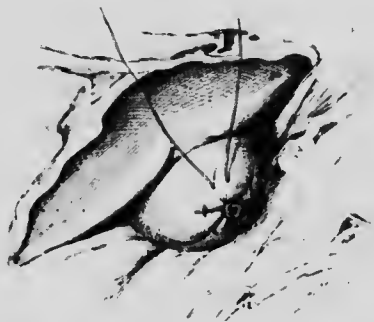


FIG. 125. THE SAME. LIGATURE "EN MASSE" HAS BEEN APPLIED IN THE GROOVE FORMED BY THE ÉCRASEUR. PLACING THE FIRST PURSE-STRING SUTURE.

If the liquid is mucous in character and whitish, with no trace of bile, obstruction of the cystic duct is probably present. In such cases there may be no calculi in the bladder, and its walls are thick and white in colour.

Foiet of the gall-bladder is carried out with aseptic compresses and the calculi engaged in the cystic duct are extracted, by seizing them in small

annular lithotomy forceps such as the author has designed and constructed for stone in the bladder. Blunt eurettes can also be employed, or small gouge forceps such as the author's model for removing polypi from the nasal fossae. The cystic duct is explored with the right or left index finger, which is introduced into the peritoneal cavity, while the other hand is employed in extracting the calculi. The finger in the abdomen presents the stones to the evacuating instrument, and facilitates their removal, when they are impacted. In some cases the calculi have to be broken, and the finger prevents perforation of the walls of the duct.

When the index finger, deeply introduced, finds no more calculi to be present, the deep bile passages are explored with a very soft sound, formed by a laminated stalk carrying at its end a round metal button, and constructed after the plan of the author's decollator for the dura mater. The sound passes generally into the bile duct, and from there into the duodenum; the extremity of the sound can be recognized through the intestinal walls. Generally as soon as the obstruction in the cystic duct is removed a certain quantity of bile makes its appearance.



FIG. 126. DIAGRAM TO SHOW CLOSURE OF THE INDURATED WALL OF A GALL-BLADDER BY TWO SUPERIMPOSED SUTURES.



FIG. 127. SECTION OF THE TRIPLE CLOSING OF THE GALL-BLADDER BY LIGATURE "EN MASSE," AND TWO PURSE-STRING SUTURES.

**THIRD STAGE—Second Condition: Atrophy of the Gall-Bladder.** When the cystic duct remains permeable the walls of the vesicle retract slowly and gradually upon the calculi, whose presence irritates the mucous membrane. It may result that the fundus of the gall-bladder is no longer apparent under the lower border of the liver. If the gall-bladder is very retracted, its situation is recognized at the vesicular depression of the liver below which it is found.

Bile calculi are easily recognized by the finger, and at the same time the cystic, hepatic, and bile ducts can be explored. Care must be taken to protect the field of operation properly before the organ is incised, since it may be infected with virulent microbes. As soon as the organ is incised, the calculi are extracted. Usually the retracted gall-bladder contains large calculi with one or more facets. Bile makes its appearance as soon as the calculi are extracted. After sponging, a small compress is introduced to tampon the cystic duct provisionally. Should there be calculi in the cystic duct, they are extracted in the manner described above.

**FOURTH STAGE: Suture of the Gall-Bladder.** The method employed for suturing the gall-bladder varies greatly, according to the alterations to which the walls have been subjected. When the walls have conserved their suppleness, and if they are exuberant, partial resection by Doyen's method

can be carried out: preliminary crushing, ligature *en masse*, and double purse-string suture. If they are not exuberant, the orifice should be closed by two superimposed purse-string sutures. This form of suture is nearly always easy to carry out, if the primary orifice be widened by divulsion and care be taken to leave intact on the side corresponding with the anterior border of the liver 12 to 15 centimetres of vesicular wall. Figs. 122 to 126 show the various stages of closure of the gall-bladder by purse-string sutures. First without resection of the walls; secondly after resection of the exuberant portion. If the walls of the vesicle are slightly indurated, it may happen that a purse-string suture is impossible. In such a case the orifice is closed with two layers of continuous suture (Fig. 126). Whether resection of the exuberant portion has been carried out or not, it is well, as a measure of precaution, to fix to the skin the two ends of the most superficial suture, in order that rapid action may be taken if any incident should demand the establishment of a biliary fistula.

**FIFTH STAGE.** Suture in layers of the peritoneum and abdominal wall leaving a small aseptic compress in contact with the gall-bladder.

#### *Marsupialization of the Gall-Bladder.*

When complete closure of the gall-bladder is impossible owing to the diseased condition of its walls, or should such closure appear to be dangerous owing to the infection of the mucous membrane, the circumference of the incision into the organ is sutured to the parietal peritoneum and a small compress is introduced tightly into the gall-bladder in order to prevent all issue of bile for the first few days. The rest of the abdominal wound is united with interrupted sutures, and the skin incision is partly closed.

#### EXTIRPATION OF THE GALL-BLADDER BY DOYEN'S METHOD.

Extirpation of the gall-bladder may be decided upon from the first in the case of a dilated non-inflamed gall-bladder, which contains a large number of small polyhedral calculi. Clinically the chief indication for extirpation of the gall-bladder is the presence of repeated quotidian attacks of hepatic colic, together with the presence of large numbers of small gall-stones in the motions. This operation may also be almost an inevitable consequence of cholecystotomy where extensive tearing of the walls has taken place, and where their inflammatory thickening renders suture impossible. Total extirpation of the gall-bladder by the classic method is an operation fraught with grave risks, because of the impossibility of properly closing the cystic duct. The author, therefore, designed in 1899 (April 6) the operation of subperitoneal decortication. By means of this artifice the ligature of the cystic canal is completely shut off from the general peritoneal cavity by the serous sheath of the vesicle whose orifice is marsupialized and drained.

**Operation—FIRST STAGE.** Incision of the abdominal wall at the edge of the external sheath of the rectus on the right side. Opening of the

peritoneum and protection of the field of operation with aseptic compresses.

SECOND STAGE.—Exposure of the gall-bladder and exploration of its pedicle. The field of operation is protected with aseptic compresses.



FIG. 128.—EXTIRPATION OF THE GALL-BLADDER BY DOYEN'S METHOD. THIRD STAGE: INCISION OF THE VESICULAR PERITONEUM, WHICH IS DETACHED FROM THE MUCOUS WALL.



FIG. 129.—EXTIRPATION OF THE GALL-BLADDER BY DOYEN'S METHOD. FOURTH STAGE: THE VESICULAR PERITONEUM HAS BEEN DETACHED, AND DRAWN DOWN AS FAR AS THE CYSTIC DUCT. CRUSHING THE CYSTIC DUCT.

THIRD STAGE.—Incision of the peritoneum over the most accessible point of the gall-bladder, and progressive circular decortication of the mucous walls. In certain cases decortication can be carried out as far as the cystic duct without opening the viscus. More often it is preferable to incise the mucous wall as soon as the peritoneum has been sufficiently stripped off and to evacuate the contents. The flask-shaped wall is then seized in the

teeth of an oval-ringed forceps. All that is now necessary is to pull on this forceps to draw the mucous wall of the gall-bladder from its serous sheath, which shrinks up towards the hilum of the liver.

**FOURTH STAGE.**—As soon as the cystic duct is reached a short-nosed forceps is placed upon it. It is then crushed in another forceps placed above the first, and the cystic duct is ligatured in the groove formed by the crushing forceps with No. 2 silk. The first forceps is removed, a security suture is applied, and the vesicular pedicle is cut through 3 or 4 millimetres beyond the ligature.



FIG. 130.—EXTIRPATION OF THE GALL-BLADDER BY DOYEN'S METHOD. FIFTH STAGE: THE SEROUS SHEATH OF THE GALL-BLADDER HAS BEEN "MARSUPIALIZED," A SMALL GLASS DRAIN IS PLACED AT THE END OF THE CANAL THUS FORMED IN SUCH A WAY THAT THE FIELD OF OPERATION REMAINS EXTRAPERITONEAL.

**FIFTH STAGE.**—Toilet of the wound. Suture of the peritoneal sheath to the abdominal wall or marsupialization. A small mesh or a glass drain is introduced.

*Operative Sequela.*—These are very simple. The ligature of the cystic duct bears only on its fibro-cellular sheath, which heals readily. Besides this the conservation of the peritoneal sheath of the gall-bladder and its marsupialization prevents all danger of the irruption of bile into the peritoneum if the ligature should give way.

## B. RETENTION OF BILE IS PRESENT.

### DRAINAGE OF THE HEPATIC DUCT.

Cases have been published of drainage of the hepatic duct and extirpation of calculi from the common bile-duct, successfully accomplished after several years of biliary retention.

In the estimation of the author, it is far from prudent to claim from these successes that the operation is hopeful when retention has persisted for a very long time. In many published cases of cures the biliary retention



FIG. 131. INCOMPLETE OBSTRUCTION OF THE COMMON BILE DUCT BY A CLUSTER OF FOUR CALCULI OF MODERATE SIZE.



FIG. 132. COMPLETE OBSTRUCTION OF THE JUNCTION OF THE THREE CANALS BY A LARGE BILIARY CALCULUS WHICH PRESENTS A SMALL BULGE AT THE LEVEL OF EACH OF THE THREE ORIFICES.



FIG. 133. MORPHOLOGICAL APPEARANCE OF VARIOUS BILIARY CALCULI.

From above downwards; In the glass box on the left small polyhedral calculi with facets, which have obstructed the cystic and common bile ducts. In the box on the right small lenticular calculi which obstructed the bile passages. Three solitary calculi which were impacted at the beginning of the cystic duct. Voluminous calculus from the gall-bladder divided into two fragments by a median plane of cleavage. Large calculus from the gall-bladder in three segments. Its curved extremity on the right was engaged in the cystic duct.



was not total, and a portion of the bile, small though it was, was able to pass by the obstruction.

When obstruction is complete, the alteration of the vital functions has become so great, in so short a period as only a few months after the appearance of the jaundice, that the tissues show no longer any tendency to remitte.



FIG. 134. CALCULOUS OBSTRUCTION OF THE COMMON BILE DUCT. EXPOSURE OF THE PANCREAS.



FIG. 135. SAFETY DRAINAGE OF THE COMMON BILE DUCT BY A T-SHAPED DRAIN.

Again, it appears to me to be indispensable to propose operation to every case of biliary obstruction when the jaundice has lasted more than six weeks.

When the surgeon takes the history in hand to operate upon a case of biliary retention, he must be ready for every emergency. For instance in a case with a history of hepatic colic for fifteen or twenty years a cancer of the bile passages may be found which is quite inoperable, and which has become grafted on an old calculous cholecystitis.

In such a case the only course is to close the abdomen, for cases where a derivative operation can be performed are rare. The best that can be hoped for is not to find a cancer.

**Operation** **FIRST STAGE.**—Vertical incision over the border of the rectus reaching from the eighth costal cartilage to the level of the umbilicus.



FIG. 136. CALCULI ARRANGED IN A ROSARY OBLITERATING THE RETRACTED VESICLE, THE CYSTIC AND BILE DUCTS.

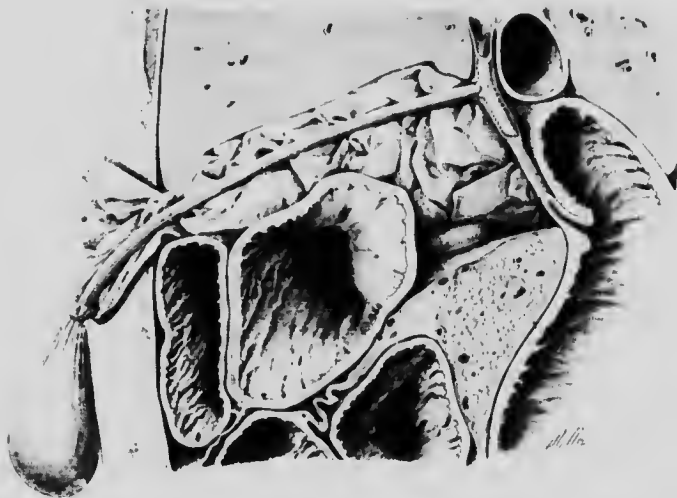


FIG. 137. EXTIRPATION OF THE GALL-BLADDER AND SAFETY DRAINAGE OF THE CHIEF BILE PASSAGES.

**SECOND STAGE.**—Opening of the peritoneum, section of the tenth, ninth, and eighth costal cartilages when necessary.

**THIRD STAGE.**—The field of operation being well exposed by means of retractors (Fig. 110), the remains of the gall-bladder are examined. A

dilated organ is rarely found, since the inflammatory reaction which accompanies the migration of the calculi is almost always followed by a retraction of the walls of the gall-bladder. This contracts, and becomes a fibrous cord which is almost hidden in a depression on the under surface of the liver.

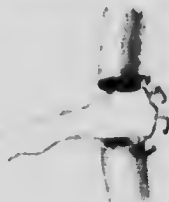


FIG. 138. DIAGRAMMATIC REPRESENTATION OF THE MODE OF REUNION OF THE PRINCIPAL BILE PASSAGES IN CASE OF COMPLETE RUPTURE BY TEARING IN EXTRACTION OF CALCULI. FIRST STAGE.

**FOURTH STAGE: *Discovery of the Obstacle.***—The deep bile passages are explored with the finger. Two conditions may present themselves. Either one or several large calculi may be arrested in the bile duct, or no tangible obstacle may be found.

1. *Calculi arrested at the Union of the Three Ducts or in the Bile Duct.*

The point of obstruction is brought well in evidence between sterilized compresses; a small incision is made and the calculus or calculi are extracted preferably intact without breaking them up.



FIG. 139. THE SAME. THE FIRST LOOP OF SILK IS TIED. PARTIAL SUTURE OF THE POSTERIOR WALLS OF THE CANAL.



FIG. 140. THE SAME. ASPECT OF THE LINE OF UNION WHEN THE TWO DEEP SUTURES HAVE BEEN PLACED IN POSITION.

Very often calculi lying in the intrapancreatic portion of the canal can be extracted by the suprapancreatic portion. They are broken up if necessary. The permeability of the ampulla of Vater is then examined.

***Suture of the Bile Duct.***—In certain cases an attempt can be made to suture and obtain union of the walls of the bile duct by primary intention, a fine silk continuous suture being employed, using arteriorrhaphy needles.

**T-shaped Drainage.**—It is, however, a more prudent measure to introduce a T-drain, which is placed in position with one short arm in the hepatic and the other in the hile duct, while the long principal arm, which is brought outside the abdomen, assures the clearance of the hile in case its normal course is slow to be re-established.

The drain is held in place by a partial reunion of the bile duct (Figs. 137-141). The field of operation is then plugged with sterilized compresses, care being taken to exclude the plugged compartment from the

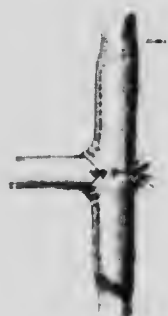


FIG. 141.—THE SAME. THE DRAIN IS IN PLACE. SUPERFICIAL SUTURE IN FRONT IS ALL THAT REMAINS NECESSARY.



FIG. 142.—THE SAME. THE SUPERFICIAL SUTURE IS IN POSITION. THE T-SHAPED DRAIN RE-ESTABLISHES THE NORMAL FLOW OF BILE, AND ASSURES CLEARANCE AS A MEANS OF SECURITY.

general peritoneal cavity by means of sutures methodically placed. The bile flows for the most part into the duodenum, and the drain can be removed after ten or fifteen days. When the flow is re-established, the tract which ends at the surface closes spontaneously.

## 2. Where no Tangible Obstacle is found.

The remains of the gall-bladder are seized in a dissecting forceps, and incised longitudinally. Pus, bile, or calculous sand is likely to be found. The vesicular canal is explored and, using the open ends of a long thin curved forceps as a guide, small progressive incisions are made. A grooved sound, or Collin's instrument for exploration of the bile passages, with a supple stem may be used. The cystic duct is also incised until the operator arrives at the junction of the hepatic and bile ducts. If the bile flows at this moment the search must proceed towards the bile duct. There may be a cicatricial contraction of the walls of the duct or of the ampulla of Vater.

When it appears to be impossible to find and remove the obstacle, the surgeon must be content to drain the hepatic duct with a rubber tube whose walls are of sufficient resistance, the extremity being fixed deeply

by means of several sutures. If the bile duct is permeable a T-shaped drain is employed as described above.

**FIFTH AND SIXTH STAGE: Peritonization.**—Exclusion of the plugged field of operation, and the repair of the abdominal wall, have already been described.

*Operative Sequela.*—These are remarkably simple when the vital forces of the patient are sufficiently vigorous. The general condition is sustained by injections of isotonic artificial serum and injections of mycolysine. The state of the wound is attentively watched, leakage of bile and all indications which may call for early change of the gauze meshes being duly noted. The deep drain and the compresses must not be removed until the repair of the whole of the periphery of the plugged compartment is satisfactory, and until no further fear exists of any complication on the part of the peritoneum.

#### RETRODUCODENAL TERMINAL CHOLEDOCHOTOMY.

The terminal segment of the bile duct can be reached by incising the peritoneum on the outer side of the duodenum, and drawing the second part of this organ towards the middle line. The calculi or calculi can be seen easily as they come to light directly after incision and divulsion of the part lying above the great pancreatic. This very exceptional operation is impossible to describe, since its technique varies with the peculiarities of each individual case.

#### Cholecystenterostomy.

Cholecystenterostomy, or anastomosis of the gall-bladder with the intestine in order to re-establish the flow of bile, is an exceptional operation,



FIG. 143. CHOLECYSTENTEROSTOMY. DIAGRAMMATIC REPRESENTATION OF THE FIRST LAYER OF SUTURES AND THE VESICULAR AND DUODENAL ORIFICES.

for its practicability depends on the integrity of the hepatic and cystic ducts and of the gall bladder. It is impracticable when, in spite of the integrity of the hepatic and cystic ducts, the walls of the gall-bladder are so altered by inflammation as to prevent their union with the intestine.



FIG. 144.—CHOLECYSTENTEROSTOMY. SECOND DEEP LINE OF SUTURE UNITING IN THE CENTRE THE MUCOS MEMBRANE OF THE GALL-BLADDER TO THAT OF THE DUODENUM.

The two dotted lines represent the two sero-serous superficial layers.



FIG. 145.—PLAN OF THE ANASTOMOSIS OF THE GALL-BLADDER WITH THE FIRST PORTION OF THE DUODENUM.

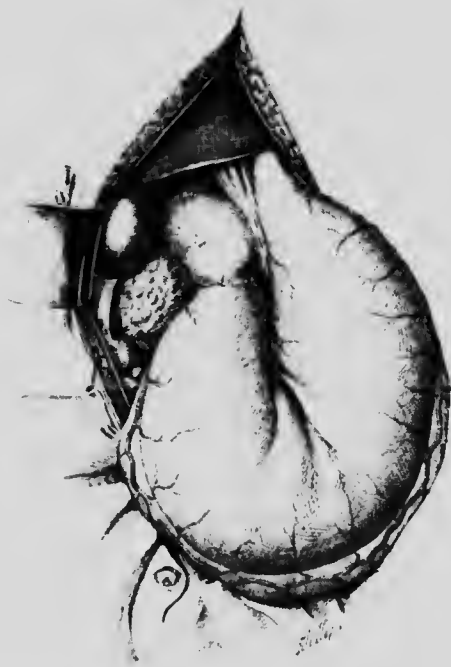


FIG. 146.—CHOLECYSTODUODENOSTOMY. FIRST STAGE: THE PYLORIC REGION IS BROUGHT TO THE SURFACE.



FIG. 147.—CHOLECYSTODODENOSTOMY. SECOND STAGE: A RETRACTOR EXPOSES THE GALL-BLADDER. LIGATURE OF THE CYSTICO-COLIC LIGAMENT.



FIG. 148. CHOLECYSTODODENOSTOMY. THIRD STAGE: THE GALL-BLADDER IS PUNCTURED AND EMPTIED. IT IS EASY TO PLACE A DOYEN'S ELASTIC FORCEPS ON THE SUBHEPATIC PORTION.

Cholecystenterostomy is scarcely ever performed except for complete obstruction of the intrapancreatic portion of the bile duct, or its duodenal orifice, by a cancer of the pancreas or the ampulla of Vater. The technique of this operation has been founded upon that of gastro-enterostomy.

**Operation**—**FIRST STAGE.**—Vertical median incision 12 centimetres in length.

**SECOND STAGE: Exposure of the Gall-Bladder.**—The peritoneum is incised, and the pyloric region of the stomach and gall-bladder are drawn outwards.



FIG. 149. CHOLECYSTODUODENOSTOMY. **FOURTH STAGE:** A DOYEN'S ELASTIC FORCEPS IS PLACED ON THE ANGLE UNITING THE FIRST AND SECOND PARTS OF THE DUODENUM. THE SECOND POSTERIOR LINE OF SUTURE IS JUST FINISHED. IT WILL BE NOTICED THAT THE TWO OPENINGS ARE VERY NARROW.

**THIRD STAGE.**—Ligature and section of the cystico-colic ligament, puncture and evacuation of the gall-bladder. Application of elastic forceps to the gall-bladder and duodenum. Anastomosis of the gall-bladder with the colon is a last resource, and is carried out with a similar technique.

**FOURTH STAGE.**—Suture of the gall-bladder to the duodenum. First posterior line of sero-serous sutures, perforation of the duodenum. Second posterior line of suture uniting the two mucous membranes in the centre, and completion of the two anterior sero-serous sutures.

**FIFTH STAGE.**—Reduction of the duodenum. Toilet of the wound. Suture.



## CONGENITAL AND ACQUIRED MALFORMATIONS.

**Congenital Malformations.***Congenital and Cicatricial Stenosis of the Bile Passages.*

Congenital stenosis of the lumen of the bile passages may cause death during birth. If stenosis is not complete this malformation may call for surgical intervention, the technique of which must be modified to suit the requirements of each particular case. It is probable that many cases of cicatricial stenosis caused by biliary lithiasis have been mistaken for congenital stenosis.

**Operation.**—If we except certain special indications which can only arise in the case of operation, intervention follows the same broad principles laid down in the description of the operation for calculous or cicatricial obstruction complicated with jaundice.

**Acquired Malformations.***Hepatoptosis.*

Hepatoptosis, or the prolapse of the anterior border of the liver, is an abnormal position of the organ the pathological results of which have been greatly exaggerated. Operations proposed for the cure of this condition generally give unsatisfactory results, since the hepatic tissue is not sufficiently resistant to give any holding ground to sutures.

*Fistula of the Gall-Bladder.*

A suppurating or calculous gall-bladder may open spontaneously into the duodenum or the colon; at times it opens on the surface of the skin, at others it may open into an intestinal loop or the perinephritic region. Figs. 150, 151, and 152 show abnormal relations of the gall-bladder with the small intestine, the colon, the duodenum, and the perinephritic region. In Fig. 152, which is an exact reproduction of an anatomical preparation hardened in formol, it will be noticed that the vermiform appendix, situated externally and ascending, is also in relation at its extremity with the colon, the duodenum, and the perinephritic region.

Discovery of these fistule may be an operative surprise. They may be found in the course of an operation for a localized perivesicular peritonitis.

**Operation**—**FIRST STAGE.** Vertical incision at the most convenient spot.  
**SECOND STAGE.**—Opening of the peritonium. Exploration of the field of operation.

**THIRD STAGE.** The adhesions are freed progressively, care being taken to prevent all leakage of pus into the peritoneal cavity.

The vesicle is emptied of its calculi if present, and its cavity is carefully cleansed. Care must be taken not to allow any intestinal contents to contaminate the wound if the intestine is opened.



FIG. 150. CALCULOUS GALL-BLADDER OPENING INTO THE TRANSVERSE COLON. (FROM A PHOTOGRAPH.)



FIG. 151. CALCULOUS GALL-BLADDER OPENING INTO THE RENAL COMPARTMENT, CAUSING PERINEPHRITIC ABSCESS. THE OPENING OF THIS ABSCESS WAS FOLLOWED BY THE ISSUE OF THE CALCULI.

**FOURTH STAGE.** If the lesion is very extensive immediate repair may be an impossibility. In such a case the wound is plugged, and the consecutive cutaneous fistula is repaired at a later date. When immediate repair is possible, the vesicular and intestinal orifices are closed by two layers of seto-serous sutures either purse-string or continuous.

**FIFTH STAGE.**—Incomplete closure of the abdominal wall, and tamponing of the wound to the level of the infected focus.

*After-Care of the Patient.*—If preventive injections of mycolysine have not been performed before operation, 20 cubic centimetres must be injected



FIG. 152.—SAGITTAL PARASTERNAL SECTION PASSING THROUGH THE INTERNAL PART OF THE CALCULOUS GALL-BLADDER (INTERNAL SEGMENT).

In front of the liver are several loops of the small intestine, whose presence would render puncture of the liver highly dangerous. The appendix is in an ascending position. The calculous gall-bladder could in this case open in front into the first part of the duodenum, lower down into the subhepatic colon, or behind into the renal compartment. An encysted purulent collection at the extremity of the appendix might also open into the same viscera.

subcutaneously into the thigh as the post-operative dressing is being applied: 10 cubic centimetres are injected four or five hours afterwards, and the injection is renewed every three or four hours. When the patient is very feeble one or two litres of isotonic sterilized salt solution are injected at other points.

## TUMOURS OF THE LIVER.

## BENIGN TUMOURS.

*Hydatid Cysts.*

Hydatid cysts of the liver are fairly frequent, even in countries where the number of dogs is not considerable. The cyst is usually single, at times there are several. Hydatid cysts of the liver may be complicated by the presence of hydatid cysts in other viscera, notably mesenteric or retroperitoneal cysts. The tumour is characterized by the augmentation in volume of the liver and functional disturbances.

*Diagnosis.*—Diagnosis of hydatid cyst of the liver has become easy owing to the researches of Weinberg of the Pasteur Institute: the complement of the serum of the guinea-pig being fixed, in the presence of the



FIG. 153. MEDIAN LAPAROTOMY FOR HYDATID CYST OF THE LEFT LOBE AND MEDIAN REGION OF THE LIVER. EXTIRPATION OF THE DAUGHTER CYSTS WITH A CURETTE.

patient's serum, by the serum of rabbits, sensitized by injection of hydatid fluid. Weinberg's reaction has given conclusive results in all cases which I have asked him to examine for me.

Weinberg's reaction is as valuable after as before an operation, as by this means we are able to be sure, months after operation, of the existence or non-existence of another hydatid cyst hitherto latent and unrecognized.

*Operation.*—Laparotomy is employed for cysts on the under surface of the liver. For postero-inferior cysts the *abdomino-lumbar* route is chosen, and the *transpleural* operation is used to reach cysts of the upper segment of the liver.

I. *Anterior or Antero-Lateral Laparotomy.*

FIRST STAGE: *Incision of the Wall.*— Fixation of aseptic towels to the skin by means of hooked forceps.



FIG. 154. LAPAROTOMY FOR A LARGE CYST OF THE LOWER SURFACE OF THE LIVER. CRUSHING OF AN OMENTAL ADHESION.



FIG. 155. — THE SAME. THE CYSTIC POUCH, THICK AND WRINKLED, IS DRAWN OUTSIDE THE ABDOMEN.

SECOND STAGE: *Exposure of the Cyst Wall.*— The peritoneum is guarded with large aseptic compresses. The leakage of the smallest amount of fluid must be avoided, since the liquid even when in a perfectly limpid

state is pathogenic for the peritoneum. This accident can be easily avoided by freely surrounding the field of operation with large aseptic compresses. The patient also is turned well over towards the right side.



FIG. 156. THE SAME. THE PERITONEUM HAS BEEN PROTECTED WITH STERILIZED COMPRESSES. THE PATIENT IS TURNED ON TO THE RIGHT SIDE. INCISION OF THE HYDATID POUCH.



FIG. 157. THE SAME. ENTIRPATION OF THE CYSTIC MEMBRANE.

THIRD STAGE: *Incision of the Cyst.*—The author's method is to incise the cyst with a bistoury; the walls are then seized with a ringed nine-toothed forceps of the usual model. The vesicles escape when present, and the

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liquid pours out of the cyst. Fairly frequently it is bilious or purulent. As the cyst empties the cellular envelope is drawn out of the abdomen; this is easy when it is partially extra-hepatic. Toilet of the cavity is carried out with aseptic compresses and large curved forceps, and the cyst membrane is extracted.

This as a rule comes away in one piece. By this technique perfect asepsis of the peritoneum is assured, even when the contents of the cyst are purulent. But the protection of the peritoneum could never be too carefully carried out, when suppuration is due to staphylococcus or streptococcus.



FIG. 158.—THE SAME. VERIFICATION AND TOILET OF THE CELLULAR POUCH. THE REDUNDANT PART WILL BE RESECTED, FOLLOWED BY MARSUPIALIZATION.

**FOURTH STAGE: Toilet of the Cystic Cavity.**—The exuberant part of the fibro cellulose envelope is resected if necessary. The cavity is then tamponed with aseptic compresses, and the circumference of the cystic opening is sutured to the parietal peritoneum and musculo-aponeurotic walls.

**FIFTH STAGE.**—Interrupted suture of the abdominal wall below the marsupialization of the cyst and reunion of the skin below the orifice left for the deep compresses.

**After-Treatment.**—Operative sequelae are very simple when the peritoneum has not been contaminated. The deep compresses are removed on the fourth to sixth day, and cicatrization proceeds gradually. No mention is made here of a curious procedure of shrinking the cavity by means of deep sutures called *capitonage*, such a procedure having the inconvenience of multiplying the anfractuosités and retarding convalescence.

*Pedunculated Cyst of the Left Lobe.*

I have seen one case of hydatid cyst of the left lobe, pedunculated and prolapsed towards the pelvic cavity. This cyst seemed to be an ovarian cyst. It was operated upon at Reims, in the service of my chief, Professor Decès. The hepatic pedicle was fibrous and resistant. This pedicle was divided with the thermo cautery after double ligature with thick silk.

*2. Latero-Posterior or Abdomino-Lumbar Laparotomy.*

If the tumour causes a prominence in the lumbar region, the incision should be made in the posterior axillary line.

The muscular layers are thick in this region. Opening the peritoneum presents no difficulty.

The cyst is evacuated, and drained easily owing to the low level of the incision in the dorsal decubitus.

**Operation**—**FIRST STAGE.**—Vertical cutaneous incision 10 to 12 centimetres long on a prolongation of the posterior axillary line, beginning at the level of the eleventh rib.

**SECOND STAGE.**—Section of the muscular layers and ligature of bleeding vessels. The two last ribs may be removed. Opening of the peritoneum.

**THIRD STAGE.**—Exploration of the right lobe of the liver, and discovery of the cystic pouch, whose most prominent part is generally extra-glandular.

**FOURTH STAGE.**—Puncture and evacuation of the cyst, care being taken to protect the peritoneum.

**FIFTH STAGE.**—Marsupialization of the pouch.

*3. Transpleural Operation.*

The approach to hydatid cysts of the convex surface of the liver by the transpleural route is the same as for abscess of the superior surface of the liver.

**Operation**—**FIRST STAGE.**—Lateral incision at the level of the seventh, eighth, and ninth ribs.

**SECOND STAGE.**—Extirpation of ninth, eighth, and seventh ribs for a length of 10 to 12 centimetres.

The diaphragmatic pleura is closely applied to the parietal pleura.

**THIRD STAGE.**—Incision of the diaphragm, whose superior surface is sutured by a continuous suture to the parietal pleura, in order to close the right pleural cavity.

**FOURTH STAGE.**—Exposure of the cyst. At times the superior surface of the liver is adherent to the diaphragm, owing to inflammatory complications, and the pouch can be evacuated without opening the great serous cavity. If the liver is not attached to the diaphragm, the peritoneum is protected with aseptic compresses. At times the wall of the pouch appears under the diaphragm with no covering of hepatic tissue. It is punctured and evacuated, care being taken to avoid contaminating the peritoneum.



If the pouch be covered with a certain thickness of hepatic tissue, it is recognized by its resistance. It is carefully punctured and evacuated.

FIFTH STAGE.— Marsupialization of the pouch which is united to the diaphragmatic incision.

SIXTH STAGE.— Aseptic tamponing and partial closure of the wound.

#### *Serous Cysts.*

Serous cysts and benign tumours of the liver are exceedingly rare.

#### **Malignant Tumours.**

Malignant tumours of the liver are, for the most part, metastatic cancerous nodules, disseminated throughout the organ. Primary cancer of the liver itself or primary cancer of the bile ducts also occurs. Primary cancer of the gall bladder is a frequent complication of chronic biliary lithiasis. These affections are beyond reach of surgical intervention.

### **SURGERY OF THE SPLEEN.**

#### **SURGICAL ANATOMY AND APPROACH TO THE SPLENIC REGION.**

The spleen is deeply buried in the concavity of the diaphragm, lying on the lowest ribs, its extremity normally never passing beyond the twelfth rib. It may, however, herniate into wounds of the left lateral lumbar region, an accident which has been observed in former times in sword wounds. The spleen was often completely luxated, and became splenecelated owing to strangulation of its pedicle. It is in this manner that cases of accidental amputation of an extroverted spleen occurred in ancient times. Indeed, certain surgeons seem to have assisted the elimination of the organ by artificially strangulating its pedicle. Rarely in modern surgery is it necessary to expose the spleen unless its volume is considerably increased. In splenomegaly the lower extremity of the organ is in the left iliac fossa and it may reach even the right iliac fossa. To the uninitiated these large spleens appear easy to remove. Nothing is further from the truth. Their mobility is but apparent, and almost unsurmountable difficulties present themselves when the upper pole of the organ is reached and the falciform fold, which hangs the spleen on to the diaphragm.

This falciform ligament, in almost every case, conceals in its folds veins dilated to the diameter of 8 to 10 millimetres, which anastomose freely with the subhepatic venous system and the inferior vena cava. These enlarged spleens, therefore, have a double collateral circulation: the portal circulation and an accessory derivation flowing towards the vena cava. The arterial system, however, is not greatly dilated. If the fixation of

the superior pole of the spleen below the left leaf of the diaphragm be taken into consideration with the above peculiarities, it will be seen at once that incision of the lowest four costal cartilages, as already described by the



FIG. 159. VERTICAL INCISION TO APPROACH THE SPLEEN. THIS INCISION COMPRISES THE TENTH, NINTH, EIGHTH, AND SEVENTH COSTAL CARTILAGES.

author, will greatly facilitate splenectomy and, generally, all operations where the upper pole of the region must be reached.

The peritoneum is opened below the tenth costal cartilage, and the tenth, ninth, eighth, and seventh costal cartilages are successively incised.

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This incision wounds only insignificant diaphragmatic attachments which descend here only to the seventh costal cartilage.

When the costal cartilages are incised, a portion can be resected on

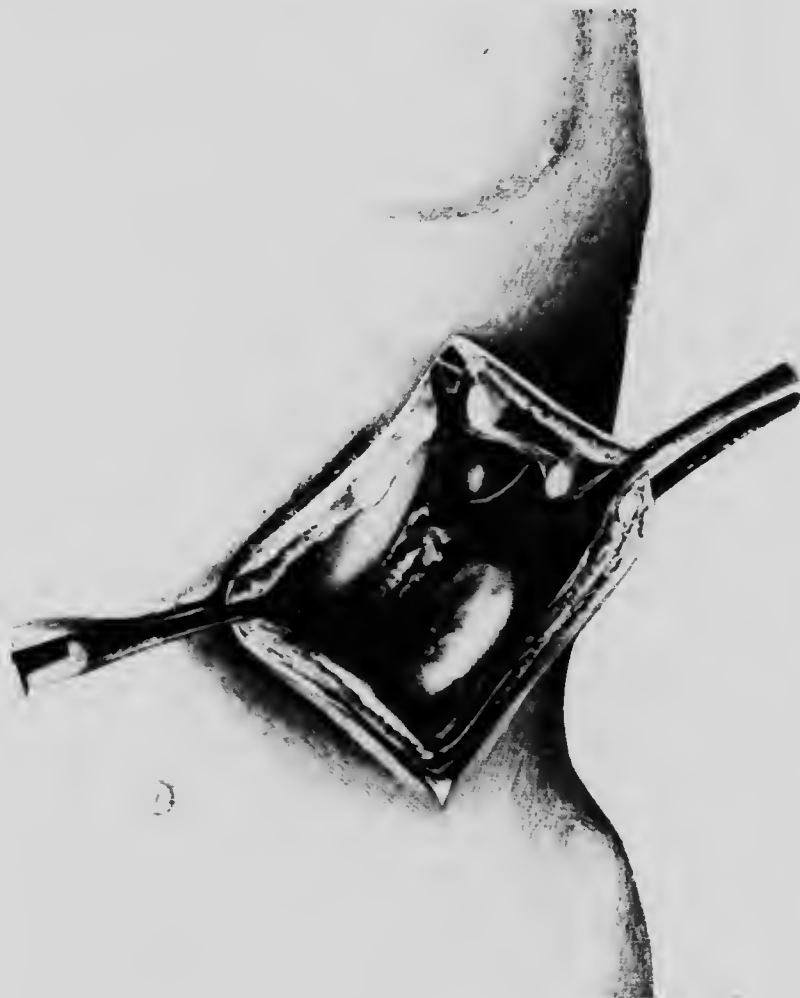


FIG. 160.—RETRACTION OF THE EDGES OF THE INCISION EXPOSE THE GREATER CURVATURE OF THE STOMACH, THE LEFT ANTERO-POSTERIOR HORIZONTAL SEGMENT OF THE COLON, AND THE LOWER POLE OF THE SPLEEN.

either side, but care must be taken to preserve the peritoneum in making this resection. Two powerful hooked forceps are applied to each edge. Traction is made on these forceps, and in the depths of the wound the greater

curvature of the stomach appears in view. To the outer side of this lie the left angle of the colon, and its subsplenic horizontal portion, which are suspended in a falciform serous fold; this fold is very accentuated in some

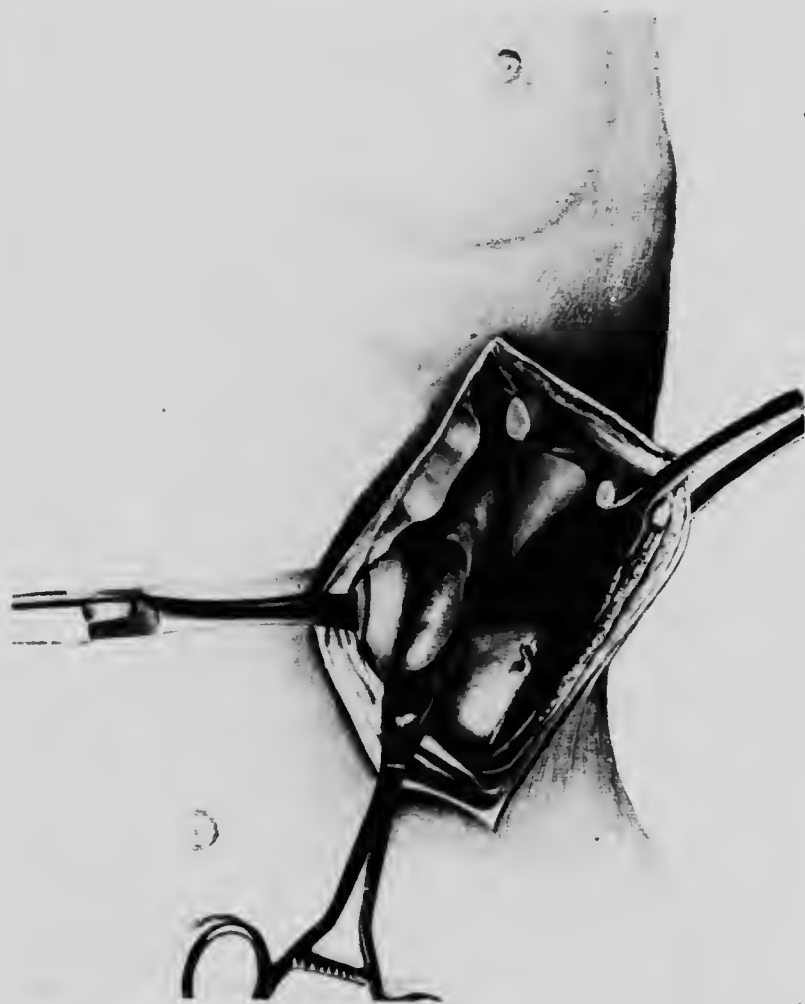


FIG. 161.—THE SPLEEN IS DRAWN OUTWARDS IN AN OVAL FORCEPS, CARE BEING TAKEN NOT TO TEAR IT.

subjects, and has been called the *sustentaculum lienis*, although in reality it should be considered as the suspensory ligament of the left horizontal antero-posterior segment of the colon, never described until now and only revealed by the anatomical sections of the author. The best proof that

this falciform fold is a suspensory ligament of the left horizontal colon lies in the fact that it is not met with in extirpation of the hypertrophied spleen, whilst its liberation is one of the most difficult stages in total extirpation of the colon. This detail is very clearly seen in Fig. 161, where the spleen, seized in an oval forceps, is pulled forwards and downwards from this serous fold.

It has already been pointed out, in treating of penetrating wounds of the abdomen, that this left suspensory ligament of the colon, wrongly called the *sustentaculum lienis*, can be used to close the lower part of the gastro-splenic peritoneal compartment, when it is necessary to tampon this space either for hæmorrhage from the short vessels or from the spleen itself.

#### Traumatic Lesions.

Rupture of the spleen in abdominal contusions produces a fatal hæmorrhage; wounds of the spleen by cutting instruments or gunshot wounds also give rise to profuse hæmorrhage. Immediate laparotomy alone can save the victim. If, in making a median laparotomy, a wound of the spleen be found, no time must be lost in making a second, submammary incision involving the four lower costal cartilages. The splenic compartment is very easily closed below, and it can be excluded from the rest of the peritoneal cavity by uniting the sharp edge of the left suspensory ligament of the colon to the external abdominal wall, transverse colon, and stomach. All effusion of blood towards the iliac fossa is thus prevented, and the wound is treated with aseptic plugging. If the spleen is ruptured at various points, it should be removed without hesitation.

#### Inflammatory Lesions.

##### ACUTE INFLAMMATORY LESIONS.

Microbial inflammation of the spleen is generally a consequence of septicæmia. Metastatic abscesses are formed occasionally. These infectious conditions do not justify any surgical interference.

##### CHRONIC INFLAMMATORY LESIONS.

Malarial splenomegaly and almost all other splenomegalies could be included in this category, with the exception of splenic leucocythæmia. Splenic leucocythæmia is possibly also infectious in origin, but its pathology is still obscure.

Blood examination is always necessary. Indeed, some splenomegalies can be treated by extirpation of the spleen, provided there be no leucocythæmia. An examination of the blood, therefore, will enable the surgeon to avoid the extirpation of a leucæmic spleen, an operation which is almost inevitably fatal.

Leucæmic splenomegaly can be treated successfully by antineoplastic vaccination combined with radiotherapy.

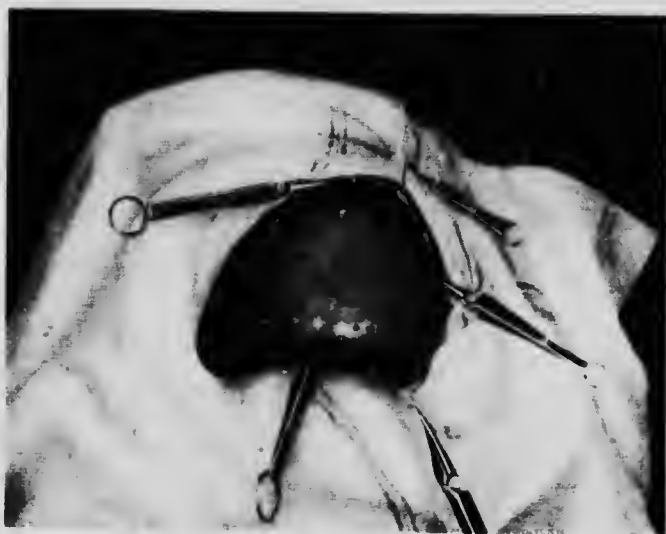


FIG. 162. —SPLENECTOMY. THIRD STAGE: ELEVATION OF THE LOWER PART OF THE SPLEEN.



FIG. 163. —SPLENECTOMY. LIGATION AND DIVISION OF SHORT VESSELS IN THE LOWER PEDICLE.



FIG. 164. SPLENECTOMY. LIGATION OF SPLENIC ARTERY AND VEIN.



FIG. 165. SPLENECTOMY. THE UPPER POLE OF THE SPLEEN IS BROUGHT OUT OF THE ABDOMEN.

*Splenectomy.*

**FIRST STAGE.**—Vertical submammary incision commencing at the level of the seventh left rib cartilage and ending below at the level of the umbilicus.

**SECOND STAGE.**—Opening of the peritoneum below the cartilage of the tenth rib and section of tenth, ninth, eighth, and seventh cartilages. Aseptic compresses are placed in the peritoneal cavity, and a certain length of cartilage is resected by the subperichondral method on either side of the incision. It will be seen at once if the incision extends low enough to allow the spleen to be brought out of the wound. If this is impossible the incision is lengthened in a downward direction.



FIG. 166.—SPLENECTOMY. LIGATURE OF THE VASCULAR SUBPHRENIC PEDICLE BELOW THE SUPERIOR POLE OF THE SPLEEN.

**THIRD STAGE.** The inferior pole of the spleen is brought out of the wound, and the short vessels are divided into several pedicles and tied at once. The spleen is extracted progressively until the upper pole is reached. It is at this moment when advantages of the incision of the four lower costal cartilages will be appreciated, as a very wide field of operation is necessary to liberate the upper pole of the spleen and to ligature its diaphragmatic attachments, which may contain enormous venous sinuses.



**FOURTH STAGE.**—The splenic mass is raised, the state of the pedicles is verified, and they are united together by a series of sutures which are intended to isolate them from the general peritoneal cavity. This closure of the splenic compartment is accomplished by uniting the greater curvature of the stomach to the transverse mesocolon and to the colon, and by suturing on the outer side the suspensory ligament of the colon to the external parietal peritonem: a compartment is thus formed which is separated from the greater peritoneal cavity.

**FIFTH STAGE.**—Verification of the operating field and partial union of the abdominal wall, leaving a space about the middle third of the incision for the tamponing compresses.

#### **Congenital and Acquired Malformations.**

Small supernumerary spleens are frequently met with. These anatomical curiosities have no surgical interest.

Displacement is fairly frequent, but rarely calls for notice.

#### **BENIGN TUMOURS.**

##### *Hydatid Cysts.*

Hydatid cyst in the spleen is less frequently met with than in the liver. As a rule, if they are voluminous they push out from the organ and become



FIG. 167.—A HYDATID CYST ON THE INNER SURFACE OF SPLEEN. EXPOSURE OF THE LOWER POLE OF THE SPLEEN.

a rounded, voluminous tumour, the palpation of which differs greatly from the segmented and clearly defined border of a spleen affected with splenomegaly.

**Operation**—**FIRST STAGE.**—Vertical incision in the mammary line. If the tumour is low, it is unnecessary to involve the costal cartilages.

**SECOND STAGE.**—Opening of the peritoneum. Protection of the operating field and exploration of the tumour. Fig. 167 shows a hydatid cyst of the inner surface of the spleen as the right hand brings it to surface.

**THIRD STAGE.**—The most accessible part of the cyst is surrounded with large aseptic compresses, to prevent infection of the peritoneum. A small puncture is made in the centre of the cyst. The hydatid fluid, which is generally limpid, escapes. The two lips of the cyst incision are seized with forceps, and the orifice is enlarged by division. If pus is present great precaution is taken to avoid contamination of the peritoneum. Traction with riuged forceps is employed on the fibro-cellular wall to bring the pouch as far as possible to the surface; the daughter cysts and membrane are then extracted.

**FOURTH STAGE.**—Toilet of the cavity. The redundant part of the pouch is excised, and sutured to the wall at its circumference (marsupialization).

**FIFTH STAGE.**—Plugging of the pouch and suture of the abdominal wall above and below the plugs.

#### *Serous Cysts.*

Serous cysts of the spleen are rare. Intervention should be carried out on similar lines as described for hydatid cysts. The surgeon treats each case on its merits.

#### MALIGNANT GROWTHS.

Primary malignant tumours of the spleen are exceptional, and it is difficult, even histologically, to distinguish them from the various splenomegalies. They should be treated with splenectomy. It should be remarked that extirpation of a cancerous spleen is a difficult operation, presenting great immediate risks. Survival from this operation is uncertain, as no proper statistics exist.

Metastatic cancerous nodules of the spleen do not call for surgical intervention, these nodules being only a local manifestation of a general infection.

### SURGERY OF THE PANCREAS.

#### SURGICAL ANATOMY OF THE PANCREAS.

The pancreas is situated in front of the vertebral column in the retro-peritoneal compartment. Fig. 168, which is a sagittal section of the right parasternal region on the right side, shows that the head of the pancreas

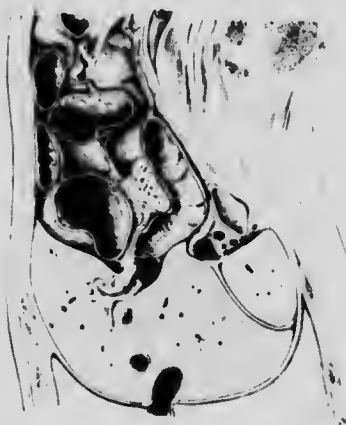


FIG. 168.—SAGITTAL RIGHT PARASTERNAL SECTION. THE LOWER THIRD OF THE PANCREAS IS SITUATED BELOW THE INSERTION OF THE TRANSVERSE MESOCOLON.

is framed behind by the second and third part of the duodenum. In front the accessible surface of the pancreas is divided in two by the insertion of



FIG. 169.—PANCREATIC CYST BEHIND THE STOMACH DEVELOPING TOWARDS THE HILUM OF THE LIVER.

the transverse mesocolon. The upper two thirds of the pancreas lie above this horizontal line, and are in relation, through the intermediary of the greater sac, with the posterior surface of the stomach. The lower third,

however, and its inferior border, are in relation, below the insertion of the transverse mesocolon, with the posterior peritoneum of the abdominal cavity. From these peculiarities it may result that cysts of the pancreas



FIG. 170.—PANCREATIC CYST DEVELOPING IN THE GREATER SAC BETWEEN STOMACH AND TRANSVERSE COLON.



FIG. 171. CYST OF THE LOWER PART OF THE PANCREAS BELOW THE TRANSVERSE MESOCOLON.

may present either above the hilum of the liver, which they compress (Fig. 169), or in front between the stomach and the colon, distending the gastro-colic (Fig. 170) omentum and coming into contact with the anterior abdominal wall below the transverse mesocolon (Fig. 171).

#### TRAUMATIC LESIONS.

Wounds of the pancreas can be caused from the front without intestinal lesion, after perforation of the gastro-colic omentum. In such cases an adhesive peritonitis may arise followed by a pancreatic fistula. Wounds of the pancreas by the left posterior route are very rare.

In the discussion of penetrating wounds of the abdomen it was pointed out that immediate laparotomy is the rule. Here the same course should be followed. The pancreatic wound can be treated by plugging. Extraction of a bullet can be carried out in the exploration of its course.

## INFLAMMATORY LESIONS.

### Acute Inflammatory Lesions.

Acute suppurative pancreatitis is rare if the relative frequency of infection of the biliary passages and of the parotid are taken into consideration. Abscess of the pancreas is discovered in the course of abdominal exploration. It is incised after laparotomy, every precaution being taken, as already described, to protect the peritoneum from infection. The cavity is treated by plugging.

### Chronic Inflammatory Lesions.

#### CALCULI OF PANCREATITIS.

Chronic pancreatitis may be caused by lithiasis of the excretory duct. Calculi of the pancreas are phosphatic calculi, microbial in origin, resembling salivary calculi. The extra-duodenal route is preferable for extraction provided that the calculus is not arrested in contact with the mucous membrane. The peritoneum is shut off and the wound is plugged.

## CONGENITAL AND ACQUIRED MALFORMATIONS.

### Congenital Malformations.

Abnormalities of the pancreas and its duct can hardly be recognized during life, and are extremely rare.

### Acquired Malformations.

#### PANCREATIC FISTULA.

Pancreatic fistulas, either of the gland or excretory duct, cause a very abundant leaking. Pancreatic juice is very easily recognized by its character. These fistulas are generally post-operative, remaining as a late complication of operation on pancreatic cysts.

**Operation**—**FIRST STAGE.**—Vertical incision 12 centimetres long, circumscribing the fistulous orifice, which is closed in a ringed forceps.

**SECOND STAGE.**—The peritoneum is opened below the fistulous tract, which is dissected out as far as the pancreas, care must be taken to avoid unnecessary damage.

**THIRD STAGE.**—The field of operation is explored to decide at which point to anastomose the fistulous tract, duodenum, or stomach.

**FOURTH STAGE.**—Gastric or duodenal anastomosis of the fistulous tract. The tract is formed by inflammatory tissue; a simple double layer of suture, therefore, at the circumference of the gastric or duodenal orifice is not enough. The most favourable locality for anastomosis is chosen, and the peritoneal cavity is shut off by a double layer of sero-serous sutures. A small compartment is thus separated off which, being superficial and sub-parietal, is well isolated from the general peritoneal cavity. In the middle of this cavity is the fistulous tract, sometimes 4 to 5 centimetres in length. A small puncture is made with a bistoury at the most convenient place in the stomach or duodenum, and the fistulous canal is introduced by the orifice thus made. Several sutural points fix the fistulous canal to the gastric or duodenal tunic. To ensheath the canal a sero-serous suture is then made which envelops it in a fold to the viscus. The circumference of this orifice is fixed to the cellular wall of the tract for a certain distance.

**FIFTH STAGE.**—Toilet of the wound and verification of the field of operation.

**SIXTH STAGE.**—Suture of the wall. An orifice is left to plug the small extraperitoneal compartment where the anastomosis has been made.

## TUMOURS.

### Benign Tumours.

#### CYSTS OF THE PANCREAS.

Cysts are fairly frequent. They are as a rule sero-sanguineous, and contain cholesterol crystals. Diagnosis is not difficult; localization only varies with their relation to the transverse mesocolon. Exploratory puncture is contra-indicated, since it involves the risk of wounding the stomach, colon, or even a large bloodvessel.

**Operation**—**FIRST STAGE.**—Vertical incision 12 centimetres in length over the most prominent part of the cyst.

**SECOND STAGE.**—The peritoneum is opened. The serous membrane must be incised with care, since the anterior abdominal wall may be closely applied to the bulging cyst.

The peritoneum is retracted with hooked forceps.

**THIRD STAGE.**—According to the position of the cyst, the gastrocolic or great omentum is broken through, between the visible vessels. As soon as the wall of the cyst appears, the peritoneum is protected with aseptic compresses, and the cyst is evacuated either by puncture or by aspiration.

**FOURTH STAGE.**—Toilet of the pouch with aseptic compresses.

**FIFTH STAGE.**—Marsupialization and plugging.

**SIXTH STAGE.**—Partial suture of the wall.

### Malignant Tumours.

In cancer of the pancreas—a relatively frequent affection, the surgeon is impotent.

Intervention in these cases confines itself as a rule to cholecystenterostomy, which is performed in case of cancerous obstruction of the common bile duct. But this operation rarely prolongs the life of the patient.

## SURGERY OF THE STOMACH AND INTESTINES.

*Historical.*—Before commencing the description of operations on the stomach and intestines I think it will not be out of place to give a short résumé of the history of the subject. The topographical anatomy of the stomach will then be described, followed by the pathology of the gastropathies.

Intestinal anastomosis was the discovery of Maisonneuve. Intestinal surgery at that date was reduced to the suture of accidental wounds. Lambert invented the suture which is named after him, and which consists in reuniting the serous membrane by sero-serous sutures which do not traverse the mucous membrane. In spite of the great advance realized by Lambert, gastro-intestinal surgery made real progress only after the discovery of the antiseptic method by Lord Lister in 1865. Czerny, Billroth's assistant, perfected Lambert's suture; he demonstrated that to obtain a good union two superimposed layers of suture were necessary.

### Pylorotomy.

Péan (April 9, 1879) was the first to attempt resection of a cancerous pylorus. The case died. Rydiger obtained the same result on November 16, 1880.

Billroth, on the other hand, cured his first case, February 28, 1881.

Wochler (April 18, 1881) and Czerny (June 21, 1881) also performed pylorotomy with success.

These two latter operations gave a total of three successful out of fourteen pylorotomies. The first results, therefore, were not very encouraging. Billroth operated a second time successfully on August 23, 1881.

On November 22, 1881, Rydiger performed his second pylorotomy this time not for cancer, but for a fibrous stenosis following simple ulcer. The case recovered.

Including Péan's case, twenty-two pylorotomies had now been performed, five patients having submitted to the operation with success.

Attempts at the operation now multiplied, and numberless statistics were published; 80 to 85 per cent. of the early operations were for cancer and 15 to 20 per cent. for cicatricial stenosis without cancerous degeneration.

### Gastro-Enterostomy.

Gastro-enterostomy was performed for the first time by Woelfler (September 28, 1881) in a case where pylorectomy was impracticable owing to the extent of the cancer and its adhesions. Woelfler, who had been successful in his first pylorectomy, had the same happy result in his first attempt at gastro-jejunal anastomosis.

On March 13, 1884 Rydiger cured a case of fibrous stenosis using Woelfler's method. Diagnosis of fibrous stenosis was only made when the abdomen had been opened.

On May 11 Billroth cured another case of duodenal stenosis due to tuberculosis. The case died after two months, and the nature of the lesion could be verified.

Rydiger on two occasions (June 20 and July 26, 1884) practised gastro-enterostomy of Billroth's type for the cure of cicatricial stenosis of the pylorus with success.

It was soon found that Woelfler's operation of anterior gastro-enterostomy was unsatisfactory in a number of cases, owing to the compression of the transverse colon by the anastomosed jejunal loop.

Von Hacker proposed to avoid the inconveniences of Woelfler's operation by making the gastro-jejunal anastomosis through a buttonhole incision of the transverse mesocolon.

Von Hacker's first operation took place on March 22, 1885. The patient died thirty-six hours afterwards. Von Hacker lost two more cases in July and October, 1885, and it appears that Czerny has the honour of performing the first successful posterior trans-mesocolic gastro-enterostomy (December 2, 1885). Von Hacker was successful only seven months later (July 24, 1886).

### Pylorectomy combined with Gastro-Enterostomy.

Billroth was the first to combine pylorectomy with gastro-enterostomy in a case where the disposition of the tumour appeared to prevent union between the stomach and duodenum. On January 15, 1885 dealing with such a case, Billroth first performed an anterior gastro-enterostomy; he then isolated the tumour from the duodenum invaginated and closed the latter, and treated the stomach in the same way after dividing the organ above the neoplasm. The patient survived the operation.

### Pyloroplasty.

This operation, it would seem, has been wrongly ascribed to Heinecke, since in 1883 Czerny successfully performed elliptic excision and transverse reunion of the stenosed pylorus. Elliptic or cuneiform excision of the pylorus sparing its posterior wall is a true pyloroplasty, and is applicable to many more cases than Heinecke's longitudinal incision followed by transverse suture (March 28, 1886).



### Gastroplasty.

On January 23, 1893, in dealing with a narrowing shrinking stenosis of the central part of the stomach, and unaware if the operation had been attempted before, the author devised a new operation—gastroplasty—with complete success.

### OPERATIONS FOR NON-CANCEROUS LESIONS OF THE STOMACH.

The early operations of pylorotomy, gastro-enterostomy, pyloroplasty, and gastroplasty, which were performed on non-cancerous patients, were all designed to treat symptoms caused by cicatricial stenosis of the pylorus.

When in 1895 the author's volume "Surgical Treatment of Affections of the Stomach and Duodenum" was published, operations performed for any other affection than pyloric stenosis were still very rare.

Bircher and Weir had attempted to diminish a dilated stomach by gastrorrhaphy in stages, and Weir only attempted this gastrorrhaphy after an unsuccessful gastro-enterostomy in a case of cicatricial stenosis of the pylorus "because the patient suffered as much as he did before." These isolated operations have but little interest. The same may be said of division of the stenosed pylorus (Hahn-Loreta) and the evertting of the cancerous stomach (Bernays).

Czeruy (July 11, 1887) performed a laparotomy for ulcer of the stomach. The operation was exploratory only. Mikulicz, treating the same case a year and a half afterwards, observed by the gastroscope a small whitish patch close to the cardia. He opened the stomach, cauterized the supposed diseased spot and reclosed the viscus. A slight anclioration was the result.

Roux successfully resected an ulcer of the lesser curvature.

Jeannel (September 24, 1892) attempted to cure a "dilatation of the stomach due to simple atony" by gastro-enterostomy. The patient died, having the duodeno-jejunal loop distended with a fetid bile containing liquid; the pylorus was healthy. The state of the duodenum was not noted.

It is evident, from these observations, that no one had grasped the real cause of gastric pain or the failure of ulcers to cicatrize, and the dilatation of the stomach.

The relief from pain which occurred after my first pyloroplasty operation led me to attempt the same procedure in another case, suffering from hæmatemesis, excess of hydrochloric acid, and probable signs of a round ulcer. This operation was followed by the death of the patient. A short while afterwards I performed laparotomy for pyloric and duodenal ulcer, complicated with profuse hæmatemesis (June 9, 1892). In this case I made a simple gastro-enterostomy, being persuaded that the patient would cease to suffer as soon as the stomach could empty itself freely into the small intestine.

Pylorotomy would have been possible. But I resisted a legitimate desire to examine a most interesting condition: ulcer of the pylorus and duodenum with considerable hypertrophy of cellular tissues and muscular coats. It was my hope to demonstrate clinically that the creation of a gastro-jejunal orifice would be capable of curing the gastralgia, and at the same time to cause cicatrization of an ulcer twenty-two years old. The result of the operation fulfilled all my hopes.

Pain disappeared on the same day as the operation. Two weeks elapsed and the patient, who for nearly twenty years had lived upon milk and Vichy water, ate with appetite, and was able to digest various foods. Neither the hæmatemesis nor the mælena returned. This observation being conclusive, I communicated the result to the Seventh French Surgical Congress (April, 1893).

This first success in a case of non-cancerous gastropathy gave me the conviction that *spasmodic contracture of the pylorus was the key to almost all gastric pathology.*

The study of the pathological physiology of diseases of the stomach was continued from 1892 to 1895. I was enabled to verify the exactitude of my earlier observations in an irrefutable manner, owing to successful operation of non-cancerous gastropathies, and I wrote in 1895 as follows:

*"Pyloric spasm dominates almost all the pathology of the stomach. The pylorus is the enemy. Its inopportune susceptibility is the cause of the most widely different gastric malaises, and the persistence of the anatomical lesions which accompany them."*

Amongst the first operations for pyloric spasm, without fibrous stenosis, the operations of Novaro of Bologna and Carle of Turin should be mentioned. The former performed thirteen operations before the year 1895, and the latter fourteen, for various non-cancerous affections of the stomach (section of inflammatory bands or pyloroplasty).

Carle reported that in five of these cases not a single symptom gave rise to the supposition of either stenosis or ulcer, the physicians having made a diagnosis of "nervous dyspepsia with dilatation." Laparotomy was performed after long and useless courses of treatment. There was gasterectasis of the greater curvature. The pyloric ring presented no cicatrice and admitted the little finger. This orifice seemed to be insufficient for the free passage of food. Carle enlarged the pylorus by pyloroplasty. "These patients," he reports, "took all kinds of food. The excellence of the result obtained shows that in these cases also a mechanical obstruction was the cause, and that the patient's sufferings depended on the stagnation of the alimentary matter in the stomach." It will be seen later that I differ only in one particular—that of the mode of intervention—for I prefer gastro-duodenostomy or gastro-enterostomy to pyloroplasty in these cases.

### Operations on the Intestines.

The history of these interventions need not occupy us here. In fact the surgery of the intestine is much easier than that of the stomach, and has only become of daily use after the first successes of Billroth, Woelfler, Czerny, and Rydiger in gastric surgery.

### TOPOGRAPHICAL ANATOMY OF THE STOMACH AND INTESTINE.

Ever since my first operations for pylorotomy, gastro-enterostomy, and resection of the intestines, in 1892, I observed that there was a considerable difference between the actual situation of the abdominal viscera and what I had been taught during my medical studies. I proceeded to study the relations of the stomach in the living subject in the course of many laparotomies. These were verified on the cadaver, and I published the results in 1895.

### Relations of the Stomach and Duodenum.†

#### A. RELATIONS OF THE STOMACH.

Fancker's tube is seldom employed to day for the exploration of the stomach. The same may be said of test meals and the analysis of the products of their digestion which have never given very practical results. These methods are now for the most part completely abandoned.

The stomach, contrary to the description of most classic writers, occupies when empty almost a vertical position. The pyloric region alone passes to the right of the median line, and the pylorus is only 2 or 3 centimetres distant from the same line in normal subjects. In studying Fig. 172 which was drawn in 1895 from nature, after most careful measurements the exact relations of the stomach can easily be made out. The subject was a well formed young man of sixteen years.

The capacity of the stomach is subject to great variation, and it will be well to study the form and relations of the viscus in a state of emptiness, physiological repletion, and dilatation.

#### 1. State of Emptiness.

The œsophagus transverses the diaphragm in such a way that its right border is exactly tangential to the median antero-posterior plane. It thus results, if we consult Fig. 172, that in a state of absolute emptiness practically the whole of the stomach is situated to the left of the middle

\* "Surgical Treatment of Affections of the Stomach and Duodenum." Edited by Ruoff, 1895.

† Quoted *in extenso* from the author's volume published in 1895, in which the topographical relations of the stomach and duodenum were first described with exactitude.

line: more than 2 or 3 centimetres of the pyloric extremity are never found to the right of this line.

The cardia is situated 2 or 3 centimetres below the œsophageal orifice of the diaphragm, and it looks downwards and to the left. The axis of

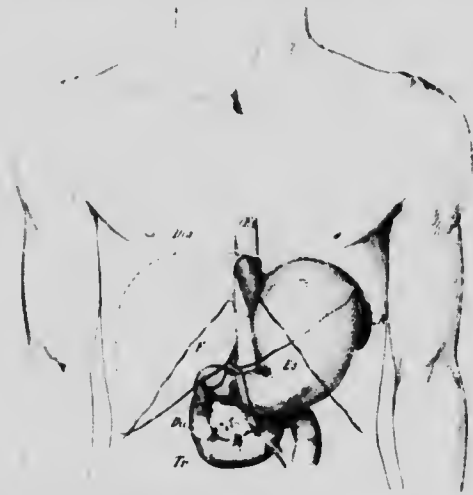


FIG. 172. —SITUATION AND RELATIONS OF THE STOMACH IN AN ADOLESCENT.

the cardia prolonged in this direction would pass below the lower extremity of the spleen. The great cul-de-sac of the stomach mounts vertically several centimetres higher than the cardia its upper part, even when



FIG. 173. SHAPE OF THE STOMACH IN A STATE OF EMPINESS.



FIG. 174. RETRACTED STOMACH. THE DOTTED LINES SHOW THE STATE OF MEDIUM REPLETION.

empty being in contact with the concavity of the diaphragm. The lesser curvature describes the segment of a parabola whose axis is more or less inclined from the horizontal, following individual peculiarities. I have

observed at times the presence of an obtuse angle where the right edge of the œsophagus becomes continuous with the lesser curvature. At other times the transition is insensible (Fig. 177), and the inner convex border of the lower extremity of the œsophagus (subdiaphragmatic or abdominal portion) is directly continuous with the cavity of the lesser curvature, forming the upper part of a widely open **S** (Fig. 174).

When the stomach is empty the pylorus is the lowest point of the organ, and its axis is either slightly declining or horizontal.

The anterior and posterior walls are then almost in contact, and the antero-posterior diameter is reduced to several millimetres. The transverse diameters are also reduced by the contraction of the smooth muscle fibres, and the greater curvature which approaches the median line is separated from the lesser curvature by a distance of 5 or 6 centimetres only (Fig. 173).

The shape of the stomach varies according as to whether the distension is pathological or caused by food.

#### 2. State of Physiological Repletion.

In physiological repletion the food obeys the laws of gravity. The pylorus closes by normal reflex following ingestion of food, which is massed at the lowest point *i.e.* in the prepyloric antrum which becomes more or less distended, and extends below the pylorus into the right hypochondrium. The great cul-de-sac, or rather the upper or phrenic cul-de-sac,



FIG. 175. ABLETT STOMACH AT THE COMMENCEMENT OF A MEAL.



FIG. 176. STOMACH IN A STATE OF PHYSIOLOGICAL REPLETION.

is therefore never in relation with the stomach contents in the vertical position, and is in contact exclusively with the gas formed in the gastric cavity.

The gas occupies the higher zone and presses the upper cul-de-sac



FIG. 177. RELATIONS OF THE STOMACH IN STATE OF REPLETION IN THE ERECT POSITION.



FIG. 178. EMPTY STOMACH AT THE MOMENT IT RECEIVES FOOD.



FIG. 179. MEDIUM REPLETION. MODIFICATION OF THE LESSER CURVATURE.



FIGS. 180 AND 181. DIFFERENT DISPOSITIONS OF THE LESSER CURVATURE DURING PHYSIOLOGICAL REPLETION OF THE STOMACH. THE SUBJECT IS IN THE ERECT POSITION.

into the cavity of the diaphragm, from which it is separated behind and on the outer side by the spleen.

In pyloric obstruction distension of the stomach by gas may be so great that the diaphragm and the chondrocostal walls are pushed upwards.

The lesser curvature which tended in the state of emptiness to straighten out (Fig. 178) now becomes more concave. The angle corresponding to the termination of the oesophagus becomes gradually effaced, and the terminal part of the lesser curvature descends to a lower level than the pylorus.

The greater cul de sac, which cannot distend beyond the vault of the diaphragm, can only feebly participate in the augmentation of the capacity of the organ.

### 3. Dilatation of the Stomach.

The stomach is no longer in a state of physiological repletion but distended or dilated (the term consecrated by use) when the increase in the size of the organ involves the prepyloric region almost exclusively. The distension is produced according to the laws of gravity, and a prolapse occurs of the lower part of the greater curvature, which invades successively first the left flank then the right flank; this develops below the pylorus, which it passes on the outer side, covering the subjacent duodenal loop (Fig. 182).

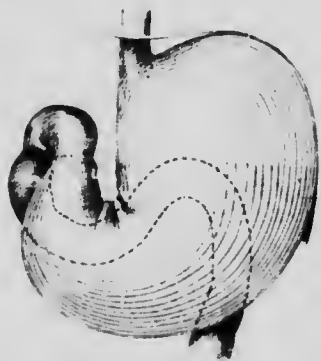


FIG. 182. DILATATION OF THE STOMACH IN THE ERECT POSITION.



FIG. 183. DIVISION OF THE STOMACH INTO TWO REGIONS, THE PREPYLORIC AND THE PYLORIC CUL-DE-SAC.

The prolapse of the antepyloric region causes a dragging on the lesser curvature, so that this curvature forms an acute angle at the junction of the upper two thirds with the lower third, and even several re-entering angles (Figs. 180, 181, and 182) which are simple witnesses of the effort which the stomach walls are called upon to support.

The enlargement of the organ is so great in such cases that the lesser curvature, in its upper two thirds, approaches the middle line. It becomes

practically vertical, and almost in contact with its lower third, which is directed upwards and to the right towards the pylorus.

*Division of the Stomach into Two Regions.*

From the description already given, it will be seen that the stomach should be divided into two distinct regions: first an upper region in relation to the left lobe of the liver, the left leaf of the diaphragm, and, on the outer side, with the inner surface and hilum of the liver; secondly, an inferior region more restricted in size corresponding with the pyloric extremity.



FIG. 184. AXIS OF THE PYLORIC ANTRUM IN THE CONDITION OF COMPLETE EMPTYNESS.



FIG. 185. AXIS OF THE PREPYLORIC ANTRUM, FASTING.



FIG. 186. SHOWING AXIS OF THE PREPYLORIC ANTRUM IN DILATATION OF THE STOMACH.

These two regions of the stomach, the upper or diaphragmatic cul-de-sac and the prepyloric cul-de-sac, are limited by a common horizontal line which passes 8 or 9 centimetres below the centre foliole of the diaphragm (Fig. 183) and corresponds nearly—since abdominal relations are never immutable—to the upper border of the pancreas.

The axis of the first portion of the superior cul-de-sac is vertical; the axis of the second or antrum of the pylorus is descending when the stomach is empty (Fig. 184) horizontal in the condition of moderate repletion (Fig. 185), and ascending in dilatation of the stomach (Fig. 186).

**B. RELATIONS OF THE PYLORUS.**

What are the anatomical relations of the pylorus? These have been studied not only in the author's anatomical researches, but also in the living subject; for, in the course of innumerable operations on the abdomen, whether for various tumours, affections of the liver or bile passages, neoplasms or stricture of the duodenum and colon, or to explore neighbouring viscera, the author has had ample occasion to determine both their integrity and their anatomical relations.

The terminal extremity of the stomach or antrum of the pylorus is in



relation to the median line. Its direction varies according to the condition of emptiness or otherwise of the stomach. It will be noticed (Fig. 187) that in the condition of absolute emptiness the greater curvature approaches the lesser curvature as nearly as a distance of but 5 or 6 centimetres at the level of the great omentum.



FIG. 187. RETRACTED STOMACH. AXIS OF THE DESCENDING PYLORUS.



FIG. 188. FASTING STOMACH. HORIZONTAL AXIS OF THE PYLORUS.

The pyloric antrum is hardly more than 3 centimetres wide, and its axis is directed obliquely downwards and towards the right at an angle of 20 degrees to the horizontal (Fig. 187). In this condition the pylorus occupies the lowest point of the stomach. When the latter is more or less



FIG. 189. REPLETED STOMACH. ASCENDING AXIS OF PYLORUS.



FIG. 190. GREATLY DILATED STOMACH. VERTICAL AXIS OF PYLORUS.

distended the prepyloric region becomes lower and the axis of the pylorus is no longer descending (Fig. 187) or horizontal (Fig. 188), but sensibly ascending (Fig. 189), to become vertical in extreme dilatation (Fig. 190).

It can be conceived what can be the consequences of this distension of

the prepyloric antrum when the stagnation of the stomach contents is taken into consideration.

The pylorus, therefore, with rare exceptions remains fixed, and is situated in the neighbourhood of the middle line. I have found it either exactly



FIG. 191. PYLORUS SITUATED TO THE LEFT OF THE MIDDLE LINE.



FIG. 192. PYLORUS SITUATED TO THE RIGHT OF THE MIDDLE LINE.

in the middle line, or, exceptionally, 2 centimetres to the left, and more often 2 to 2½ or 3 centimetres to the right.

The direction of the pyloric ring differs according to the state of distension of the stomach.

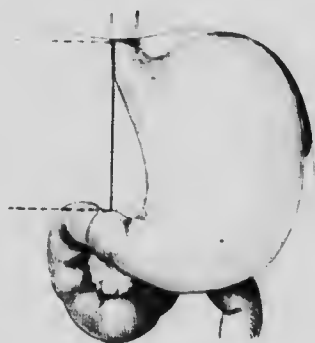


FIG. 193. NORMAL DISTANCE BETWEEN THE CARDIA AND THE PYLORUS.

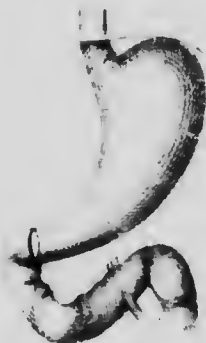


FIG. 194. THE PYLORIC RING IS VERTICAL WHEN THE STOMACH IS EMPTY.

When the stomach is empty the sphincter is vertical (Fig. 194), becoming oblique in moderate repletion (Fig. 195) and horizontal in cases of extreme dilatation (Fig. 196).

The upper border of the pylorus is generally 7 to 9 centimetres below the oesophageal orifice of the diaphragm (Fig. 193).

It is generally covered by the sharp edge of the liver, and is in close relation with the fundus of the gall-bladder. The fundus of the gall-bladder often lies on the first part of the duodenum, into which as we have already seen it may open in calculous cholecystitis.

Displacement of the pylorus seldom occurs except when it is the site of an annular new growth, which is limited and non-adherent. Following the laws of gravity, the displacement is downwards, the pylorus descending to the neighbourhood of the umbilicus, and keeping close to the middle line. This pyloric displacement, which is often met with in the living subject affected with limited new growth, causes an elongation of the superior ligament (gastrohepatic omentum) and the pancreatico pyloric fold (the posterior ligament) of the pylorus. When this elongation has



FIG. 195. POSITION OF THE PYLORIC RING IN MODERATE REPLETION.



FIG. 196. IN DILATION THE PYLORIC RING IS HORIZONTAL.

existed for a long time it may become permanent, and it is in these cases that the thickened and indurated pylorus may migrate as far as the right iliac fossa and even to the pubes and true pelvis.

Diagnosis is not very difficult in cases of this nature, the small tumour being coincident with the classic signs of pyloric obstruction, and its situation varying with the condition of emptiness or repletion of the stomach. When no neoplastic degeneration has occurred we have never seen the pylorus lower than 9 centimetres below the diaphragm, and in nearly every case, as we have already stated, it was covered by the liver and colon, so that when the abdomen was opened no part of the stomach was visible. It was this peculiarity which struck Malibran in his first autopsies of children (*loc. cit.*, p. 41 *et seq.*). "When the abdomen is opened," states Malibran, "the stomach is not seen at all. To see it the whole of the left cartilaginous part of the thoracic wall must be raised, and not too much retracted, nor should the colon be distended, for then the stomach is veritably buried deep in the abdominal cavity. When the liver is raised the stomach is



FIG. 197. INFANT STOMACH COVERED BY THE LIVER AND TRANSVERSE COLON.



FIG. 198. RELATIONS OF THE PYLORUS AND FIRST PART OF THE DUODENUM WITH THE FIRST LUMBAR VERTEBRA.



seen in its entirety. . . . Its two orifices, cardiac and pyloric, are almost on the same vertical median plane, the pylorus being carried more to the right and situated lower than the cardia. . . . The greater curvature looks almost directly to the left and the lesser curvature to the right."

This description of the infantile stomach by Malibran is similar in every respect to the condition we have observed in healthy men of all ages.

#### C. RELATIONS OF THE DUODENUM.

If we except the first part, which participates in the mobility of the pylorus, the duodenum is firmly fixed on the sides and in front of the lumbar vertebrae. The first part alone is movable, and its direction varies according to the dilatation of the stomach. When the latter is in a condition of absolute emptiness or moderate repletion the first part of the duodenum is horizontal or very slightly ascending, and ends at its superior angle to turn outwards and backwards along the first lumbar vertebra. It corresponds in front with the lower border of the liver, which at times completely covers



FIG. 199.—EXCEPTIONAL POSITION OF THE PYLORUS TO THE LEFT OF THE FIRST LUMBAR VERTEBRA.

it. Should, however, the pyloric antrum be distended, the terminal portion of the stomach takes an upward direction and the first part of the duodenum assumes a similar direction. When prolapse occurs of a cancerous pylorus as far as the umbilicus or into the iliac fossa (as we have seen in the living subject) the first part of the duodenum becomes considerably elongated by the permanent slackening of its fixing serous folds. This disposition is very favourable in resection of the pylorus, since the pylorus can be freely brought out of the abdomen in such an eventuality.

The second part of the duodenum starts on the right side of the first lumbar vertebra, and is in relation successively with the inferior vena cava and the hilum of the kidney (Fig. 205).

The third or horizontal part is situated in front of the third and fourth lumbar vertebrae. This third portion of the duodenum, as Jonnesco has well remarked (*Progrès Méd.*, 1889, p. 178), varies in shape and extent, the duodenal loop assuming sometimes an annular shape (Fig. 201) or following a variable disposition of the prevertebral portion, assuming a **U** (Fig. 202), a **V**, or an **L** shape (Fig. 204).

The superior mesenteric artery, which springs from the anterior surface of the aorta nearly at the level of the upper part of the second lumbar vertebra, crosses the duodenum almost vertically at a point which was considered in classical treatises to be the commencement of the jejunum. But if we study the relations of the duodenum in a fresh subject it will not be difficult to make out that the fixed portion of the small intestine is not limited below at the mesenteric artery.

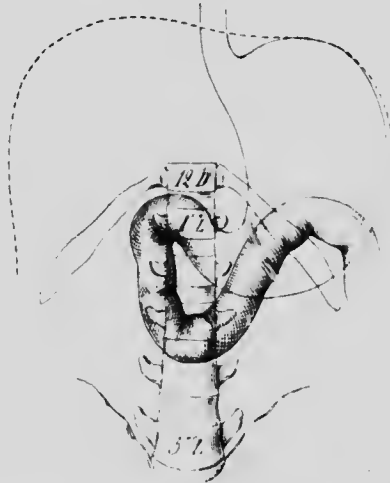


FIG. 200. ASCENDING POSITION TAKEN UP BY THE FIRST PART OF THE DUODENUM IN THE FULL CONDITION OF THE STOMACH.

A fourth part of the duodenum is almost always existent, lying on the left side of the aorta and vertical column, and ascending in a nearly vertical direction. It extends as far as the right side of the second or first lumbar vertebra. The configuration and extent of this fourth part of the duodenum varies sensibly should the duodenal loop below be **U** or **V**-shaped; a distinctly annular duodenum indeed may be met with in some cases (Fig. 206). In such a case the duodeno-jejunal angle was 2 centimetres higher than the pylorus.

Subjects occur, on the other hand, in whom the fourth ascending portion

of the duodenum is completely absent or nearly so. This disposition, seen in Fig. 206 (a sketch from nature), is exceptional, and has been described as normal by the classical writers (Sappey, Cruveilhier, etc.), who seem to have only studied the relations of the duodenum altered by maladroit dissection.



FIG. 201. ANNULAR DUODENUM.



FIG. 202.—U-SHAPED DUODENUM.



FIG. 203. V-SHAPED DUODENUM.

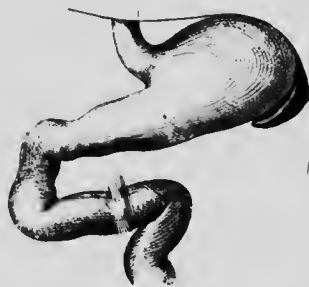


FIG. 204. —L-SHAPED DUODENUM.

It is also erroneous to attribute an annular shape to the fetal duodenum. The duodenum in the fetus is oftener V-shaped, the V being more or less open, and the lower angle very evident (see Figs. 210 and 211 taken from a photograph).

The ligament of Treitz which extends from the right edge of the œsophageal opening of the diaphragm to the duodeno jejunal angle occupies a position which varies according to the subject. The commencement of



the jejunum is also variable over a distance of several centimetres, and corresponds sometimes with the first, and at others with the second lumbar vertebra.

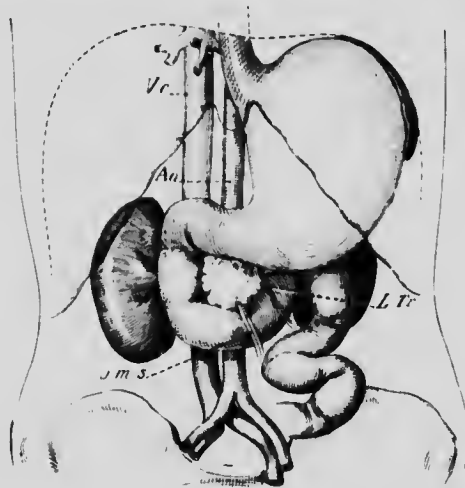


FIG. 205. —RELATIONS OF THE DUODENUM WITH THE RIGHT KIDNEY, HEAD OF THE PANCREAS AND GREAT VESSELS.

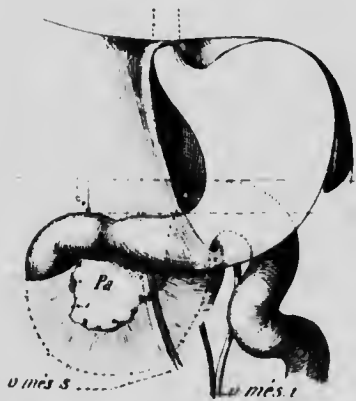


FIG. 206. —RELATIONS OF THE FOURTH PART OF THE DUODENUM, TERMINATING AT A HIGHER LEVEL THAN THE PYLORUS.

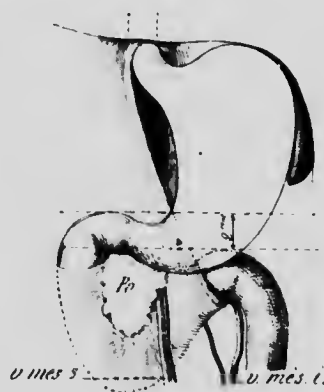


FIG. 207. —RELATIONS OF THE FOURTH PART OF THE DUODENUM TERMINATING SLIGHTLY BELOW THE PYLORUS.

The respective dispositions of the duodenum, the ligament of Treitz, and the superior and inferior mesenteric vessels, can be studied in Figs. 204 to 208, where care has been taken to show the superior and inferior mesenteric vessels and the peritoneal folds.

Fig. 206 is a drawing of an annular duodenum whose fourth part occupies so high a position that the jejunum commences 2 centimetres higher than the pylorus.



FIG. 208.—L-SHAPED DUODENUM. THE FOURTH PART IS NOT EXISTENT.

Fig. 205 shows a V-shaped duodenum, the angle being but slightly open. The fourth part is short and the jejunum commences 2 centimetres below the pylorus. Fig. 208 shows an L-shaped duodenum, so disposed that the ascending portion does not exist.

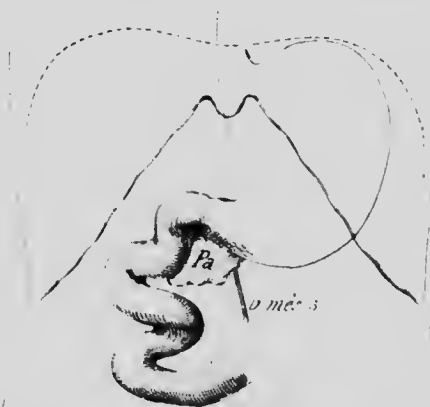


FIG. 209.—ABNORMALITY CAUSED BY LACK OF TORSION IN THE INTESTINAL TUBE OF A FETUS

In this subject the fourth portion of the duodenum may be considered as non-existing. This portion is reduced to a length of 15 to 20 millimetres, and corresponds to the interval separating the superior mesenteric vessels from the ligament of Treitz. The duodenum in such a case takes the shape of a widely open V almost rectangular, with the lower arm almost horizontal, or rather it is L-shaped and ends exactly where crossed by the superior mesenteric vessels. The subperitoneal portion of the duodenum in these three figures is seen in outline: it extends from the head of the pancreas

to the ligament of Treitz, and rests on the prolongation of the fibres of the right pillar of the diaphragm.

It has been our good-fortune to observe a case of abnormal duodenum, caused by lack of torsion of the intestinal tube in the course of its development. The duodenum in this case descended vertically in the right flank, describing two or three curves (Fig. 209), and opened freely into the jejunum without any line of demarcation. This case is identically similar to another which was the subject of an interesting communication by Professor Farabœuf in 1885.

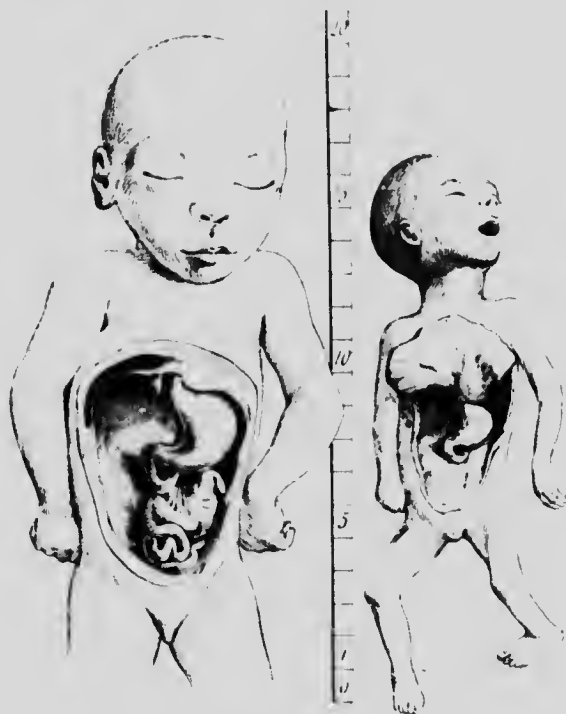


FIG. 210.—RELATIONS OF THE STOMACH AND DUODENUM IN THE FETUS. (FROM A PHOTOGRAPH.)

The stomach was slightly dilated and the jejunum was bent into several angles by tuberculous peritonitis.

This disposition is normal in the "roussette," a species of wild mouse which lives habitually suspended by the claws of its hind-legs, and is accustomed to eat and digest head downwards.

We have considered that it would be of interest to corroborate the schematic drawings by tracings taken from photographs obtained from nature.

These photographic reproductions are of inestimable importance. They prove the exact accuracy of M. Millot's designs, which were executed from the most minute measurements.

The proofs were prepared in the dissecting-room of the medical school at Reims, from fresh subjects, by M. Rothier a friend and collaborator of the author. Certain parts which were faintly visible (ligament of Treitz, pillars of the diaphragm, etc.) were brought into evidence by sprinkling them with a little chalk.

Before the subjects were opened care was taken to photograph them intact, in order to ascertain the exact relations of the viscera with the



FIG. 211.— DISSECTION OF THE PILLARS OF THE DIAPHRAGM AND SUSPENSORY LIGAMENT OF THE PYLORI'S IN THE NEWLY BORN. (FROM A PHOTOGRAPH.)

chondrocostal border, the umbilicus, and the pines, by means of superimposed proofs. Only preparations presenting a special interest have been reproduced in this volume.

Fig. 210 represents two fœtuses macerated for several years in alcohol, into which they had been totally immersed. The shape and relations of the stomach have not undergone notable modification. In the larger fœtus, which was the better preserved, it can be clearly seen that the stomach is not different in shape from that of the healthy adult in a state of moderate repletion. The duodenal loop is in the form of an open V with an angle of 40 to 50 degrees; below it the suspensory ligament of the mesentery is seen.

Figs. 211 and 212 represent the viscera of a child a few days old, dead from athrepsia. On opening the subject, the liver was found to cover the pyloric region, and the greater curvature was hardly seen below the transverse colon.

In Fig. 211 the liver is drawn up with hooks. The stomach, which is slightly dilated, is very clearly obliquely placed from above downwards, from left to right and from before backwards. The right end-sac (pyloric antrum) overlaps the pylorus to the right; the axis of the pylorus is ascending, and nearly vertical in direction. The rather voluminous spleen is



FIG. 212.—THE SAME. THE STOMACH HAS BEEN LIFTED TO THE RIGHT. LIGAMENT OF TREITZ AND SUSPENSORY LIGAMENT OF THE MESENTERY.

normal in its relations; it is situated on the outer side, above and behind the great tuberosity of the stomach. This figure is arranged to show the duodenal loop and the mesenteric ligaments. Above, under the liver the two pillars of the diaphragm can be distinguished surrounding the œsophageal orifice, and lower down the suspensory ligament of the mesentery.

The liver was completely removed (Fig. 212), in order to dissect the ligament of Treitz. The stomach is lifted on to the right foliole of the diaphragm, describing a rotation of 180 degrees on a vertical line passing through the œsophageal opening of the diaphragm and the pylorus. The duodenal loop is now revealed in its totality together with the duodeno-

jejunal angle into which the ligament of Treitz, the prolongation of the right pillar of the diaphragm, is inserted. To the left of this right pillar is the suspensory ligament of the pylorus.

In another subject (Fig. 213), an adult, the liver was greatly hypertrophied. The suspensory ligament, which is usually oblique from above downwards and from left to right, or in cases of slight hypertrophy vertical, was oblique below and to the left. This disposition was due to the hypertrophy of the right lobe of the organ, which extended into the left hypochondrium. The



FIG. 213.—STOMACH PYLORUS AND DUODENUM PUSHED TO THE LEFT BY HYPERTROPHY OF THE RIGHT LOBE OF THE LIVER. (FROM A PHOTOGRAPH.)

gall-bladder, which is usually situated 4 or 5 centimetres to the right of the median antero-posterior plane, was situated almost in the middle line.

The transverse colon, instead of being slightly ascending, dived toward the pubis and again ascended as far as the lower extremity of the spleen, forming the two arms of a V (Fig. 213).

On the left of the gall-bladder (to the right of the reader) the prepyloric cul-de-sac of the stomach could be made out in the angle formed by the two lobes of the liver.

When the liver was raised the curious shape of the stomach was remarked.

It was triangular in shape and absolutely vertical in position as far as the lowest point of the pyloric antrum; here the terminal portion took an upward direction. This latter portion was situated entirely to the left of the middle line, from which the pylorus was 2 centimetres distant (Fig. 213).

This stomach was represented diagrammatically in Figs. 191 and 197.

In Fig. 214 the second part of the duodenum touches the middle line by its left border, and the left half of the transverse colon ascends in the left hypochondrium as far as the lower extremity of the spleen, hidden by the tuberosity of the stomach.



FIG. 214.—HORN-GLASS STOMACH CAUSED BY THE PRESENCE OF AN ENORMOUS SPHINCTER. (FROM A PHOTOGRAPH.)

The displacement of the pylorus and the duodenum to the left in this subject, and the deviation of the suspensory ligament of the liver, seem to have been caused by the enormous development of the sphincter, which was followed in its migration towards the left by the suspensory ligament of the pylorus, an appendage of the gastrohepatic omentum, and the pancreas.

Another case was still more surprising. When the abdomen was opened nothing remarkable was noticed. The liver relations appeared to be normal, and it completely covered the pylorus.

The transverse colon, as is most frequently observed, was ascending on

direction, and hid what could appear of the stomach below the left lobe of the liver, which was not extensive. The great omentum was detached, and the liver was lifted with a hook and attached with a ligature to the chondrocostal wall. The pylorus and lower extremity of the stomach then came in view, the latter being nearly vertical in situation.

The exact position of the pylorus was then sought for. It seemed to be to the left of the middle line, where Fig. 214, the dilated pyloric antrum terminates.



FIG. 215.—THE SAME. VIEW OF THIS HOUR-GLASS STOMACH WHEN THE LIVER WAS RAISED AND THE SUSPENSORY LIGAMENT OF THE PYLORUS WAS DISSECTED.

Taking the origin of the duodenum in the fingers, it was seen that the pylorus was not situated where the exterior shape of the stomach gave cause to expect it to be, but 3 centimetres higher, at the point where in Fig. 215 the suspensory ligament of the pylorus was inserted.

The general shape of the stomach seemed to be different from that which we were accustomed to observe, and a loop of small intestine was seen under the chondrocostal border, in relation with the middle part of the ventricle.

In order to obtain a clearer view of the anatomical relations, the liver and chondrocostal wall were raised. The stomach then came entirely into view. It was an hour-glass stomach, the central part being restricted.



The intestinal loop which had been remarked in the concavity on the left edge of the stomach, at the level of the stricture, filled the space existing in the greater curvature which was caused by this abnormality (Figs. 214 and 215).

The lobe of Spiegel being exposed by ablation of the gastrohepatic omentum, the stricture of the stomach was found to have occurred exactly at the level of the tail of the pancreas.

No anatomical lesion seemed to account for this stricture of the stomach. At this point thickening of the circular fibres formed a veritable sphincter. The whole of the liver was now detached, together with the



FIG. 214. THE SAME. RELATIONS OF THE DUODENAL LOOP AND ORIGIN OF THE JEJUNUM WITH THE PANCREAS AND LESSER CURVATURE.

remainder of the intestines; the stomach immediately became changed in shape as the pyloric antrum, which was full of fluid, prolapsed toward the iliac fossa (Fig. 216).

The stricture of the central part of the stomach became much less apparent when all the serous folds of the region were removed in order to bring into clearer view the ascending direction taken by the pancreas, as well as the situation of the fourth part of the duodenum and commencing loop of the jejunum which, with the pyloric antrum formed a horizontal figure-of-eight (Fig. 216).

Finally we photographed a considerably dilated stomach (Fig. 217) whose inferior cul-de-sac descended as far as the promontory and covered

part of the sigmoid. The axis of the pylorus was absolutely vertical. The suspensory ligament of the pylorus can be clearly seen in the photograph, opening out on the terminal vertically ascending portion of the lesser curvature.

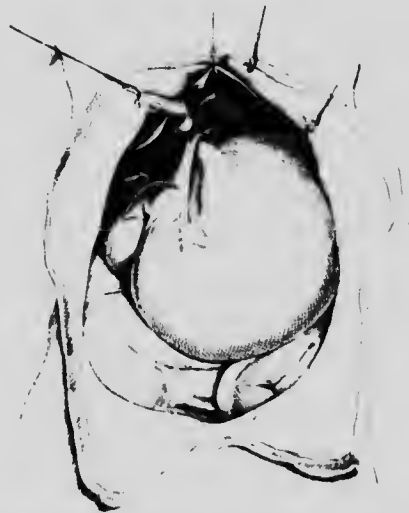


FIG. 217. CONSIDERABLE DILATATION OF THE STOMACH AND DISSECTION OF THE SUSPENSORY LIGAMENT OF THE PYLORUS. (FROM A PHOTOGRAPH.)

The second portion of the duodenum was full of gas. This specimen represents one of the most accentuated forms of gastric dilatation that can be met with. Fig. 182 was drawn from this photograph.

### Physiology.

#### A. FUNCTIONS OF THE PYLORUS.

The physiology of the stomach and duodenum could but suffer from the inexact anatomical description supplied by classic authors. Upon this basis physiologists have raised, without any control, purely speculative theories on the mechanical phenomena of digestion.

Let us consider the mechanical phenomena of digestion in the stomach, avoiding the ancient errors and remembering the exact shape and situation of the organ.

In the condition of emptiness the pylorus is the lowest point of the gastric reservoir; liquids and solids, therefore, can only remain in the gastric cavity as long as the pyloric sphincter remains closed. Ingested food, indeed, falls almost vertically from the cardia into the pyloric antrum (Fig. 218). The pylorus contracts as the first aliments are ingested, and, owing to this

closure, the food accumulates in the prepyloric cul-de-sac (Fig. 219). This occlusion of the pylorus while gastric digestion is incomplete is admitted by every physiologist. It can be confirmed easily by touching the pylorus with the finger during stomach digestion in the dog.



FIG. 218.—RETRACTED STOMACH. THE PYLORUS OCCUPIES THE LOWEST POINT.



FIG. 219.—MODERATE REPLETION. THE AXIS OF THE PREPYLORIC ANTRUM IS DIRECTED UPWARDS.

This fact is of capital importance in gastric digestion; it is the key to gastric dilatation; it is well marked in stomachs where putrid fermentation takes place, since the pyloric reflex energetically resists the passage of chyme, which is irritant and imperfectly acted upon.

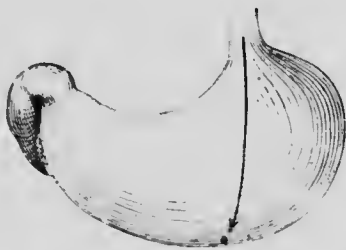


FIG. 220.—STOMACH IN THE POSITION DESCRIBED BY CLASSICAL AUTHORS.



FIG. 221.—ABSOLUTELY EMPTY STOMACH. TRUE COURSE OF A CAUSTIC LIQUID SWALLOWED BY ACCIDENT.

This fact has been confirmed clinically by Dr. Frémont in patients suffering from inefficiency of the gastric secretion.

He has shown that, in persons suffering from excess of hydrochloric acid with organic fermentation, the stomach when left to itself is never emptied until after six or seven hours, with the usual suffering in such cases. Whereas when the employment of alkalis or other therapeutic measures

bring the gastric chemical equilibrium to a normal condition the stomach empties rapidly, and digestion is finished before the following meal.

If the stomach were horizontal, as it has often been wrongly represented, the normal pylorus would be situated at a high point in the gastric reservoir, and the stomach would be incapable of emptying itself without a very energetic action on the part of its muscular walls. In this case the pyloric sphincter would serve no useful purpose.

The illustrations of Sappey and other classic writers are useless to explain the cicatrices of the pylorus following the ingestion of caustic fluids. These substances should perforate the stomach at its lowest point, which would be about the middle of the greater curvature (Fig. 220).



FIG. 222. EMPTY STOMACH.



FIG. 223. HALF-FILLED STOMACH.

The first arrow shows the point where the first contact of an iced drink is felt.

But the facts are entirely different. The corrosive liquids, by exciting the reflex contractibility of the stomach, reduce it to its minimum size. The organ becomes nearly vertical in position, and the caustic fluid is brought into contact with the pylorus, which closes vigorously (Fig. 221). The reader can easily follow in his own person the course of a very hot or cold fluid. The moment an iced drink is swallowed he will notice a painful spot to the left of the middle line about the level of the cartilage of the ninth rib or slightly lower *i. e.*, at the level of the pyloric antrum (Figs. 222 and 223).

It is now established that the mobility of the stomach is far removed from that of the muscular gizzard of grain-eating birds. The stomach performs simple writhing movements in the course of digestion, movements which are similar to other portions of the digestive tract. These movements facilitate the mixture of the digestive juices with the ingested food during their elaboration.

## B. LENGTH OF SOJOURN OF FOOD IN THE STOMACH.

It has been observed in man, in various cases of duodenal fistula, that the length of stay of foodstuffs in the stomach varies according to their nature. Liquids in general, even milk, were found at the level of the duodenal fistula very shortly after ingestion.

According to the same authorities, solid elements such as bread and meat can be observed at the cutaneous orifice fifteen to thirty minutes after ingestion, when the quantity ingested is very small. (Busch, quoted by Beaunis, p. 731.) Busch found, however, in the same subject, that after an abundant meal the stomach did not empty itself completely for three or four hours.

After an evening meal the stay of the ingested food was further prolonged, and certain of the elements only emerged from the fistulous opening on the following morning.

This delay in the evacuation of the stomach is quite in accord with our anatomical description, when the subject is in the horizontal position. Simple decubitus, in fact, modifies the position of the pylorus. In the



FIG. 224.—MUSCULAR FIBRES OF THE "CRAVAT DE SUISSE," AND OBLIQUE MUSCULAR FIBRES OF THE STOMACH. (FROM KUSS AND DEVAL.)

dorsal decubitus the pylorus, situated in front of the first lumbar vertebra, comes to lie on a much higher plane than the posterior surface of the stomach, which lies in the left hypochondrium on the kidney and posterior abdominal wall.

In the healthy stomach, the subject being in the erect position, the pylorus occupies, in the condition of moderate repletion, a low position, for the prepyloric cul-de-sac descends 5 or 6 centimetres lower. The greater part of the contents can, therefore, be evacuated, as soon as the sphincter opens, by simple gravity.

The action of the muscular fibres of the stomach only come seriously into play when passive distension occurs of the pyloric antrum. At the moment the pylorus opens—*i.e.*, when the stomach contents are sufficiently elaborated to be admitted into the small intestine—the longitudinal and oblique muscles of the stomach, especially the longitudinal bundle called the "cravat de Suisse," come into play. The combined action of these muscles tends to straighten the lesser curvature and lift the pyloric antrum.

This action on the part of the "cravat de Suisse" and the oblique or deep muscular layer of the stomach has hitherto been misconstrued owing to the common error of imagining the stomach to have its long axis transversal and directed from one hypochondrium to the other (Fig. 224). In order to understand the role of these muscular fibres properly, it will be sufficient to restore the stomach to its true position and displace vertically Kuss and Duval's diaphragm, at the same time re-establishing the œsophagus and pylorus in their shape and direction (Fig. 225). The muscular fibres of the "cravat de Suisse," disposed along the lesser curvature, are aided in their action by the oblique fibres. These fibres are parallel to the fibres of the "cravat de Suisse," and form a parabola the concavity of which bestrides the termination of the left border of the œsophagus and the commencement of the greater cul-de-sac of the stomach. The cardia may be considered as a fixed point for the action of these two groups of muscles which straighten the lesser curvature and raise the prepyloric antrum or lesser cul-de-sac.

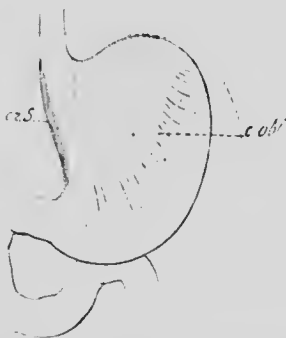


FIG. 225. DISPOSITION OF THE SAME MUSCULAR LAYERS, THE STOMACH BEING DRAWN IN ITS TRUE POSITION. (DYEN.)

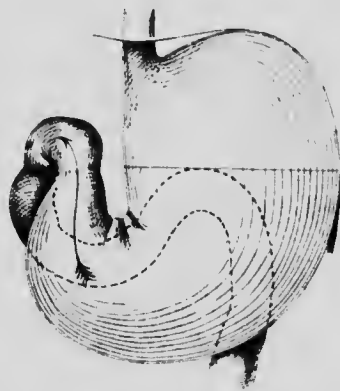


FIG. 226. DISTENSION OF THE LONGITUDINAL AND CIRCULAR MUSCULAR FIBRES OF THE STOMACH IN CHRONIC DILATATION.

Permanent distension or dilatation of the stomach is characterized by the permanent distension of the pyloric antrum and insufficiency of the muscular tunics. Stagnation of the contents becomes intense, and the contents remain in the prepyloric cul-de-sac, and can only escape by overflow. The pylorus, whose axis has become ascending and almost vertical, is in these cases 10 or 15 centimetres above the lowest point of dilated viscus (Fig. 234), and is so situated that it will only admit the ill-digested contents which distend the stomach to pass as an overflow. These stomachs, which never empty themselves completely, although the pylorus is permeable, are seen very often in post-mortem examinations where "muscular atony" is believed to be the cause of the dilatation. Knowledge of the normal relations of stomach and pylorus will reduce to a few exceptional

cases the application of this most speculative theory as to the cause of primitive dilatation of the stomach.

It has already been stated that Cook (1854) and Bush (1858) described the rapid passage of foodstuffs beyond the pylorus, also that these penetrated into the intestines without modification by the gastric juice. (The cases observed suffered from duodenal fistula.)

Certain physiologists with Beannis claim that there are two ways in which the stomach empties itself—first by absorption of peptones as they are produced, and secondly by the passage of chyme into the duodenum. This passage, according to the author, is repeated in small masses, which become more copious as digestion advances, until the whole of the stomach contents have passed into the intestine.

Richert on the other hand, found that the chyme passed in one mass into the intestine, and that the stomach hardly took more than a quarter of an hour to empty itself completely (Beannis, p. 732).

Beaumont, Schmidt, Busch, Ewald, and Boas admit with Beannis that food passes the pylorus as it becomes liquefied; this evacuation begins about 10 minutes after arrival in the stomach, and the stomach empties itself at intervals. Rossbach and Herzen, however, observed in the dog, as Richet did in the case of Verucil's patient, the passage of the chyme in one mass, and that only at the end of gastric digestion.

The pylorus is closed in the normal state, incontinence of the pylorus would not have any pathological importance, since, according to Novaro, Carle, and our own observations, the cure of grave dyspepsia is brought about by suppression of the pyloric sphincter. Nevertheless pure water and watery solutions are not long retained in the empty stomach, and the same may be said of the majority of drugs. During a repast fluids and solids are mixed and form together in a compact pulp. The whole constitutes the chyme which passes into the intestine when it is sufficiently elaborated.

The swallowing every half-hour during digestion of a glass or half a glass of cold water is the best means of indefinitely retarding the evacuation of the stomach. Each ingestion of cold water causes the pylorus (which is ready to open if digestion approaches completion) to close with energy, and the stomach contents, even if they are completely elaborated, are held up in the stomach as long as the liquid is not incorporated with the general mass of the chyme. On the other hand, a single dose composed of a very small quantity of very hot infusion, taken some time after a meal, will succeed in activating gastric digestion.

Dr. Malibran made repeated observations in order to ascertain, in following out the course of stomach digestion, the precise moment at which the pylorus opens to allow the stomach contents to pass. A pyloric splashing sound is very clearly produced at this moment, which is absolutely characteristic. The pylorus, as we have just pointed out, closes at the ingestion even of pure water, only to open when the fluid is ready to pass into the intestine. If the quantity of water swallowed is small the splashing sound occurs almost immediately. After an early breakfast, consisting of

a fairly copious cup of tea, it is found that the pylorus often does not open for several hours, and then at intervals which succeed one another every few minutes (Malibran).

#### C. DOES ABSORPTION TAKE PLACE IN THE STOMACH?

Is the mucous membrane capable, as Beaunis claims, of participating in the absorption of fluids and peptones?

Beaunis admits absorption, on the part of the gastric mucous membrane, of completely elaborated peptones as they are produced.

He thus accords to the stomach superior absorbent properties to those possessed by the large intestine, where only non-albuminoid liquids and solids are entirely absorbed, while commercial peptones, even when greatly diluted, cannot pass the epithelium, and putrefy *in situ*, causing fœtid stools and lively irritation of the rectal mucous membrane.

The opinion of Beaunis and some other physiologists that the gastric mucous membrane of man absorbs albuminoids is quite erroneous.

Human pathology provides us with undeniable facts on this subject, which are confirmed by the animal experiments of several authors.

Whether a patient be suffering from pyloric stricture, annular cancer, or cicatrix, where there is no appreciative alteration of the gastric mucous membrane, wasting is slow as long as the liquids can pass the stenosed orifice, and the patient becomes gradually thinner and weaker. Nourishment simply is insufficient.

When the pylorus becomes impermeable to liquids the patient suffers immediately from agonies of thirst, which hitherto were absent, the tissues dry up, the skin becomes rugose, and if the superacute symptoms are not averted by repeated injections of water, death supervenes in less than a week. We have observed these phenomena, whatever the dilatation of the stomach, in certain patients who could keep the enormous quantity of 3 to 5 litres of water or other liquids in the stomach, for twelve to twenty-four hours, with no relief to their terrible thirst. Even opiates had no longer any effect, their absorption being prevented by the gastric mucous membrane.

The phenomena of stomach absorption, therefore, claimed by Beaunis, is of no interest, since patients with pyloric stricture suffer from thirst when their stomachs contain several litres of water.

From the absorption point of view the human stomach may be compared to that of the horse. The famous experiments of Colin have shown that this animal is absolutely refractory to a considerable dose of strychnine introduced into the stomach when the pylorus is ligatured, but immediately the ligature is removed the phenomena of poisoning are produced.

According to some authorities, the stomachs of herbivora alone are without the power of absorption, and the gastric mucous membrane of carnivora absorb water, salts and peptones, as claimed by Beaunis during the whole process of digestion. This entirely theoretic opinion is not based upon a single physiological fact. Gley and Langlois (*Dic. Encycl. Soc. Med.*



vol. xxxvi., p. 122) have observed, on the other hand, since 1888 that the dog's stomach absorbs no liquids at all. Fresh experiments were undertaken by Gley and Rondeau in 1893 on dogs with a duodenal fistula. An external cannula being fixed into the duodenum, the dogs suffered from extreme thirst, and drank continuously without succeeding in alleviating their thirst, no matter how long the water remained in the stomach. The whole of the water, in fact, escaped by the duodenal canal (*Transactions of the Society of Biology*, November 13, 1893). Identical results were communicated by Mering to the Twelfth German Congress of Medicine, Wiesbaden (in *Semaine Méd.*, April 1893, p. 191).

If the stomach of carnivora does not absorb pure water, there are stronger reasons for it not to absorb peptones.

#### D. ACTION OF THE BILE ON STOMACH DIGESTION.

A last question remains to be solved: Is it a fact that, according to Beaunis, penetration of bile into the stomach immediately arrests albuminoid digestion?

Dastre (1880-1883) has shown that a certain quantity of ox bile (50 to 300 grammes) introduced into the dog's stomach either by an œsophageal catheter or gastric cannula caused no disturbance to the animal. The introduction of bile was made before a meal, after a meal, and at various times during the period of digestion. The appetite seemed to increase, and heavy doses produced only a purgative effect.

The majority of observers hold the opinion that albuminoids are far from being completely transformed in the stomach, and that many substances only traverse it to be really digested in the intestine, which opinion confirms the view that albuminoids can be perfectly elaborated in the stomach as well as in the small intestine, in the presence of bile.

It is probable, on the other hand, that the action of the gastric juice is continued in the small intestine, and Dr. Frémont has noticed in patients suffering from liver torpidity that the ingestion towards the end of a meal of a certain amount of ox bile, in order to excite the action of the liver, improves instead of impedes stomach digestion.

Dogs with a biliary fistula waste rapidly if all the bile excreted is collected. Thus, a dog in which Frémont, in the course of his experiences in physiological pathology made a biliary fistula, began to waste, presenting a dry scaling coat when all the bile secreted was collected by means of the fistula.

In the interval of the experiments the dog became fat and in good health, and his coat took on its normal aspect, because he constantly licked the fistula and swallowed the bile by instinct as it was produced. Far from admitting the claim of Leven, that the stomach possesses no real digestive action, and that its functions are merely mechanical phenomena preparatory to dissolution and dissociation, we are of the opinion that the stomach juices remain active in the small intestine. The experiment of Dastre also agrees with the phenomena we have observed in patients whose

pylorus we have suppressed, and in whom, although the foodstuffs no longer rest in the stomach, albuminoid digestion is much better than before the operation. If it could be proved that the gastric juice is absolutely inactive in the intestine, it would be necessary to go further than the opinion of Leven and arrive at the absurd deduction that the stomach is a useless organ.

Czerny in 1878, and afterwards Carvallo and Pichon in 1893 (*Soc. Biology*, November 25, p. 929), believed that they had demonstrated that digestion and nutrition could be satisfactorily carried on in a dog deprived of his stomach.

The animal operated upon by Carvallo and Pichon was at first fed with milk, which was very imperfectly digested. The animal then vomited all solid food. Three weeks after the operation pulpy food was administered. The weight, which had descended from 10 kilogrammes 100 grammes (at the time of operation) to 8 kilogrammes 600 grammes, rose in four weeks to 9 kilogrammes. After the seventh week solid food could be given: soups composed of hashed meat and bread. The animal ate slowly and masticated the larger pieces of meat instead of swallowing them gluttonously.

Digestion of cooked meat was perfect; raw meat, however, even when minced, was not assimilated. The same occurred with tendons and gristle, which were well digested in a control dog.

We find it impossible to conclude, after this observation, that perfect digestion can take place in the absence of the stomach, and our therapeutic results lead us to incline to the hypothesis that in our patients the gastric juices continue in the intestine the action which they have been unable to finish in the gastric reservoir, widely anastomosed with the jejunum.

#### E. THE ROLE OF THE DUODENUM.

What is the physiology of the duodenum? Does it serve the simple function of an intermediary canal, where the chyme becomes neutralized by the mixture with the secretion of Brunner's glands before submitting to the action of the pancreatic juice and bile?

The new anatomical facts which we possess with regard to the configuration and fixity of the duodenal ring seem to us to signify mechanical phenomena of some importance, for we have seen that the gastro-duodenal circle is complete in the majority of subjects, and that the muscle of Treitz and the origin of the jejunum are at times situated higher than the pylorus.

The commencement of the duodenum has a certain amount of mobility, whilst its termination is firmly fixed on the left side of the second or first lumbar vertebra.

The low position of the pylorus in relation to the fixed point of the commencement of the jejunum is accentuated every time, and cases are not rare where proptose of the pylorus takes place. If it be also taken into consideration that the calibre of the duodenum is wider than that of the jejunum, and that the celhilo-muscular ligament of Treitz causes a distinct narrowing of the small intestine, it will be recognized that, in the erect

position, the first loop of the jejunum, concave below, acts as a syphon to the duodenum. If the pylorus is situated lower than the commencement of the jejunum, or pathologically lowered together with the prepyloric antrum, bile comes in contact with the pylorus, and will have a certain tendency to enter the stomach before the duodeno-jejunal syphon can empty. These multiple curves are otherwise very unfavourable for the free evacuation of the stomach contents into the intestine. It is likely, as has already been claimed before the discovery of the fourth part of the duodenum and the ligament of Treitz, that the rapid arrival of the bile in the duodenum at the end of gastric digestion primes the duodeno-jejunal syphon, and thus favours stomach evacuation. Should the commencement of the jejunum be situated higher than the pylorus, bile will tend to pass



FIG. 227.—NORMAL CALIBRE OF THE DUODENUM AS THE EVACUATION OF THE STOMACH TAKES PLACE.

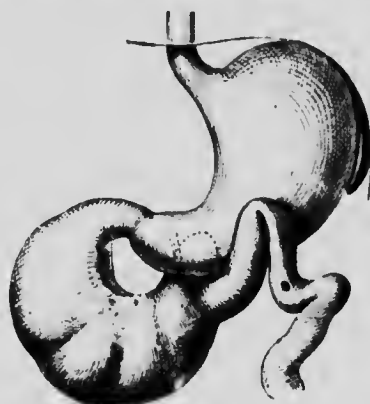


FIG. 228.—CONSIDERABLE DISTENSION OF THE DUODENUM CAUSED BY ADHESIONS AND BRUSQUE ANGULAR CURVATURE OF THE COMMENCEMENT OF THE JEJUNUM.

through the latter, and enter the stomach, before passing beyond the ligament of Treitz. These anatomical peculiarities explain the frequent presence in the stomach of a small quantity of bile and pancreatic juice (Debove, "Lavage of the Stomach," p. 39). Distension of the duodenum is observed in cases of stricture of the commencement of the jejunum; in such cases the duodenum may dilate to such an extent that it may contain more than 1 litre of bilious fluid.

In examining to the right of the middle line and in the neighbourhood of the umbilicus, a bubbling and splashing sound is heard identical with those produced in dilatation of the stomach.

We have observed these phenomena in the living subject, and have verified the position in the course of laparotomy.

It is, then, well established that when the pylorus is perfectly permeable stagnation of food in the stomach can be caused by defective function

of the duodenal loop. If we except those cases—which are also very doubtful—where, according to Debove, the habitual absence or presence of bile and pancreatic juice in the stomach coincide with manifest signs of obstruction, and are a presumption of pyloric or duodenal stenosis, the symptoms of stomach dilatation do not differ widely, whether the stricture is situated at the pylorus or in the first part of the duodenum, or even between the ampullæ of Vater and the commencement of the jejunum.

### **PATHOLOGY.**

#### **SPASM OF THE PYLORUS, ITS RÔLE IN CHRONIC AFFECTIONS OF THE STOMACH.**

The pathology of the stomach is dominated by one phenomenon—the evacuation of its contents. If, indeed, we except acute affections of the stomach, especially febrile gastric disturbances and acute gastritis, and only concern ourselves with the study of chronic affections, from dyspepsia to cancer, we are struck with the etiological importance of the pylorus and the duodenal ring.

Normal digestion is accompanied with a general sensation of well-being, which follows the satisfying of hunger.

The name "dyspepsia" is given to a pathological state physiologically characterized by disturbance of the phenomena of digestion, and by symptoms of painful or distressing sensations of veritable intensity which react more or less on the general condition.

#### **Dyspepsia.**

Gastric dyspepsia is the more characteristic and at the same time the better studied form. Intestinal digestive troubles are most often secondary to it, and are amenable to the same therapeutic treatment. Lientery, or the alvine evacuation of incompletely digested food-stuffs, has, indeed, disappeared after one of our operations on the pylorus, although this symptom is considered generally to be one of the most precise indications of intestinal dyspepsia.

The study of dyspepsia only entered upon a truly scientific phase with the practice of examining the stomach contents, invented by Leube in 1879. It is interesting to recall that in this year occurred the first known case of resection of the pylorus, which was due to Péan's initiative. This year 1879 will hereafter be remarkable in medicine as well as in surgery for the first stage in the modern and rational period of the therapeutic treatment of stomach affections.

The word "dyspepsia" signifies difficult or painful digestion. The word also signifies a durable and chronic affection, and no one would dream

of giving the name "dyspepsia" to momentary digestive troubles which may arise as a result of a too copious meal or the ingestion of irritating food.

These passing alimentary excesses constitute indigestion; constantly repeated, they end in dyspepsia.

The phenomena of dyspepsia are so common, and the subjective symptoms are so varied, that clinical forms have been multiplied artificially and uselessly for therapeutic purposes. Some authorities based their classification on the predominance of nervo-motor phenomena, others on the vitiation of the gastric chemical processes.

Attempts have been made, with poor success, to obtain therapeutic indications in individual cases by analyzing the contents of the empty stomach in the morning, and by administration of a test-meal, which is extracted after an hour.

#### EXPLORATION OF THE STOMACH.

Exploration of the stomach is based upon the practice of stomach catheterization. Kussmaul was the first (1867) to introduce methodical washing of the stomach into the current therapy of dilatation of the stomach; in this he was followed by Leyer, who introduced into France Kussmaul's pump, which was soon replaced by a simple red indiarubber tube.

Ewald, having to treat a case of poisoning far from any help, improvised a simple rubber gas-tube for washing out the stomach. Since that date simple œsophageal catheters were invented, which were passed by means of a mandrel as a guide.

Faucher's tube is the best-known soft sound in France; this must be swallowed by the patient. Faucher was one of the first to point out the advantages of this method of stomach lavage, and popularized the use of lavage in obstinate anorexia and in cachectic conditions (1881). Faucher's work had wide popularity in France. Faucher's tube is firm enough to prevent the canal becoming impermeable owing to its flexion to which it is submitted. Its surface is smooth. A circular mark 30 centimetres from the end marks the point on the tube which corresponds to the buccal orifice when the end has passed the cardia.

#### *Dilatation of the Stomach.*

In 1895 I demonstrated that dilatation of the stomach, supervening without fibrous or cancerous stricture of the pylorus, was the consequence of spasmodic contraction of the pyloric sphincter. Dilatation occurs in patients with lack of hydrochloric acid as well as in those suffering from hyperacidity.

Excess of hydrochloric acid is usually very obstinate. The patient is nervous and irritable, tormented with insomnia, and is easily fatigued. The attacks become more frequent, and the unfortunate sufferer, depressed by gastric pain and inanition, falls into a condition of grave cachexia. Hyperchlorhydria is extremely difficult to cure. Digestion in the intestine becomes modified in its turn; assimilation becomes insufficient, and the

enfeebled state of the patient becomes so marked that a cancer of the stomach may be suspected.

It is with hyperchlorhydria that dilatation of the stomach is most usually associated. The majority of so-called dilatations, caused by "loss of tone in the smooth muscle fibres," are really cases of hyperchlorhydria, and to describe these dilatations as originating in paresis is to put a wrong interpretation on the facts. These stomachs, distended as they are, contract energetically when they can evacuate their contents, either under the influence of an electric excitation or under the simple pressure of the hand.

The primitive cause of this dilatation is purely mechanical; the stomach dilates because an obstacle exists preventing the outflow of the chyme. This obstacle is the contracture of the pylorus, a contraction which exaggerates by reflex action the gastric hyperacidity. "Essential dilatation of the stomach," therefore, properly speaking, does not exist. It is a term wrongly used through a mistaken notion of its meaning. The stomach is simply distended, and the distension is maintained by the permanent contraction of the pylorus.

Hyperchlorhydria is in itself only a grave affection, because it is one of the premonitory symptoms of cancer of the stomach. It is also observed in cases of very old gastric cancer complicated with habitual dilatation. But it is well known that old ulcers of the stomach are frequently the starting-place for cancerous degeneration. The micro-organism of cancer, which rarely can attack intact healthy cells, can, on the other hand, penetrate with ease cells which have become altered by chronic inflammation. These cells live henceforth in symbiosis with the pathogenic microbe, and multiply, becoming henceforth cancer cells.

#### *Relations of the Stomach and Transverse Colon.*

The disposition of the transverse colon is infinitely variable. Some physicians have built up speculative theories on the intestinal "ptoses" on entirely wrong premises.

Inventors of ptosis of the transverse colon were ignorant of the real relations of this part of the large intestine, and, above all, they did not know how to explore the abdomen. Many of these authors have added in their descriptions the sonority of the transverse colon and that of the stomach. The best way to avoid this error is to make the patient drink, before the first examination, a glass or two of gaseous soda-water.

In recent times the palpation and percussio of the stomach are supplemented by radioscopy and radiography after the absorption of bismuth milk composed of the following:

Nitrate of bismuth	..	..	4 grammes.
Mucilage	..	..	40 ..
Milk	..	..	100 ..

To return to the relations of the stomach and transverse colon. This part of the colon deserves the name "transverse," strictly speaking, in

the young child and the adolescent, for it is almost horizontal (Fig. 229). Its direction becomes gradually ascending from right to left, from the gall-bladder to the lower extremity of the spleen (Fig. 230). Occasionally, in the adult, the splenic flexure of the colon is in relation with the anterior border of this organ (Fig. 230).



FIG. 229.—RELATIONS OF THE TRANSVERSE COLON AT BIRTH.

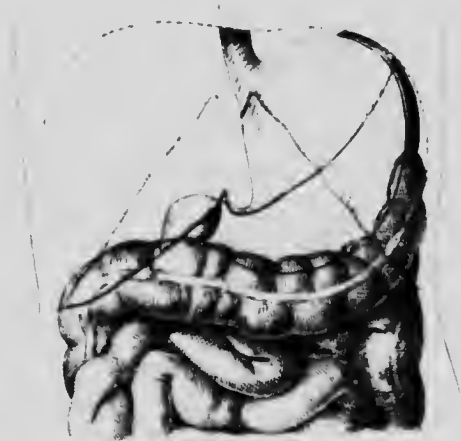


FIG. 230.—RELATIONS OF THE TRANSVERSE COLON IN THE ADULT.

Later on it will be seen that our recent method of fixation and series section of anatomical subjects and in predetermined planes, has enabled us to discover two hitherto undescribed colic segments: the right lateral postero-anterior colon, and the left lateral antero-posterior colon.



FIG. 231.—EXCEPTIONAL POSITION OF THE SPLENIC ANGLE OF THE TRANSVERSE COLON.

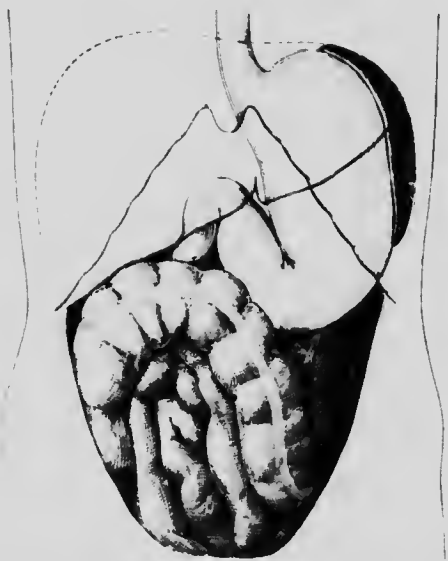


FIG. 232.—THE CENTRAL PORTION OF THE TRANSVERSE COLON DESCENDS IN THE FORM OF A V BELOW THE UMBILICUS DURING THE STATE OF REPLETION OF THE STOMACH.

The nearly horizontal position of the transverse colon rarely remains permanent in the adult.

The existence of dilatation is admitted when *clapotement* is observed in the morning, when fasting, below the centre of a line drawn from the umbilicus to the border of the left false ribs. If the lower limit of the stomach



cannot be made out at first examination, the patient should swallow a glass of soda-water, by which means the situation of the pyloric antrum can be more precisely defined. When true dilatation is present, abnormal fermentations are observed, and a series of pathological manifestations, together with a group of morbid phenomena, which result in auto-intoxication. Dilatation of the stomach is often caused by habitual contraction of the pylorus.

Permanent distension of the stomach is caused exclusively by the stagnation of the stomach contents. The mechanism is very simple. It has already been remarked that the pylorus does not open unless the stomach contents are sufficiently elaborated. Any durable vitiation of the gastric chemical processes, any lesion of the mucous membrane such as an ulcer, would cause reflex contraction of the pylorus—that is to say, the prolongation of the stay of the contents in the stomach, and, consequently, the dilatation of the organ.

Simple dilatation of the stomach, with no pyloric lesion, can also occur as a consequence of a regular overcharge of the organ, such as occurs after a certain time in heavy eaters. It has also been observed in feeble subjects whose smooth muscle fibres lack tone, and cannot overcome the constant contraction of the pyloric sphincter. Indeed, as long as the musculature of the stomach remains intact and powerful (as is generally to be observed in diabetic subjects, who are almost always heavy eaters) the stomach tends to distend during digestion, and regains its shape when its contents are evacuated. These "big stomachs," which should not be confounded with dilated stomachs, function very well as a rule, and do not cause dyspeptic or other painful symptoms.

Malibran has shown how useful it is to distinguish between simple atony and akinesia in stomach dilatation (*Union Médicale*, February, 1890). Certain stomachs, even when dilated from the clinical point of view, continue to empty themselves well, as long as the musculature remains active. These stomachs digest well, and the pylorus opens when the chyme is properly elaborated. Should vitiation of gastric chemical processes or the presence of a round ulcer cause continual contraction of the pylorus, the prepyloric cul-de-sac being habitually distended, loses its power of contraction (akinesia), and dilatation occurs, with its usual complications, alimentary stases, organic fermentation, painful phenomena, etc.

Ingestion of alcohol or white wine in the morning, when fasting, which destroys sooner or later the peptic glands, abuse of drink either at meals or during their intervals, and irregularity of meals, are so many causes of dyspepsia, and tend to cause, sooner or later, dilatation of the stomach. Reflex contraction of the pylorus, excited by the presence in the stomach of an ill-digested alimentary mass, determines first a passing, then a permanent, distension of the organ—a distension becoming more marked as the prepyloric antrum follows the laws of gravity and the direction of the gastro-duodenal outlet approaches the vertical, thus opposing in an increasing degree the easy evacuation of the stomach contents.

The muscular tunic, constantly distended and forced, loses its faculty

of contraction (akinesia of Malibran); the peptic glands, fatigued by an exaggerated secretion, atrophy gradually; and symptoms of chronic gastritis soon manifest themselves. It can be seen, therefore, that chemical derangement is the dominating factor, and that gastric dilatation is secondary to the chronic spasms of the pylorus.

The pain which accompanies dilatation of the stomach is due at the same time to the burning of the mucous membrane by the hyperacid juice, to the distension of the nerve plexuses, and to the reflex contraction of the muscular tunics, which are in a constant state of tonicity. The best clinical proof of the rôle played by the contraction of the muscular tunics, in the production of the pain in "flatulent dyspepsia," is the immediate relief which follows the least eructation; the stomach diminishes slightly in volume, the corresponding relaxation of the muscular layer causes their spasmodic and painful contraction to cease momentarily. Should several successive and large eructations take place, the pain disappears in a few minutes.

Amongst other reflex troubles suffered by patients with dilated stomach, vertigo, dizziness, defects of vision, such as amblyopia, and rarely hemiopia and diplopia, have been mentioned. These symptoms, constituting together gastric vertigo, are not certain evidence that dilatation is present, and are equally observed in different forms of dyspepsia.

Pain, therefore, in Reichmann's disease depends greatly upon pyloric spasm. Patients force themselves to vomit knowing that their sufferings will cease when the stomach is empty. For the same reason our patients cease to suffer when a gastro-jejunal orifice, with no sphincter, assures the free evacuation of the stomach contents.

We do not lay stress upon symptomatic dilatation in cicatricial structure or cancer of the duodenum and pylorus, as this form is uncontested. Diagnosis and operative indications will be discussed later.

#### ULCER OF THE STOMACH.

Spasm of the pylorus plays a most important part in the etiology of vomiting, particularly in the obstinate vomitings of pregnancy, in dyspepsia, and in dilatation of the stomach. It should have even a more pronounced influence upon graver affections such as ulcer and cancer.

Simple ulcer of the stomach was differentiated from cancer by Cruveilhier in 1830.

Our researches since 1892 have thrown a new light upon the etiology of ulcer of the stomach. Simple ulcer occurs in 88 per cent. of cases in the lesser curvature, the posterior surface, and pyloric extremity; in 27 per cent. of cases on the lesser curvature; in 43 per cent. on the posterior surface; and in 18 per cent. at the pyloric extremity (Debove). The lesion, therefore, is produced almost exclusively on the parts of the mucous membrane which are in constant contact with the food, and yet the classification of Debove, into ulcers of the posterior surface, lesser curvature, and pyloric extremity, on the one hand, and of the anterior surface, the greater curvature, the

cardiac end, on the other hand, is based upon the erroneous anatomical description given by classical authors of the situation of the stomach.

If, as we propose, the stomach be divided into two separate portions by a horizontal line passing at the level of the upper border of the pancreas (Fig. 233), comprising first the great or superior cul-de-sac, where the

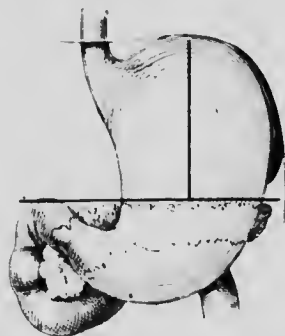


FIG. 233. THE PREPYLORIC ANTRUM IS LIMITED BY A LINE DRAWN PARALLEL TO THE UPPER EDGE OF THE PANCREAS.

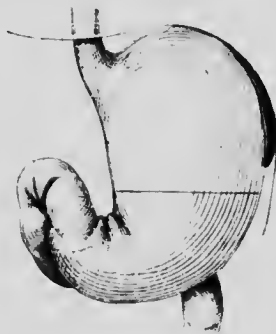


FIG. 234. WHEN THE STOMACH IS IN A STATE OF REPLETION THE PREPYLORIC ANTRUM IS 6 TO 8 CENTIMETRES LOWER.

gases are apt to lodge, and secondly the pyloric antrum, it will be seen that 95 per cent. at least of ulcers originate on the lesser curvature, the pyloric antrum, and on the posterior wall—that is, on those parts of the mucous membrane constantly in contact with the ingested food.

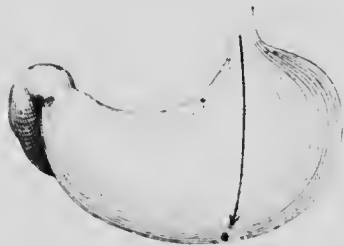


FIG. 235.—STOMACH IN POSITION DESCRIBED BY CLASSICAL AUTHORS.



FIG. 236.—TRUE POSITION OF EMPTY STOMACH. COURSE TAKEN BY IRRITATING FLUIDS.

In dorsal decubitus the chyme comes in contact with the posterior wall, situated at a lower level than the pylorus.

The frequency of ulcers of the lesser curvature is very naturally explained by our anatomical researches. We have already seen that the lesser curvature, far from being nearly horizontal, as described by anatomists, is entirely situated, if we except 2 or 3 centimetres of its pyloric end, on

the left of the middle line. Its concavity looks towards the right, whilst its convexity, near the cardiac end, receives the shock of the swallowed mass. Any angular body, any corrosive liquid, therefore, will first wound the superior third of the lesser curvature (Fig. 236), and will come into contact, directly afterwards, with the pylorus, especially if the stomach is completely empty at the time. This will explain the possibility of a cicatricial stricture of the pylorus after the swallowing of caustic liquids. If the stomach had the form usually attributed to it (Fig. 235), corrosive liquids would fall directly, as we have shown in discussing the anatomy of the stomach, upon the central part of the greater curvature; they would be unable to reach the pylorus, which would be lying on a higher plane.



FIG. 237. ULCER OF THE PREPYLORIC ATRIUM WITH COMMENCING CANCEROUS DEGENERATION AT THE MARGIN.

We have seen, on the contrary, that when the stomach is empty and retracted, which retraction cannot fail to occur on the ingestion of an irritating liquid, the pylorus is the lowest point: a stomach distended as is represented in Fig. 234 would take the aspect represented in Fig. 236 by means of the maximum possible contraction of its muscular tunics.

It is also for this reason that a silver five-franc piece is easily evacuated in the stools, and it is the sharp curves of the duodenum, especially the first as well as the ascending direction of the pyloric axis in the dilated stomach (Fig. 274), which prevents the passage of long foreign bodies such as forks, etc., into the small intestine, accidents which have occasioned interesting operations by Labbé and cert. in other surgeons.

The aspect of the simple ulcer is very variable: often it is a loss of substance, rounded with perpendicular edges, and no neighbouring lesion. In one case, which ended in death from perforation, we found an orifice of about 6 millimetres at the bottom of an oval loss of substance of the

dimensions of a sixpenny piece. If the ulcer is of long date it is rare not to find secondary inflammatory lesions, and the callous and indurated masses are at times so thick that it is impossible to distinguish, as Billroth himself admits, between cancer and ulcer, if we judge from macroscopic appearances alone.

We have operated on several of these cases. On two occasions pyloric and duodenal lesions were found, 8 to 12 centimetres in extent, with neighbouring adenopathies; and on two other occasions vast callous ulcerations of the lesser curvature, in one case commencing to perforate the abdominal wall. We shall see later that although clinical diagnosis between ulcer and cancer is often very difficult when signs of pyloric stricture exist without any appreciable tumour, once the abdomen is opened no difficulty any longer exists, and contrary to the opinion of Billroth, we have but once experienced any difficulty in the course of many operations in distinguishing between inflammation and neoplasm in the lesions present.

The habitual coincidence of hyperchlorhydria with simple ulcer, and its localization in those portions of the digestive tube which are in constant contact with the gastric juice, have long suggested the view that one of the etiological factors of round ulcer is the digestion of the stomach wall. Chemical analysis showing the coincidence of hyperchlorhydria with simple ulcer has corroborated this theory. Nevertheless the frequency of Reichmann's disease without coincident ulcer gives rise to the belief that hyperchlorhydria is not a causative factor, but that the presence of a very active gastric juice is simply an added item to the circulatory, traumatic, and phlegmatic lesions, which are generally invoked in the etiology of round ulcer.

Microbial infarcts come also into consideration when infectious diseases are to be numbered among the antecedents. Chantemesse and Vidal have succeeded in producing experimentally ulcerations of the stomach in guinea-pigs by feeding them with virulent cultures of their dysentery bacillus. The action of these microbes was more energetic after alkalization of the stomach contents. Dilatation of the stomach also seems to be favourable to the production of ulcers of infective origin in animals.

Hyperacidity of the gastric juice seems to play a remarkable part in the persistence of ulcers of the stomach. We should, however, mention this fact with reserve: it cannot be the sole cause, since experimental wounds of the gastric mucous membranes in animals, as well as operations on the stomach in man, are followed as a rule by rapid cicatrization.

When the ulcer is, or is not, the consequence of hyperchlorhydria or of a local destruction of the gastric mucous membrane (traumatism, embolus, or bacterial infarct), it is quite evident that alternative distension and emptying of the stomach are the principal causes of the duration of the illness.

Spasm of the pylorus, exaggerated by the irritability of the ulcerated mucous membrane, becomes added to the general stomach intolerance. The narrow cicatricial zone which is likely to be formed during the repose of the organ becomes torn during the efforts of vomiting, and it is difficult

to imagine how some ulcers manage to become completely cicatrized, in spite of this alternate emptying and distension of the organ, and in spite of the deleterious contact of the digestive juices.

The pain of ulcer itself is due to the irritability of the stomach, which, owing to the pyloric spasm, can only evacuate its contents by vomiting. Indeed, the attacks of gastralgia disappear immediately after operation; the same occurs with the hæmatemesis and all other alarming symptoms.

These results are inappreciable if we reflect on the gravity of this affection, and the frequency of the most unforeseen complications such as excessive hæmorrhages, perforative peritonitis, the opening of the stomach into the pleura, the pericardium, the left ventricle, etc. The mortality of ulcer of the stomach treated medically reaches, in fact, the enormous number of 50 per cent. (Debove), *and this total is well below the reality if it be taken into consideration that in a large number of cases cancerous degeneration takes place at the edges of the ulcer or its cicatrix.*

Brinton, Dittrich, Lebert, Hæberlin, Rosenheim, Hauser, Stiénon, have proved the transformation into cancer of simple ulcer. Our own personal observations of the transformation into malignant tumours (sarcoma, cylindrical-celled or squamous-celled epithelioma) of primarily benign tumours of the breast, the ovaries, or the uterus, and the histological examination of several pyloric tumours which we have removed from the living subject, confirm this view.

#### CANCER OF THE STOMACH.

If the anatomical findings of certain authors are to be admitted, that 4 to 9 per cent. of stomach cancers are grafted upon simple ulcers, it is probable that their etiology has, in the majority of cases, escaped the notice of the clinician, the ulcer having entirely given place, by time the autopsy was made, to malignant degeneration.

These figures of 4 to 9 per cent., therefore, bear no relation to those cases where the cancer has caused a premature death, or being found by hazard in the course of an autopsy for an intercurrent affection, has only invaded as yet a small portion of the ulcerated surface.

The frequency of latent ulcerations without hæmatemesis, and the long duration of premonitory dyspeptic troubles in the history of cancer of the stomach, permits the affirmation that if the rapid and certain cure of ulcer is assured a large number of patients would be saved from the later evolution of a carcinoma. Whether a cancer becomes inoculated on a primarily ulcerated and constantly irritated surface as "smoker's cancer" develops on the lips or the tongue, or whether it develops interstitially, by an imported embolus, as in infectious osteomyelitis in a "loens minoris resistentie," the harmful action of the pylorus is undeniable. The continuous spasm of the pylorus which complicates and aggravates dyspepsia, ulcer of the stomach, dilatation, and chronic gastritis, should, therefore, be reckoned among the most evident causes of cancer.

## STRICTURE OF THE PYLORUS.

In the preceding sections we have seen a little of the rôle played by the pylorus in chronic affections of the stomach. We will now study successively the spasmodic strictures of the pylorus and, finally, cicatricial and neoplastic strictures.

**A. Intermittent Spasm.**

Simple spasm of the pylorus is but an exaggeration of its physiological closing. Spasmodic closure of the pylorus is brought about under the influence of a nervous reflex, the origin of which varies greatly (indigestion, vomiting of pregnancy, etc.).

Vomiting is an inevitable phenomenon of pyloric occlusion. Pyloric spasm also coincides frequently with a hyper-irritability of the gastric mucous membrane, which becomes intolerant even of the lightest food.

Pain may be directly connected with an alteration of the stomach walls. It is generally the expression of the distension of the organ by a hyperacid liquid. The pylorus is here again in fault, and the more acute the pain the more energetically the pylorus contracts. This reflex spasm of the pylorus, as we have already seen, is one of the principal etiological factors in the simple ulcer and its complications, hæmatemesis and perforation. It is the cause of the non-cicatrization of the ulcer, and facilitates, by the stagnation of the ingested food, secondary evolution of cancer. Should a simple catarrhal gastritis be present at an early stage, the pylorus again comes into play, and is the primary cause of the wrongly named *essential* dilatation of the stomach. The irritability of the pyloric sphincter ends in a spasmodic contraction of the pylorus.

**B. Spasmodic Stricture. Permanent Contracture.**

One of the causes of contracture of the pylorus is the presence, close to the sphincter, of an erosion or a fissure, which can bring about the same spasmodic phenomena which are observed in other sphincters.

These spasmodic strictures, which should not be mistaken for simple exaggeration of the contraction of the pylorus, such as is observed in pregnancy (reflex vomiting) and in some dyspepsias, can cause grave symptoms, and may give rise to the illusion of an organic stricture.

We shall see later that this pyloric contraction is often but the first stage in the evolution of a true stricture.

**C. Fibrous Stricture.**

Continual contraction of the pylorus may be the starting-point of a true fibrous stenosis.

"Ca" erh localized to this region of the stomach," as taught by Luton of Rheims, and "irritable erosions" of Kussmaul, true fissures of the

pyloric region, aggravate at first a reflex pyloric atresia. This stenosis caused by simple contraction may become definite as a result of the deposit of plastic elements. It is certain that at times we meet with fibrous narrowing in the pylorus, whilst traces of simple ulcer are only seen in the neighbourhood, and at a certain distance.



FIG. 238. SMALL JUNTA-PYLORIC PENETRATING ULCER WHICH HAS CAUSED FIBROUS STENOSIS OF THE PYLORUS.

In such cases a submucous interstitial process must be admitted, which is due to prolonged irritation, and which ends in the fibrous and retractile transformation of the embryonic tissue. It is in this fashion that blennorrhagic strictures of the urethra are produced.

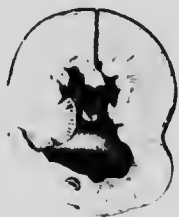


FIG. 239. PENETRATING ULCER OF THE PYLORUS CAUSING COMPLETE STENOSIS.



FIG. 240. LONGITUDINAL SECTION ON THE OPPOSITE SURFACE TO THE ULCER.

Many fibrous strictures of the pylorus constituted by a narrow cicatricial ring can evolve insidiously in this way, and cause a fatal issue. Stricture of the pylorus are indeed grave only according to the degree of narrowing of the orifice.

A simple annular band formed solely of mucous membrane, and in-



appreciable externally or by palpation direct of the pylorus, can occasion death.

At other times a small whitish band is noticed on the serous surface of the pylorus, which is evidence of the subjacent interstitial irritation. We have often observed filamentous adhesions with neighbouring viscera, starting from a small stellate plaque, which is fibrous and indurated.



FIG. 241. VERTICAL SECTION OF THE ULCER SHOWING IMMINENT PERFORATION OF AN ARTERIOLE.

Lastly the callous masses may extend as far as the second part of the duodenum, and may be mistaken for cancer, if the operator is not well experienced in the pathological study of this class of lesion. Hypertrophied glands are frequently met with in the neighbourhood of callous ulcers. Such was the case in three cases operated upon by me aged twenty-two, forty and fifty-eight years. The latter patient had a tumour of



FIG. 242. ULCER OF THE PREPYLORIC ANTRUM AND COMMENCING CANCEROUS STRICTURE OF PYLORUS. (FROM A PHOTOGRAPH.)

the pylorus, which was thought to be a cancer before operation. It was found to be a vast pyloric ulcer, with thickening of the musculature, and indurated masses of phlegmatic origin.

Reflex contracture of the pylorus, one of the principal complications of simple ulcer, becomes more marked as the ulcer is nearer to the pylorus.

The ulcer often rides over the sphincter, encroaching at the same time on the stomach and the duodenum.

We have seen one of these ulcers cicatrize in the pyloric portion to such an extent as to prevent the admission of a crow's quill. An analogous case has been observed by Dr. Henry Collin ("Simple Ulcer of the Duodenum," Paris, 1894, Steinheil).

Death was caused in this case by peritonitis following perforation. The ulcer covered the pylorus, which became obliterated during the progress of cicatrization. Figs. 252 and 253 represent this interesting case. We are indebted to Dr. Henry Collin for the drawings. Certain ulcers of the pylorus and duodenum may be followed by absolute stricture, without any premonitory grave symptoms; an ordinary dyspepsia is suspected, but vomiting becomes more frequent, and a fatal issue is so rapid that the least hesitation is fatal to the patient. This was the case in the young man of twenty-two years quoted above, where we operated *in extremis* successfully. Mention should be made of cicatricial stenosis of the pylorus following the ingestion of caustic substances. Sometimes also tuberculous lesions occur.

#### D. Neoplastic Stricture.

Neoplastic strictures are generally cancerous in nature. Sarcoma of the pylorus is very rare.

Very varying forms of cancer are found in the stomach. The sole cancer which is of interest from the surgical point of view is annular scirrhus of the pylorus. Scirrhus of the pylorus develops generally in the form of a fairly narrow ring about 15 to 20 millimetres thick (Fig. 242). Its centre is occupied by a tortuous and narrow canal, and the mucous membrane is unaltered to the naked eye. This ring spreads out, and becomes thinner towards the stomach, and generally ends abruptly on the side of the duodenum at the level of the pyloric diaphragm. In some cases a buried and retracted cicatricial marking is seen on the peritoneal surface. At times the mucous membrane is ulcerated; we have seen it both red and turgid. Our observations on the living subject have led us to the conviction that, in the fresh state, healthy parts can easily be distinguished from diseased parts, which are slate-coloured, and the seat of an unmistakable interstitial thickening. We have seen three cases of total cancerous degeneration of the stomach: the first, in February, 1885, at the Pitié Hospital, and the others quite recently in the course of our laparotomies for stricture of the pylorus. These stomachs were reduced to their smallest dimensions, and presented the same shape and relations observed in the condition of absolute emptiness. In these cases of tractile cancer of the stomach the anatomical lesions are the same as in annular scirrhus of the pylorus. The induration involves principally the muscular coats, which are thickened and become the seat of a sort of hard oedema. The cellular tissues are loose, and seem healthy. The mucous membrane, red or slate coloured, is several millimetres thick.

Do unimpeachable observations exist of true annular myomata of the

pylorus? We are of the opinion that these cases are exceptional, for in several cases in which a superficial examination led us to the diagnosis of an annular myoma the histological study of the specimen has always revealed evident cancerous degeneration of the subjacent mucous membrane. Thus the specimens shown in Figs. 242 and 244, which on a superficial examination appeared to be striking examples of annular myoma of the pylorus, were found to be carcinomata on histological examination.

The question of the possible existence of annular myoma of the pylorus is of extreme importance from the surgical point of view, and if it be well demonstrated that only an insensible transition exists between



FIG. 243. —CANCEROUS STENOSIS OF THE PYLORUS WITHOUT EXTENSIVE LESIONS OF THE MUCUS.

simple irritating processes and the neoplasm, surgical cure of stomach lesions which are the forerunners of cancer will be acclaimed amongst the great successes of surgery.

Hypertrophy and sclerosis of smooth muscle tissue is, in fact, one of the results of prolonged irritating processes. And Billroth, since his earliest operations, has drawn attention to those cases of callous ulcer of the stomach all the more easily confounded with cancer since they are frequently its starting-place. I have attempted to demonstrate in a precise manner, by means of histological study of certain specimens, what are the differences and analogies between the two processes; irritating and neoplastic.

In our discussion of inflammatory stricture of the pylorus, we have drawn attention to a case where the examination of the patient as well

as the direct aspect of the tumour led to the diagnosis of scirrhus of the pylorus.

This woman, aged fifty-nine, presented all the symptoms of complete pyloric stenosis. Simple inspection of the abdomen revealed, in the neighbourhood of the umbilicus, owing to the extreme wasting of the patient, a



FIG. 244.—CANCER'S STENOSIS OF THE PYLORI'S WITHOUT EXTENSIVE ALTERATION OF THE MUCOSA.



FIG. 245.—CANCER INVOLVING THE WHOLE OF THE STOMACH; SO-CALLED PLASTIC LINITIS.

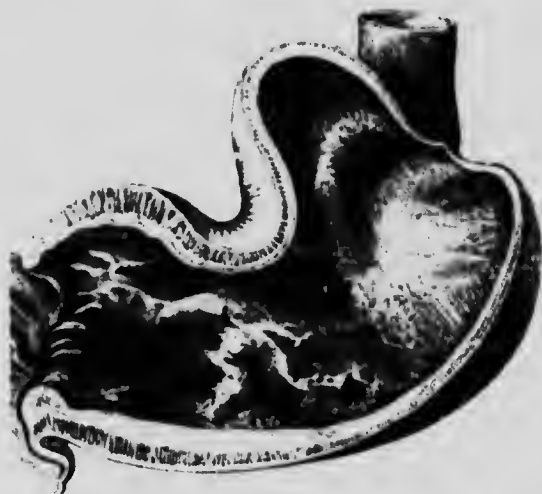


FIG. 246.—CANCER INVOLVING ALMOST THE WHOLE OF THE STOMACH WITH THICKENING OF THE WALLS; FORM NAMED PLASTIC LINITIS.

swelling which appeared to be movable in every direction, and which on palpation appeared to have all the characters of a protracted pyloric scirrhus.

When the abdomen was opened the pylorus was easily brought outside the wound. The induration was found to extend for 6 to 8 millimetres on

the side of the stomach, but hardly encroached at all on the duodenum. In spite of the absence of glandular infection and cancerous extensions in



FIG. 247. —POLYPS OF THE PREPYLORIC ANTRUM INVAGINATED IN THE PYLORUS.

the neighbourhood the neoplastic character of the mass appeared to be free from doubt. I performed pylorotomy. After operation the part was incised and washed with tepid water. As I have always found to be



FIG. 248. —ADHESIONS FOLLOWING THE EVOLUTION OF A SMALL PERFORATING ULCER.

the case in scirrhus stricture of the pylorus, the thickening involved particularly the muscular layer, which in such cases reach a thickness of 8, 10, or 12 millimetres.

The mucous membrane, which was slightly turgid, presented a vast loss of substance, comprising half the circumference of the pyloric antrum.

and extending for the whole length of the part removed. It did not appear to be infected with cancer. The epithelial surface was intact as a whole.

The cellular tissue seemed to be healthy, and both mucous and cellular tissues had completely disappeared where there was the loss of substance, which seemed to be a vast callous ulcer. I expressed the opinion to my assistants that the specimen was a rare type of callous ulcer, which had resembled a neoplastic stricture of the pylorus, and whose naked-eye appearance was sufficiently characteristic to make diagnosis of cancer out of question before the histological examination. This specimen was all the more interesting since at first the diagnosis of callous ulcer had seemed to me evident in several analogous cases, whilst in this case the tumour, on opening the abdomen, presented seemingly all the appearances of cancer. I immediately hardened the specimen for histological study, which, to the naked eye, differed so slightly from veritable scirrhus of the pylorus.

Microscopic examination revealed the presence of cylindrical-celled epithelioma grafted on an old ulcer.

#### POLYPUS OF THE STOMACH.

Besides stenosis by circular or organic lesion, the pylorus may be obliterated by the engagement of a pedunculated polypus of the stomach. Cruveilhier and Cornil have reported several cases which ended fatally.

#### FIBROUS OR INFLAMMATORY STENOSIS FROM EXTRAPARIETAL CAUSES.

Mention should be made also of strictures caused by a simple bend of the duodenum close to the pylorus, also occlusion following repeated attacks

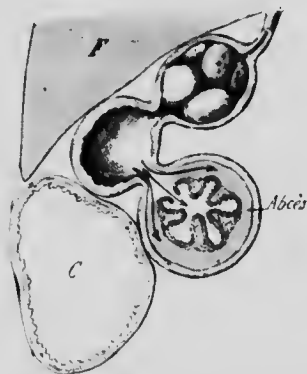


FIG. 249.—PYLORIC STENOSIS CAUSED BY IRRUPTION OF THE PUS FROM A VESICULAR ABSCESS INTO THE STRICTURED TUBIC OF THE PYLORUS, COMPRESSING THE MUCOUS MEMBRANE.

of localized peritonitis, by the compression of a granular mass, a neighbouring aneurism, or a hydatid cyst, etc.

In one of our cases lately operated on biliary lithiasis was the cause, complicated by successive attacks of peritonitis. The gall-bladder having formed an abscess, opened into the duodenum close to the pylorus, and caused a diffuse interstitial submucous suppuration. This was complicated by the signs of total stenosis and hepatic infection (Fig. 249).

#### ANNULAR CONTRACTION OF THE STOMACH.

##### A. Hour-Glass Stomach.

In describing the strictures of the pylorus, mention should be made of a lesion which causes analogous symptoms.

This affection is annular contraction of the stomach, mentioned by various authors. The condition, though rare, has been met with on several occasions.

It has even been suggested that biloculation of the human stomach may be a physiological phenomenon.

Glenard states that he observed three cases of hour-glass stomach in forty autopsies; this proportion is quite exceptional.



FIG. 250. SCHEMA OF AN ULCERATING STENOSIS OF THE CENTRAL PART OF THE STOMACH, WITH ADHESIONS OF THE EDGES OF THE ULCER AND PARTIAL PERFORATION OF THE ABDOMINAL WALL.



FIG. 251. ABNORMALITY OF THE STOMACH (BILOCULAR STOMACH) DUE TO THE DISPOSITION OF THE CIRCULAR TUNIC FORMING A SUPERNUMERARY SPHINCTER.

Hour-glass stomach is characterized generally by the presence of two compartments nearly equal in size, separated by a sort of muscular ring, forming a veritable sphincter. This disposition is well shown in Figs. 250 and 251. This stomach, which we met with in the course of our anatomical investigations, was quite healthy.

At times the contraction of the stomach is due to cicatrization of an ulcer of the lesser curvature or of several neighbouring ulcers. The anatomical disposition shown in Fig. 251 would be eminently favourable to the production of a cicatricial contraction of the central portion of the stomach;

a like contraction would expose the subject to the production of a round ulcer.

M. Millot has observed an hour-glass stomach in a monkey. The stenosis was tuberculous in nature. I have met with and successfully operated upon a case of cicatricial stenosis of the middle portion of the stomach in a living subject. The lower segment had undergone a sort of rotation which accentuated the contraction. This stomach, which is represented in Fig. 270, was the cause of a most interesting operation, since it became necessary to devise a new method of procedure, on the spot, in order to deal with this unexpected condition. The patient recovered.

This was the first case of hour glass stomach which had been observed in the living subject, and which had called for surgical intervention.

### B. Lesions of the Duodenum.

We will close this chapter by passing in review those lesions of the duodenum which are capable of impeding the free passage of chyme into the jejunum, and for this reason justifying the same operative procedures as the lesions of the pylorus.

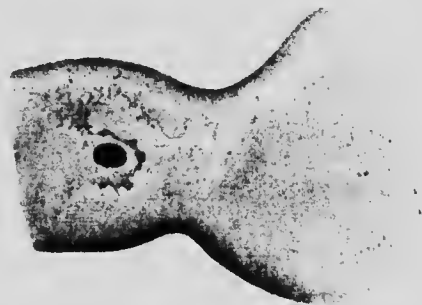


FIG. 252. PERFORATING ULCER OF THE FIRST PART OF THE DUODENUM.

Clinical history of ulcer of the duodenum is associated with the name of Buequoy in 1887, and no symptom described by this authority has lost the importance which he originally gave to it.

In describing the lesions of the duodenum, we borrow largely from the remarkable monograph by Dr. Henri Collin, son of M. Collin, the eminent Parisian instrument manufacturer.

After the stomach, the duodenum is the situation where round ulcer is most frequently found in the digestive tube.

The lesion, as a rule, is in close neighborhood to the pylorus.

Among 269 cases described in this thesis, the ulcer was situated in 242 cases in the first part of the duodenum, in 14 cases in the second part, in 3 cases in the inferior angle, and in 3 cases in the ascending (fourth portion). The situation was precisely fixed in 127 cases with relation to the anterior and posterior planes of the subject.



In 71 cases the anterior wall was involved, in 45 the posterior; in 10 cases the upper border, and in 1 the inferior border.

The ulcer often bestrides the pylorus, or is very close. Perforation is the most frequent termination of simple ulcer of the duodenum. Figs. 252 and 253 show the internal and external surfaces of a duodenum affected with a perforating ulcer close to the pylorus.

In 83 cases out of 100 the ulcer was single. In 233 observations 26 were double ulcers. Three times three ulcers were found, and nine times more than four ulcers.

Spontaneous healing of duodenal ulcer owing to the formation of cicatricial tissue is observed, according to Dr. Collin, in 8 per cent. of cases



FIG. 253. THE SAME. THE SPECIMEN IS INCISED. THE ENCAVATION OF THE ULCER AND THE PERFORATION ARE SEEN.

quoted (22 cases in 263 observations); and again this healing is illusory since the cicatrization nearly always produces an impassable fibrous stenosis. Death from perforation is practically the rule, above all when the ulcer is situated on the anterior surface of the duodenum. Peritonitis from perforation may supervene unawares, as may happen in cases of latent ulcer of the stomach.

Death may take place from fulminating hæmorrhage; ulceration of the hepatic artery, the pancreatico-duodenal artery, the portal vein, or even the aorta, being found at the autopsy. In cases where the ulcer was situated at the level of the superior or posterior surface of the duodenum, retro-peritoneal suppurating foci have been found, also subphrenic, subhepatic,

and pancreatic (Hoffmann). or even perforation of the gall-bladder (Gross, quoted by Collin and Reinbold, *ibid.*, p. 82). Our personal observations

(Fig. 249) lead us, nevertheless, to the opinion that in two of these cases there may have been an error of interpretation, and that the duodenal ulceration was not primary, but followed the opening into the duodenum of a calculous cholecystitis. M. Collin quotes gastric or duodenal ectasis as one of the most frequent consequences of duodenal ulcer in course of cicatrization. Obliteration of the common bile duct may also be observed, also obliteration of the pancreatic duct and thrombosis of the portal vein. Duodenal ulcer, indeed, rarely cicatrizes without leaving appreciable traces, and when the ulceration is deep the work of repair practically always involves neighbouring organs to a greater or lesser degree.

Histologically, the lesions of duodenal ulcer are not very different from those we have described in ulcer of the stomach, and M. Collin draws special attention to the dilatation of Lieberkühn's glands in the immediate neighbourhood of the ulcer, the accumulation of the lymphatic elements and sclerosis of the subjacent muscular layers.

Duodenal ulcer is more frequent in the male than in the female (205 males in 257 cases, or 80 per cent.).

The symptoms of duodenal ulcer were described in a masterly fashion by M. Bucquoy (1887): "An anæmic person, not necessarily dyspeptic, is seized suddenly, several hours after a meal, with pains localized to the subhepatic region, followed by fetid alvine dejections mixed with blood. The same evening the condition improves. Six weeks afterwards there is a renewed attack of enterorrhagia without gastric trouble or vomiting. Hematemesis is rare in such a case. The conservation of the appetite and the gastric tolerance place the stomach out of court."

The situation of the lesion becomes obscure only when a cicatricial stenosis is produced with gastric or duodenal ectasis and profuse hematemesis.

Pain, as a symptom in cases of duodenal ulcer, is remarkable for its irregularity, the attack being generally of short duration. The pain is felt at the seat of election in the right hypochondrium, and commences, not at the moment of ingestion of food, but several hours later, when the contents of the stomach begin to pass into the small intestine. This pain is intense; it lasts until the chyme is evacuated into the jejunum, and reaches its zenith towards the end of digestion. Often an attack of vomiting ends the crisis.

Hematemesis can occur as in ulcer of the stomach. Melena is frequent, but often passes unperceived. Digestive troubles are less marked than in gastric ulcer, and the appetite is not interfered with.

The etiology of duodenal ulcer is very obscure, except in those cases where it coincides with an extensive burn of the external teguments or erysipelas (42 cases out of 279). A satisfactory explanation has never been given of the production of a duodenal ulcer in extensive burns of the skin. The theory of microbial infection upheld by Letu'e and Collin rest simply upon probabilities, since specimens were only obtained more than twenty-four hours after death.

Duodenal ulcer may cause the production of inflammatory masses which are perceptible to abdominal palpation, and it will be of use to point out that in certain cases of callous duodenal ulcer the adjacent callosities have been mistaken for a cancerous tumour. We have drawn attention to several analogous cases in discussing callous ulcer of the stomach and pylorus whether they encroach or not on the first portion of the duodenum.

Do cases of spasmodic contraction exist in the duodenum as we have observed in the stomach, besides simple ulcer and fibrous stenosis? Spasmodic contraction of the duodenum may occur as a complication of ulcer of this part of the intestine. Such was probably the case in a patient on whom we operated when *in extremis*, and who was attacked with vomiting of food, practically continuous hæmatemesis, and who died of exhaustion with progressive lowering of the temperature.

Congenital stenosis of the duodenum has also been observed, simulating a cicatricial stricture, also strangulation by a band, as is met with in other parts of the digestive tube. Fremont records a case of congenital contracture of the duodenum in a child who had also an imperforate anus. This child was successfully operated upon by Kirrison for the imperforate anus, but died shortly after the operation without apparent reason. At the autopsy congenital stenosis of the duodenum was found, and a second stricture of the small intestine.

Cancer of the duodenum is rare. It occurs almost always as an extension of pyloric cancer. In one of our own cases malignant degeneration had extended along the duodenum as far as the ligament of Treitz, and we were able to demonstrate that the neoplasm extended below the mesocolon as far as the commencement of the jejunum. Cancer of the pancreas may also invade the duodenum by direct extension. We have observed this on several occasions, and have been enabled twice to diagnose the condition from the signs and palpation of the abdomen in patients only thirty years of age. Jaundice caused by obstruction of the common bile duct is usually a premonitory sign of approaching death.

Amongst other causes which can impede the passage of chyme into the duodenum, attention has been drawn to the compression of the duodenum by a floating kidney or by a tumour of the pancreas. Nicaise and Glenard have incriminated also an exaggerated tension of the mesenteric cord which obliterates the calibre of the third part of the duodenum. Lastly the same accident may be produced at the origin of the jejunum at the level of the insertion of the muscle of Treitz. We would not lay too much stress upon the rôle played, in such an occurrence, by the configuration of the duodenal loop and the high position of the origin of the jejunum, which is often on the same horizontal plane as the pylorus, and even on a notably higher plane.

Spasm of the duodenal loop is sufficient in these cases to cause a reflux of bile into the stomach, the dilatation of this organ, daily vomiting with gastric crises, and general symptoms of a most disturbing character.

### DIAGNOSIS AND OPERATIVE INDICATIONS.

In the previous chapter we have discussed the various obstacles which may prevent the passage of chyme into the duodenum: Hour-glass stomach, simple contracture, spasmodic cicatricial or organic stricture of the pylorus, inflexion and adhesions of the first part of the duodenum, compression of the duodenum by a floating kidney or a neighbouring tumour, spasm of the duodenum or stricture following an ulcer, primary or secondary cancer of the duodenum, compression of the intestinal calibre by the mesenteric cord or the muscle of Treitz.

It now remains for us to determine if it is possible for us to recognize these various affections and to specify the indications for operation. Diagnosis of stomach affections is often doubtful, and a case rarely occurs where the whole of the symptoms permit the affirmation that a round ulcer or pyloric stenosis exists. Diagnosis of duodenal affection is still more obscure.

This difficulty of precision specially arises after a perusal of the latest books on the subject, for the habitual symptoms of various gastric affections seem to have lost part of the diagnostic value they enjoyed several years ago.

#### Dyspepsia.

It is now known that simple dyspepsia may take the most varied forms, and that its benign forms, even as its obstinate and graver forms, may be premonitory symptoms to the formation of round ulcer, pyloric stricture, and cancer.

#### Ulcer of the Stomach.

The pain of ulcer is by no means a certain sign; it is also a sign of hyperchlorhydria without ulcer. We have observed it to be just as acute in cases where the gastric secretion was neutral or alkaline.

An ulcer may remain latent; in such a case it is not brought into evidence by any alteration of the stomach functions. Pain itself may be absent, and it is in this way that a person believed to be in robust health may succumb in several hours from peritonitis by perforation.

#### Hæmatemesis.

Hæmatemesis is not a pathognomonic symptom even if the blood be brilliant. The colour of the vomited blood (red-blood or coffee-grounds vomiting) gives us information on the intensity of the hæmatemesis, and the length of time the blood has remained in the stomach, but we can attribute no other diagnostic value to it, and the distinction between the bright red hæmatemesis of ulcer and the coffee-grounds vomiting which characterize cancer is far from having the exactitude attributed to it by certain authors. Lastly, the vomiting of blood may be a symptom of stasis in the region of the portal vein, owing to an alteration in liver or

heart or from a special condition of the blood such as hæmophilia; it may even be hysterical.

Vomiting of bright red blood may also be observed without appreciable cause. It has been observed in the female as a supplementary phenomenon in menstruation.

In a case operated upon in 1892, in spite of the classical symptoms of ulcer (lancinating pain, bloody vomiting, and vomiting of food), we found it impossible to recognize any other lesion than a congested plaque bright red in colour situated on the anterior wall of the pyloric antrum.

Vomiting which occurs in dilatation of the stomach without true pyloric stenosis (spasmodic contracture of the pylorus) yields as a rule to appropriate treatment, and especially to methodical lavage of the stomach, which restores to the gastric muscles their temporary loss of tone.

### Vomiting of Food.

Repeated vomiting is but a sign of gastric intolerance. We have seen patients with simple pyloric spasm reject the smallest mouthfuls of liquid swallowed. This intolerance of the stomach without pyloric lesion is a frequent accompaniment of pregnancy.

On the contrary, vomiting may not be present in patients with true stricture. This phenomenon may be observed in young subjects, and several of our cases whose pylorus was rigid and narrow (6 to 8 millimetres) only vomited at rare intervals. The stomach still possessed enough digestive power and muscular contractibility to drive liquefied and dissociated foods into the small intestine as they became elaborated. Digestion continued for eight to ten hours, and was accompanied by intolerable pain. Vomiting, therefore, is not a certain sign of pyloric stenosis except in cases where it is persistent, and becomes repeated with lessening intervals.

At the commencement vomiting is rare: the stomach only rejects food when it is veritably overloaded. The patient vomits a bowlful of ill-digested matter, amongst which ingested elements are found several weeks old.

Fragments of truffles are specially easy to recognize by the microscope owing to the grouping and aspect of the spores.

The attacks of vomiting occur every fortnight, then every twelve days, then every ten days; the intervals become gradually less, for the contraction progresses and never gives way.

The last period of the illness begins when the pylorus is become impermeable to fluids. If we may so describe it, this is the commencement of the acute period.

Wasting up to this moment is slow, but progressive. It now accentuates daily. The patient becomes weaker, is obliged to take to his bed, and dies in a few days from thirst, in spite of the stagnation of several litres of water in the stomach.\*

\* Several observations have enabled us to establish this absolute impermeability, in the human subject, of the mucous membrane: the stomach to nutrient liquids, and even to pure water (see above, Physiology).

### Dilatation of the Stomach.

Dilatation is not a certain sign of an anatomical lesion of the pylorus. Spasm alone of the pyloric sphincter can determine a considerable gastric dilatation.

Gastric catarrh is, peculiarly, a sign of secondary atony of the gastric musculature. We have, indeed, observed cases with pyloric occlusion without dilatation of the stomach. The organ, being extremely irritable, rejected the smallest quantity of swallowed fluids.

Simple dilatation of the stomach, which has been wrongly named primary and protopathic dilatation or dilatation due to muscular atony, is the result of a constant contracture of the pylorus, a reflex contraction caused by irritation of the gastric mucosa (overloading with food, excess of alcohol, pyloric fissure, ulcer of the lesser curvature, etc.). This dilatation without anatomical lesion of the pylorus or duodenum may cause daily vomiting and progressive wasting, so great that an organic lesion may be suspected.

### Cancer of the Stomach.

Diagnosis of cancer of the stomach is very difficult, especially at the commencement, for from the point of view of surgical intervention we are but little concerned that a doctor should recognize a cancer of the stomach already old in a patient who has a tumour the size of a fist.

Cases are unfortunately too frequent where the medical diagnosis is made, so to speak, in a retrospective sense, when all the therapeutic measures have become powerless.

It would be better for the patient if the doctor could recognize in time the commencement of so grave a malady.

It has been demonstrated, in the stomach as in the majority of other organs, that a cancer habitually develops at a spot previously irritated, in a "locus minoris resistentiæ," where the diseased cells become inoculated; a wart on the lip becomes the starting-place of a canceroid; a polypus of the uterus imperfectly operated on gives place to a carcinoma.

Chronic gastritis and ulcer of the stomach are premonitory accidents of cancer.

Our efforts, therefore, should be directed against non-cancerous affections of the stomach, which are so often premonitory of carcinoma.

When once cancer is confirmed, all surgical intervention is illusory, and the survival of the patient can only be obtained by means of antineoplastic vaccination.

The annular scirrhus of the pylorus, which is characterized often by a slow evolution, and which causes a general affection late in the disease, alone is capable of a wide extirpation.

Annular scirrhus of the pylorus is often mobile and prolapsed; it is found on palpation either near the umbilicus or to the left of the middle line. It has already been seen that the diagnosis of the situation of the

tumour presents no difficulty at all, the neoplasm coinciding with the rational signs of pyloric stenosis: daily vomiting, dilatation of the stomach, rarity of the stools, and weakening of the intestinal tract.

Nevertheless, in spite of a pyloric tumour being found, the diagnosis of cancer in some cases may not be exact. I have observed certain cases of annular thickening of the pylorus which have been mistaken macroscopically for pure "myoma," whilst the microscope has revealed an evident cancerous lesion. In another case I removed a callous tumour of the pylorus, with complete stenosis, in which it was impossible to find the least trace of cancerous alteration in the walls of the ulcer. This specimen is reproduced in Figs. 232 and 242. The edge of a vast ulcer is seen, and the limits of the gastric mucous membrane, which was healthy and hardly congested, whilst the muscular layers, owing to the prolonged local irritation, was thickened and sclerosed sufficiently to cause total pyloric stenosis.

In several other very young patients (twenty-two years, thirty years, etc.) we have seen enormous callous masses with no other symptoms than obstinate dyspepsia with crises of gastric pain. In doubtful cases the progressive wasting and the straw yellow cachexia cannot be considered of real diagnostic value. The same may be said of black vomiting; the appearance of subclavicular or inguinal glands, and phlebitis of the calf or of one of the upper limbs, will corroborate the first symptoms.

Age is no contra-indication; for instance, we have several times met with enormous gastric ulcers in the course of laparotomies on patients who never vomited blood, and we have seen a case of simple cicatricial stenosis in a man of sixty-four whom we believed to be attacked with cancer.

#### **Ulcer and Stricture of the Duodenum.**

The sudden appearance of melena in the midst of perfect health, pain situated below the liver to the right of the middle line, its appearance three or four hours after a meal, and the absence of all gastric phenomena at the outset of the affection, are not sufficient to characterize duodenal ulcer. Diagnosis of ulcer of the duodenum is still more difficult than that of ulcer of the stomach. The habitual presence in the chyme extracted by the test meal method has been wrongly cited by Debove as a probable sign of duodenal stenosis. This fact would only have appreciable importance for diagnosis for those exceptional cases of stenosing ulcers of the third and fourth parts of the duodenum.

#### **Differential Diagnosis between Cancer of the Stomach and Non-Cancerous Gastropathy.**

The diagnosis between cancer and non-cancerous affections of the stomach is often a problem of the greatest difficulty. The advanced age of the patient cannot be invoked in favour of cancer; I have observed cancer of the stomach in the female between twenty-five and thirty years

of age, and ulcer of the stomach in a man of sixty-two. Certainly in these exceptional cases it is difficult to form a diagnosis.

The march of events also varies greatly. Callous ulcer and cicatricial stenosis of the pylorus can occur at the age of eighteen or twenty years. Other cases which I have seen in whom ulceration occurred during adolescence only became complicated with fibrous stenosis of the pylorus at the age of forty or forty-five years.

Since cancer may become grafted upon old ulcers, the long history of functional disturbances cannot be quoted against the hypothesis of cancer. Cancer, on the other hand, frequently has a very insidious onset. The patient wastes slowly, and becomes pale and anæmic; he becomes feeble, and has an earthy tint. When the lesion does not attack the pylorus the symptoms are obscure, and the diagnosis is not evident until a large epigastric tumour or obstructive phenomena make their appearance.

The newer methods of examination, such as gastroscopy and radio-scropy after a bismuth meal, are powerless to reveal anything but the shape of the stomach, the direction of the pylorus, and its degree of narrowing.

#### Sero-Diagnosis of Cancer.

The microbe which I discovered in cancer and which I succeeded in cultivating in 1900 (the *Micrococcus neoformans*), produces, by inoculation on certain of the lower animals, and especially in case of the white rat, lesions identical with those of the spontaneous cancer of man and animals. In 1908 (Société de Biologie, May 9) I demonstrated the fact that we can make a diagnosis in cases of deep-seated cancer by a reaction analogous to the Wassermann reaction for the diagnosis of syphilis. This reaction takes place in presence of an aqueous extract of the powder of *M. neoformans*.

To a convenient quantity of the patient's serum prepared for the experiment by heating to 56° C. is added a suitable proportion of the aqueous extract of the powder of *M. neoformans*, normal guinea pig serum, and distilled water. After keeping this mixture one hour in the stove at a temperature of 38° C., we add to it an emulsion of the red blood-corpuscles of the sheep. The fixation of the complement prevents hæmolysis when we are dealing with a case of confirmed cancer. In the course of my original researches in 1908 I demonstrated the fact that all deep-seated cancers—notably those of the œsophagus, stomach, intestine, and uterus—give a positive reaction (fixation of the complement). Very small tumours in the primary stage—that is to say, small adenomata and small superficial canceroids, which have not yet infected the general economy—give a negative reaction in most instances. The serum of patients affected with diseases other than cancer give a negative reaction.

The following are the results obtained in 1908. Eighty were examined, which may be grouped as follows:

1. Forty-two cases of cancer, including 15 cases of the breast, 8 cancers of the uterus, 5 cancers of the stomach, 3 cancers of the rectum, 2 cancers



of the tongue and pharynx, 2 malignant tumours of the axilla, 3 sarcomas of the back, and 2 osteosarcomata.

2. Ten cases of various new-growths, 1 lymphadenoma of the neck, 2 adenomata of the breast, 1 suspected mammitis, 1 case of multiple lipomata of the uterus, 2 ovarian cysts.

3. Twenty-eight cases of varied affections: 7 appendicitis, 6 salpingitis, 1 prolapse, 1 mastoiditis, 1 hernia, 2 burns, 1 whitlow, 2 traumatic lesions, 1 craniectomy, 1 atrophic cirrhosis, 2 joint tuberculousis, 3 anal fistulae.

Some of these sera were examined several times, making in all 200 examinations. The results were as follows:

1. The serum of cancerous patients has a specific action in the presence of powdered cancerous tumour or powdered *Micrococcus neoformans*.

2. Of 42 cancerous sera examined, 3 cases alone gave a doubtful reaction, 1 was a cancer of the larynx in a syphilitic subject treated with mercury, 2 were cancers of the stomach and uterus in a very enfeebled condition.

3. In the 10 sera of varied new-growths, 1 lymphadenoma, 1 adenoma of the breast, 2 fibromyomata, and 1 ovarian cyst, gave a positive reaction; 1 case of suspected mammitis, 1 lipoma, 1 adenoma of the breast, 1 fibromyoma, and 1 ovarian cyst, gave negative results.

4. In the 28 sera taken from patients suffering from different affections, and which were taken as controls, 3 sera prevented hemolysis in the control tubes. These sera were taken from cases addicted to chronic alcoholism, one of whom had cirrhosis of the liver, two others gave irregular results.

5. Serum taken from horses vaccinated with cultures of *Micrococcus neoformans* give the same fixation of the complement as the serum of cancerous patients.

6. Every serum having an elective action for the powdered tumour has the same elective action for the powdered *Micrococcus neoformans* or for twelve-hour cultures of the microbe in broth, which cultures it agglutinates in dilutions of from 1 in 10 to 1 in 100.

7. The same sera which have no specific action for extracts of other microbes have no agglutinating action on the fresh cultures of these.

8. The opsonic index of cancerous sera (not heated to 56°) in relation to the *Micrococcus neoformans* differs as a rule sensibly from the opsonic index of normal sera.

These researches were again taken up in 1913 in Professor Metchnikoff's laboratory; the following is a résumé of the results obtained:

#### SERO-DIAGNOSIS OF CANCER.

By M. M. T. Yamanouchi.

We have studied the serum reactions of 279 cases—from both cancerous and non-cancerous subjects—in presence of the watery extract of cultures of a micrococcus which we have isolated in a large number of cases of cancer. Of 20 cancerous cases, from which aseptic fragments of the tumour or of the

glandular metastases were inoculated on non-neutralized broth\* of cow's udder, 13 cases have furnished us with a pure culture of a micrococcus, the morphology and properties of which have been recognized as identical with those of the *M. neoformans* described by Doyen. In 7 cases we obtained a mixed culture of the same micrococcus and of *Staphylococcus aureus*. This micrococcus, of which the presence has thus been proved constant in cancerous lesions, was used as antigen.

**Preparation of the Antigen.**—The microbes obtained from these cancer cases and cultivated on the surface of gelose, were dried in a vacuum. After being pounded up for a long time into a state of minute division, 0.5 gramme of the powder was placed in contact with 100 c.c. of a physiological saline solution to which 0.25 per cent. phenol had been added. This emulsion was then agitated for a period of three hours, after which the maceration was continued for twenty-four hours at the temperature of the room; the liquid was then centrifuged. The reaction is properly produced only when the antigen has been prepared with great care. Fresh guinea-pig serum was employed as complement, in varying doses. We have not employed the amboceptor (prepared hemolytic rabbit serum). For each serum we prepare tubes with the following mixtures:

	Patient's Serum	Antigen	Guinea Pig Serum suitably diluted (for example, 1 in 5)	Physiological Saline Solution
	cc.			
First tube .. .. .	0.1	0.1	0.1	0.7
Second tube .. .. .	0.1	0.1	0.15	0.65
Third tube .. .. .	0.1	0.1	0.2	0.6
Fourth tube (control) ..	0.1		0.1	0.7

The tubes are placed in a stove at 38° C. (100.4° F.) for thirty minutes, and we then add to the contents of each tube 0.1 c.c. of a 5 per cent. suspension of the red globules of the sheep. They are then replaced in the stove till the fourth (the control) tube has had its contents completely hemolyzed.

The sera examined had been obtained—some from Paris, at the clinic of Dr. Doyen; some from Dr. Bataille of Rouen; some from Dr. Lenonène and Dr. Laurent of Havre.

We have also made comparative experiments with antigens derived from other pathogenic microbes—staphylococcus, streptococcus, *Bacillus coli*, pneumococcus—which exist in many subjects, cancerous and non-cancerous; as well as with non-pathogenic microbes, that of chicken cholera, sarcine, and *B. subtilis*.

\* Macerate in the refrigerating apparatus for twenty-four hours 500 grammes of cow's udder deprived of fat and minced up in 1,000 grammes of distilled water. Express the liquid and make the quantity up to 1,000. Add 1 gramme of dried peptone and 0.5 gramme of pure sodium chloride. Heat slowly up to 120° C. (248° F.).

Cool, filter, and place in tubes. Sometimes many filtrations are necessary before a completely clear fluid is obtained.

These control experiments have demonstrated the fact that fixation of the complement may take place as well in cancerous as in non-cancerous subjects, in the presence of an antigen prepared from microbes which often exist in the human body as a merely banal infection. On the other hand, fixation of the complement is never produced by antigens

Diagnosis	Number of Cases	Result	
		Positive (No Hemolysis)	Negative (Hemolysis)
Cancer of tongue .. .. .	12	12	
Cancer of larynx .. .. .	3	3	
Cancer of oesophagus .. .. .	4	4	
Cancer of stomach .. .. .	32	32	
Cancer of pancreas .. .. .	1	1	
Cancer of rectum .. .. .	8	8	
Cancer of breast .. .. .	37	30	7
Cancer of uterus .. .. .	22	22	
Cancer of ovary .. .. .	3	3	
<b>Total .. .. .</b>	<b>122</b>		
Epithelioma in process of generalization:			
Small localized canceroids (at onset of growth)			
Adenoma of breast .. .. .	8		8
Sarcoma .. .. .	5		5
Myxoma .. .. .	5	2	3
Fibroma of uterus .. .. .	1		1
.. .. .	2		2
<b>Total .. .. .</b>	<b>21</b>		
Tuberculosis .. .. .	21		21
Hydrcele of testicle .. .. .	1		1
Inguinal hernia .. .. .	1		1
Hysteria .. .. .	1		1
Fibrous stricture of rectum .. .. .	1		1
Dilatation of stomach .. .. .	1		1
Prolapse of uterus .. .. .	4		4
Hemorrhoids .. .. .	1		1
Exudative pleurisy .. .. .	1		1
Chronic metritis .. .. .	2		2
Purulent salpingitis .. .. .	1		1
Purulent appendicitis .. .. .	3		3
Acute appendicitis .. .. .	1		1
Subcutaneous abscess .. .. .	5		5
Purulent nephritis .. .. .	3		3
Compound fracture of thigh .. .. .	1		1
Angina .. .. .	1		1
Chronic laryngitis .. .. .	2		2
Intestinal fistula .. .. .	2		2
Gastric ulcer .. .. .	1		1
Biliary lithiasis .. .. .	1		1
Renal lithiasis .. .. .	2		2
Subjects in apparent health .. .. .	1		1
<b>Total .. .. .</b>	<b>14</b>	<b>1</b>	<b>13</b>
Syphilis .. .. .	<b>70</b>		
<b>Total .. .. .</b>	<b>44</b>	<b>10</b>	<b>34</b>
<b>Grand total .. .. .</b>	<b>257</b>		

derived from cultures of the cholera of fowls or those obtained from *sarcina*, or from *B. subtilis*.

The table on p. 227 shows that establishment of the diagnosis of cancer has been made possible, and precision attained in cases previously doubtful from the clinical point of view—that is to say, in cases of deeply situated cancer, the existence of which was afterwards verified, either by surgical operation, or, in hospital cases, by post-mortem examination.

We will consider here the diagnosis of cancer only. In the series above tabulated, representing a total of 279 serums examined, we have 144 cases, which presented the distinctive features of cancer, with 137 positive results (the 7 negative results were obtained in cases of small tumours of the breast, which were still localized). With small commencing canceroids, sarcomata, and benign tumours, we have, on the other hand, obtained but 2 positive results in a series of 29 cases. Finally, among 70 cases affected with other lesions, or in apparent health, we obtained but a single positive result, and that was in the case of an individual among whose immediate ancestors many cases of cancer had occurred; and of 44 syphilitics, 10 of the cases gave a positive reaction, while 34 presented each a negative one.

The fixation was manifested in a very sharply defined way in all the fully characterized cases of cancer—that is to say, in those which were complicated with metastases or glandular infection. The prevention was also very clear in the deep-seated cancers which were still in the primary stage, especially in those of the œsophagus, stomach, pancreas, and ovary. On referring to the figures furnished in the above table, we find that of 37 cases of cancer of the breast 7 gave no reaction; these were all very small tumours in the beginning of their growth, clearly localized, and without glandular infection. It will be noticed that all the cases of epithelioma or canceroid of the skin that were accompanied with adenopathy gave a positive reaction; while, on the other hand, small localized and very limited canceroids gave a negative reaction. Such was also the case with a subcutaneous myxoma and with two fibromata of the uterus. Five cases of adenoma of the breast also gave in every instance, a negative reaction. The reaction was also negative in all the other patients, who were the subjects of some other disease or of suppuration.

As control experiment, we also examined the serums of a certain number of subjects in apparent health, and of a large number of clearly defined syphilitic cases. Among fourteen subjects in apparent health, the specific reaction of cancer was observed in one case. That individual, whose address we have preserved, will be kept under observation. He is a man aged forty-five, who sought advice because he felt his strength declining and believed himself affected with cancer; many of his immediate ancestors had been affected with cancer.

Among forty-four syphilitics who gave each a positive Wassermann reaction, fixation of the complement took place ten times in presence of our special antigen—that is to say, the reaction was identical with that obtained in cases of confirmed cancer. But when we come to consider the frequency of the occurrence of cancer in old syphilitic subjects, we may consider it

possible that some of those cases were really affected also with latent cancer, while it is equally possible that fixation of the complement may, in certain cases of syphilis, be produced by a different mechanism. This is a question which we will endeavour to elucidate. Those ten patients will be watched in future with the object of ascertaining whether any of them become affected with malignant disease.

To summarize in conclusion: If we except syphilis, in which fixation of the complement on our special antigen may, perhaps, take place in cases in which no cancer exists, the reaction which we have just been studying seems to be of such a nature as to enable us to form a precise diagnosis, especially in cases of deep-seated cancer and those at the period of development in which they escape all clinical investigation.

The following conclusions may be drawn from these series of experiments:

1. The serum of cancerous patients contains specific bodies.
2. The specific substances contained in the sera of cancerous persons possess a selective action for the extract formed from the powdered tumour, and for the *Micrococcus neoformans* as well as for young cultures of this microbe, bringing about fixation of the complement and agglutination.
3. Diagnosis of cases of deep cancer can be established in the majority of cases by three experiments: (1) Fixation of complement; (2) agglutination; and (3) determination of the opsonic index.

Of these methods the first, the fixation of the complement, is the most accurate.

The best antigen is the extract of the powder of *Micrococcus neoformans* at 1 per 1,000. Extract of powdered tumours can rarely be used, since most cancerous tumours contain glucosides which have hæmolytic properties, and whose presence changes the conditions of the experiments.

#### Chemical Analysis of Gastric Contents.

The importance of gastric chemical analysis in the diagnosis of cancer has been greatly exaggerated.

Although absence of hydrochloric acid is the rule in cancer, and the exception in ulcer, I have found complete achlorhydria in a case of old dilatation of the stomach with callous ulcer in a patient thirty years of age.

#### Microscopical Examination of Vomited Matter.

Microscopical examination of vomited matter gives no indication in cancers of recent date, and it is rare to find in chronic cases characteristic fragments of cancer tissue.

### **External Aspect of the Patient and Exploration of the Epigastric Region.**

The glance of an experienced clinician is superior in most cases to all other methods, but this requires a clinical intuition which is possessed only by the few.

An operative experience of hundreds of cases of cancer of the stomach is necessary to be able to judge at the first glance the special tint of the patient, particularly the anemia in patients who are not yet wasted, and who have external signs of a cancerous cachexia without having undergone grave disorder of nutrition.

These patients are still well nourished, but pale and anæmic, and waste rapidly, although they take plenty of nourishment. They are generally feeble, and have but a moderate degree of vital force. Gastro-enterostomy is a serious undertaking in these cases, because the omenta are filled with fat, and sutures hold very badly in tissues so ill-disposed to proper union.

Exploration of the epigastrium very soon reveals the characteristic induration, but a very experienced hand is required for its recognition.

Many doctors are too rough in their manner of palpation of this region, and cause an exaggeration of the reflex contraction of the rectus muscles, a contraction which is already present in cancer from the first, and which hinders the perception of the lesion itself. It is impossible to have too much practice in palpation, for only a hand which is skilled enough to palpate deeply without causing pain can recognize a very early tumour.

Besides the cancer patients who are still well nourished, others are found to be wasted, with retracted abdominal walls in whom the smallest tumours are easily discovered. When stenosis exists the tumour is outlined under the skin, as is also the shape of the contracted gastric reservoir, in which writhing movements can be excited by gentle massage.

The first examination being made, the patient is made to swallow a glass or two of gaseous water, in order to bring into evidence the shape of the stomach and the tumour itself.

As we have already seen, endoscopy and radiography complete these data, but it is rare that any really useful inferences can be drawn by these means for the differential diagnosis between cancer of the stomach and non-cancerous gastropathies.

## **OPERATIVE INDICATIONS.**

### **1. Cancer of the Stomach.**

Surgery alone, is powerless to give durable results in cancer of the stomach.

But antineoplastic vaccination, using injections of mycolysine combined with the toxins and the cell bodies of the *Micrococcus neoformans*, killed

by means of heat, called cytolase, has had numerous successes in my hands during the past ten years.

Since operation is powerless to hinder evolution of cancer of the stomach, we come to the following conclusions:

1. Vaccination with cytolase should be employed on the appearance of the first premonitory symptoms of cancer of the stomach.

2. Pylorotomy is only indicated in rare cases of very small cancers of the pylorus, having an extent of 3 or 4 centimetres. When this operation is performed vaccination with cytolase should be carried out both before and after operation.

3. In the majority of cases of cancerous stenosis of the pylorus the lesion is too extensive to allow of a radical operation, and the surgeon is constrained to practise gastro-enterostomy, and he should at the same time commence treatment with cytolase.

I have still (1915) under observation patients suffering from gastric cancer who were treated by gastro-enterostomy and vaccination combined, in the years 1903 and 1904, in whom the tumour has completely disappeared.

In cancer of the stomach operation should not be directed against the cancer itself, of which it is impossible to prevent the extension, but should be directed so as to deal with the results of the mechanical stenosis and particularly with the obstruction of the pylorus. As long as there are no symptoms of obstruction, surgical intervention is contra-indicated, and the patient should be treated exclusively by anticancerous vaccination — i.e., by injections of cytolase.

If stenosis occurs operation must be performed before the patient becomes too enfeebled, in order to re-establish the circulation of the stomach contents, but operation should be limited to gastro-enterostomy, which is always less dangerous than pylorotomy.

#### VACCINATION WITH CYTOLASE.

Anticancerous vaccination, using the toxins and dead cells of *Micrococcus neoformans*, is particularly successful in cancer of the stomach. The injections of cytolase are combined with injections of leucolase, a phagogenic arsenical compound. The following procedure should be followed in order to obtain the best results. The injections are made every two days, one injection of cytolase being followed by three injections of leucolase. To commence the treatment 3 c.c. of leucolase are injected, followed by an injection of 4 c.c. after two days, and a third of 5 c.c. The first injection of cytolase should be graduated, commencing with 1 c.c., and arriving at the maximum dose (5 c.c.) about the third or fourth injection. The treatment then continues in the same way, an injection being given every two days, one dose (5 c.c.) of cytolase being followed by three of leucolase, each of 5 c.c. Each tube of cytolase must be well shaken before opening, in order to mix the microbial cells well in the liquid. Small cancerous lesions of the stomach begin to yield after two to three weeks. The treatment should last for at least three to four months, and should

be prolonged if the tumour is slow in commencing to disappear. Anti-cancerous vaccination is quite inoffensive; it will by no means cure all cancers of the stomach, especially when employed too late, but it will give unlooked-for results, and durable results in 60 per cent. of cases if they be treated in time and with perseverance.

## 2. Non-Cancerous Affections of the Stomach.

In the year 1892, when I began to study operative indications with relation to the non-cancerous gastropathies, I received encouragement in this direction by former clinical observations. I called to mind general cases of grave affection of the stomach which had caused the death of the patient during middle age without any trace either of ulcer or of cancer being discovered at the autopsy.

Clinical study of a certain number of cases of ulcer of the stomach and obstinate dyspepsia accompanied by wasting and veritable cachexia soon revealed to me (1) that the determination of what was called gastric chemistry gave no indication which could permit of the institution of a rational and really efficacious treatment: (2) that the majority, if not all, of the painful phenomena experienced by dyspeptics were due to the stagnation of food material in the stomach.

The earliest operations which I undertook confirmed these observations, and permitted me to decide—

1. The pylorus of patients suffering from ulcer or grave dyspepsia is in a state of spasmodic contracture which is almost permanent.
2. Habitual spasmodic contracture of the pylorus becomes gradually complicated by fibrous induration of the gastro-duodenal sphincter, which results in the formation of a ring only 6 to 8 millimetres in diameter.
3. So-called atonic or essential dilatation of the stomach does not exist, and is but a theoretic conception based on insufficient clinical observation. The stomach dilates solely by reason of the habitual contracture of an irritable pylorus, a contracture which is often reflexly caused by a painful gastropathy, such as round ulcer, hyperchlorhydria, etc.

In addition to cases of ulcer of the stomach, or typical hyperchlorhydria with hypersecretion and paroxysmal crises, there exists, then, a certain category of patients who only suffer from gastric weight, in whom the evacuation of the ventricle, though slow, finishes towards five or six o'clock in the morning. Lavage of the stomach in these cases, when performed in the morning fasting, does not bring up alimentary matter. However, the patients waste and weaken, and may become cachectic. The majority can only digest in small quantities, while some seem to absorb in total quantity enough material to assure health.

The condition of these patients is serious, since the food taken into the stomach undergoes fermentation, which prevents normal assimilation. A sufficient quantity of ternary and nitrogenous food, however, is absorbed daily in sufficient quantity. Nutrition is defective because the ingested elements are altered during their sojourn in the stomach, to the extent of



becoming improper for assimilation, if not toxic. The error of the theorists who have invented atonic and essential dilatation of the stomach can only be attributed to the fact that they were ignorant of the exact situation and normal relations of the organ.

4. In order to defend spasmodic contracture of the pylorus against the partisans of atonic and essential dilatation of the stomach, I was obliged to institute a long series of anatomical experimental research. I have observed this lesion in the living during my laparotomies. I had no difficulty in showing that with the stomach in a state of vacuity the pylorus occupies the lowest point. The stomach cannot, therefore, dilate unless the pylorus contracts, and holds up in the ventricle the ingested elements.

These researches on the normal anatomy of the stomach, which were confirmed by all later observations, were published in 1895 in my book on the "Surgical Treatment of the Diseases of the Stomach and Duodenum." Atonic dilatation of the stomach exists no more than essential enteroptosis. Daily experience in laparotomy is sufficient to impress upon the surgeon the fact that the empty stomach, such as is present in cesophageal stenosis, is almost inaccessible and rests under the costal margin. The greater curvature drags up with it the transverse colon, which is situated above the umbilicus. Should the stomach be, on the contrary, not dilated, but in a state of physiological repletion, the transverse colon descends with the greater curvature, and it falls, forming a more or less accentuated V. concave above, and well below the umbilical cicatrix.

The first operative successes which I obtained in 1892-1895 confirmed my clinical and anatomical observations.

I demonstrated that *gastro-enterostomy*, when properly performed and when the orifice functions properly, causes a total disappearance of all painful symptoms in patients suffering from chronic gastropathies which have not yet become cancerous.

Pain, vomiting, and hemorrhages from round ulcer disappear, painful phenomena of grave dyspepsia improve, and cure is complete in cases of round ulcer of the greater or lesser curvature at a distance from the pylorus, also in inveterate dyspepsia with hyperchlorhydria or an old alcoholic gastritis with change in the peptic glands.

Excessive contracture of the pylorus causes gastric pain. This contracture of the pylorus may be temporary or lasting, simple or spasmodic, a reflex from round ulcer or any other irritating cause in the gastric mucous membrane; it is sufficient to remove it, to see all the painful and distressing gastric signs disappear, and to re-establish nutrition and appetite to normal conditions.

In 1895 I formulated in the following terms the indications for operation in chronic non-cancerous gastropathies:

*Every chronic affection of the stomach which resists medical treatment and is causing a grave wasting of the body economy is henceforth amenable to surgical treatment.*

This formula has been adopted by every partisan of the surgical treatment of non-cancerous affections of the stomach. In grave gastropathies

medicine as a rule plays a small part, and precise diagnosis occurs only at the autopsy. Patients and doctors, therefore, must become accustomed to accept operative treatment as soon as the inefficacy of medical treatment become evident. Medicine, when powerless, must yield to surgery, and the surgeon has the right to claim the patient before he becomes too feeble to undergo an operation without danger.

The indication for operation is formal and immediate when there is fibrous stenosis of the pylorus, since operative intervention definitely cures the patient. The same can be said in round ulcer of the stomach and in inveterate spasmodic contracture of the pylorus.

It is now seven years since I published my work on the surgery of the stomach. I have modified nothing, either in anatomical description or in the indications for operation in non-cancerous gastropathies where gastro-duodenostomy and gastro-jejunostomy (the creation of a wide and properly functioning pylorus) are the sole efficacious remedies.

## GENERAL TECHNIQUE OF INTESTINAL RESECTION AND ENTERO-ANASTOMOSIS.

### DOYEN'S METHOD.

In order to facilitate our description of operations on the stomach, the first chapter will be devoted to a description of the general technique of intestinal resection and entero-anastomosis.

In the first volume (Figs. 458-460 *et seq.*) we have described intestinal suture, using Doyen's continuous suture with fixing interruptions, also the purse-string suture for the closing of small wounds. We have also seen that a purse-string suture is the best means of closing the gall-bladder after cholecystotomy.

### Doyen's Continuous (*Entrecoupé*) Suture (*Suture à Points passés*).

This continuous suture (or suture No. 1 silk), made with a curved round needle with split eye, is an excellent intestinal suture. Whether mucous sutures are employed or not, two superimposed sero-serous sutures must be made. But simple continuous suture, when more than 2 or 3 centimetres in length, may cause dragging or wrinkling of the line of union. To prevent this inconvenience, I commenced in 1892 to stay the suture at every three or four points by passing the needle through the preceding loop.

This modification of the ordinary continuous suture causes the silk to be stayed where necessary, and obviates with certainty all danger of strangling, and the partial sagging of the line of union. By the use of

Doyen's suture, a union is obtained by an interrupted suture with the advantage that the line of coaptation is continuous.

Doyen's continuous suture is the best procedure for reuniting the intestine and stomach, and for the partitioning of the peritoneum where

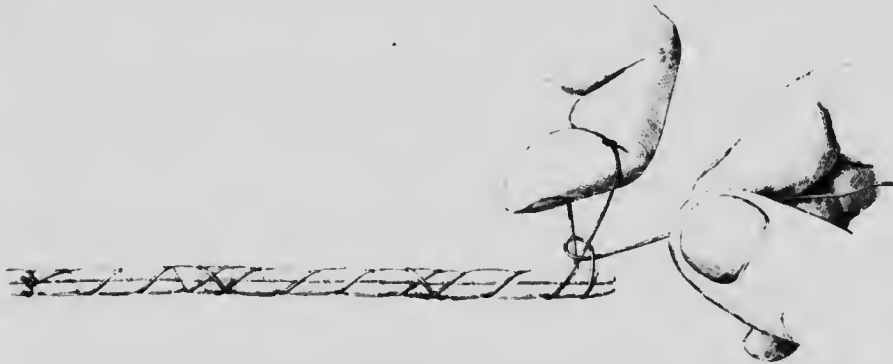


FIG. 254. DOYEN'S CONTINUOUS SUTURE (ENTRECOUPE) WITH FIXED INTERVALS. THE TERMINAL KNOT IS BEING TIED; FIRST MOVEMENT.



FIG. 255. THE SAME. SECOND STAGE OF THE FINAL KNOT.

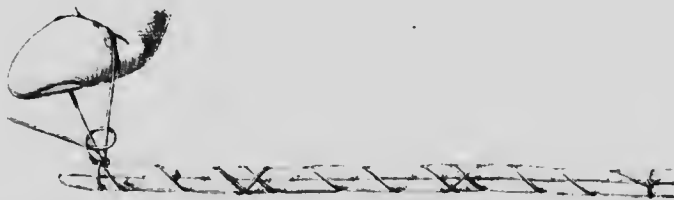


FIG. 256. THE SAME SUTURE PERFORMED FROM RIGHT TO LEFT. TYING THE FINAL KNOT.

peritonization is performed—*i.e.*, the repair of the visceral and parietal serous membrane.

To make the final knot, the last loop is caught on the left index finger in order to draw the two ends tight; they are then tied with the terminal thread.

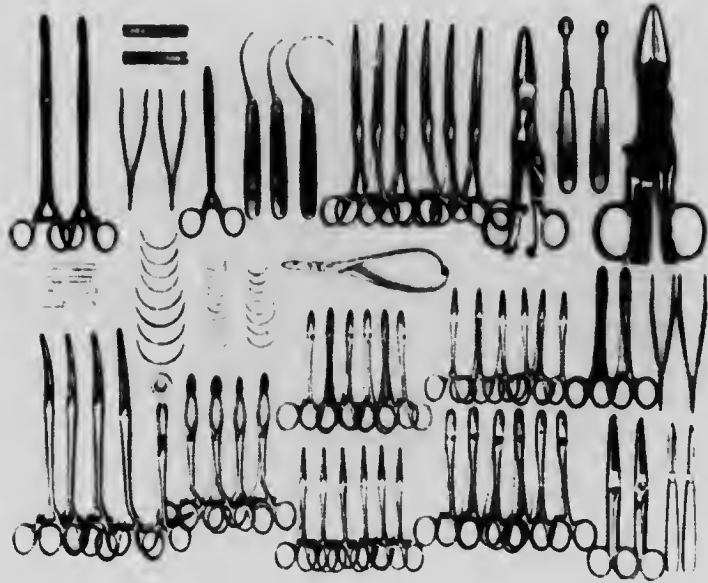


FIG. 257. INSTRUMENTATION FOR OPERATIONS ON STOMACH AND INTESTINE.

From below upwards, and from right to left: Two bistouries, 2 scissors, 6 artery forceps, 6 forceps with 6 teeth, 4 oval forceps, 1 special forceps for anastomatic button, 4 long curved forceps (22 centimetres).  
 Two dissection forceps, 2 short-nosed vein forceps, 6 small Champonnière's hæmostatic forceps, 6 needle-holder forceps with excavated ends, 1 eccentric and automatic Doyen's needle-holder, open-eyed needles, 6 glass drains.  
 One Doyen's éraseur (large model), 2 curettes, 1 Doyen's éraseur (small model), 6 Doyen's supple elastic-nosed forceps for temporary closure of stomach and intestine, 3 curved mounted needles, one needle-holder, 2 clip forceps, 25 metal clips, 2 long eccentric oval forceps.

#### Purse-String Suture.

To close a small perforation of the intestine, the simplest procedure is to surround the orifice with a suture arranged like a purse-string.

The thread is tightened carefully, drawing on the two terminal loops in order to obtain a punctiform reunion. It is then tied. It is prudent to place a second purse-string suture above the first as a measure of security, just as in longitudinal suture of the intestine two sero-serous sutures are always placed, one over the other.

Purse-string suture is used also to exclude from the peritoneal cavity and to cover small ligatured mesenteric stumps or ligature *en masse* of the intestine after preliminary crushing.

It will be seen presently that in resection of the intestine by this method, circular ligature closes the intestinal tube. This circular ligature is made after preliminary crushing of the intestinal loop in the following manner: The ligature bears solely on the fibro-cellular structures which are not

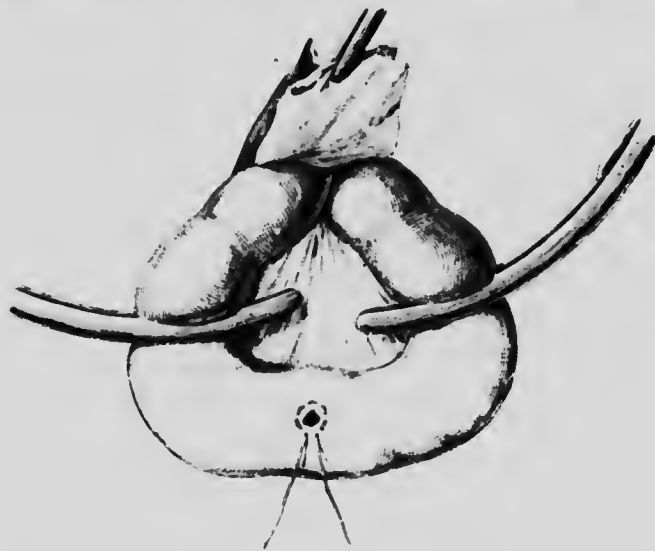


FIG. 258.—CLOSURE OF A SMALL INTESTINAL PERFORATION BY PURSE-STRING SUTURE (DOYEN).

destroyed by the instrument. As soon as the ligature is completed, a strong curved forceps is placed on the distal side, and section is made between the ligature and the forceps, care being taken not to allow any trace of intestinal contents to escape. The small stump deprived of its mucous membrane is then carefully cauterized.



FIG. 259. TRANSVERSE SECTION OF AN INTESTINAL LOOP THUS TREATED.

The double sero-serious apposition will be noted.

I employ the same technique for resection of the appendix, for small intestinal wounds, and for resection of intestine and stomach.

This procedure gives absolute security, and prevents all danger of secondary contamination of the peritoneum. The first purse-string suture should

be placed far enough from the ligature in order that the latter should be covered without any dragging. The suture, therefore, must be placed farther or nearer according to the size of the stump. The first suture is tightened and ligatured, and the stump is buried.

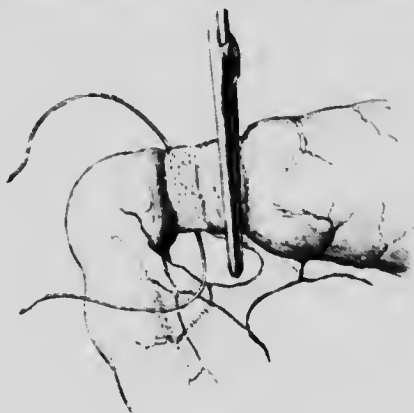


FIG. 260. CRUSHING OF THE DUODENUM, PASSING THE SILK.



FIG. 261. LIGATURE TIED IN THE GROOVE FORMED BY THE ECRASEUR.



FIG. 262. VIEW OF THE INTERIOR EXTREMITY WHEN THE FIRST PURSE-STRING SUTURE IS APPLIED.



FIG. 263. THE SAME.

The purse-string suture is finished. The circular ligature is excluded from the peritoneal cavity.

Exclusion from the peritoneal cavity is assured by a second purse-string suture. This second suture is made with the two ends of the first suture or with another thread passed at a sufficient distance from the depression formed by the first. The second suture is now tightened, and the closure of the peritoneum is assured. The ligature *en masse* and the stump, if eliminated later, fall into the cavity of the intestine without accident.



FIG. 264. LIGATURE "EN MASSE" OF CRUSHED INTESTINE: LONGITUDINAL SECTION.



FIG. 265. SECTION OF THE PART AFTER APPLICATION OF THE FIRST PURSE-STRING SUTURE.



FIG. 266. THE SECOND PURSE-STRING SUTURE IS APPLIED.

### RESECTION OF THE INTESTINE.

**DOYEN'S METHOD.**— Since the year 1897, and after discovering the crushing method, I have completely abandoned end-to-end union in intestinal resection. I exclusively employ lateral anastomosis after terminal closure of both superior and inferior loops. The technique of intestinal resection by this method is both simple and rapid, and can be carried out with perfect asepsis.

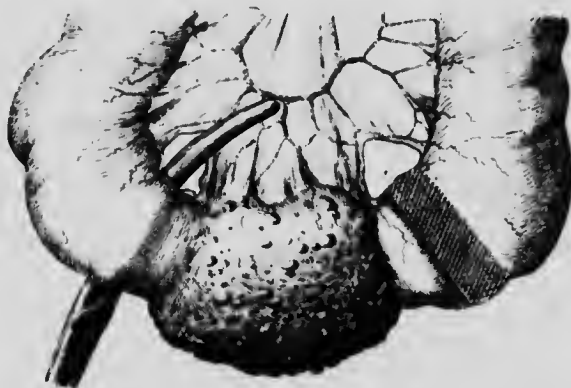


FIG. 267. —RESECTION OF CANCEROUS INTESTINE.

On the left, perforation of the mesentery; on the right, the intestinal walls have been crushed.

**Operation.**— We will suppose that the first stages of the operation are over. The abdomen is opened, the tumour is discovered and drawn outside the wound. The serous cavity is protected by aseptic compresses.



FIG. 268.—THE SAME.

The intestine has been crushed and tied on either side of the tumour. Forceps have been applied between the ligatures and the tumour.



FIG. 269.— THE SAME.

Resection has been accomplished on each side between the forceps and the ligature.

*Third Stage: Resection of the Tumour.*—The mesentery is perforated above and below the tumour at about 10 or 15 centimetres from its limits.



### Crushing and Ligature of the Intestine.

The intestinal tunics are crushed carefully, either with the large *écraseur* or, if not very thick, with the small model. Crushing must be applied progressively and not brusquely, to prevent tearing the serous coat, which would cause the intestinal contents to escape. This accident, which is easily avoided in using Doyen's model of *écraseur*, is almost certain to occur if any of the spurious copies of this instrument are employed, as their mechanism is usually very defective. Crushing must be made progressively, and the sensation of rupture of the mucous coats can be perceived readily. When the rings of the *écraseur* are brought as near together as possible, the surgeon opens the blades of the instrument, which he carefully removes. He immediately places a strong ligature, in the groove thus produced, which is tightly secured. The same manœuvre is carried out beyond the limits of the tumour on the opposite side.

### Suture of the Intestine.

A curved forceps is placed on either side between the ligature and the tumour, and the intestine is sectioned against the forceps at a certain distance from the corresponding ligature. It is easy to prevent all escape of intestinal contents; the two ligatures *en masse* are immediately inspected, and on either side a reinforcing ligature is placed, superimposed on the first.

### Crushing and Ligature of the Mesentery.

The tumour is immediately enveloped in an aseptic compress, and the mesenteric pedicle is crushed at one or several points according to its width. Ligatures are applied in the grooves of the *écraseur* to assure hæmorrhage. I never employ serial ligatures, which form large stumps which are difficult of absorption. In some cases crushing, ligature, and section of the mesentery are carried out before resection of the intestine is performed.

### Purse-String Suture of the Intestine.

The two stumps formed after ligature *en masse* of the proximal and distal ends of the intestine are now examined. The thermocautery is applied, care being taken to destroy the least vestige of mucous membrane which may survive, and they are excluded from the peritoneal cavity by burying them beneath a double purse-string suture (see above). The threads of these two purse-string sutures must be passed with special care in the region of the mesenteric insertion, where the sero-serous union of the intestine should be perfect.

### Peritonization of the Mesentery.

A silk suture is now passed on the mesenteric side for the whole length of the mesenteric breach as represented in Fig. 270. This is drawn tight

and tied, bringing together the two intestinal ends, which henceforth end blindly.

A similar suture is placed on the other face of the mesentery. This suture, which ends in several sero-serous intestinal points, reduces the primary breach of substance to a potential space.

**Entero-Anastomosis.**

All that now remains is to form an anastomosis between the now juxtaposed intestinal loops. This can be carried out either in the position figured in Fig. 271 or in that of Fig. 272.

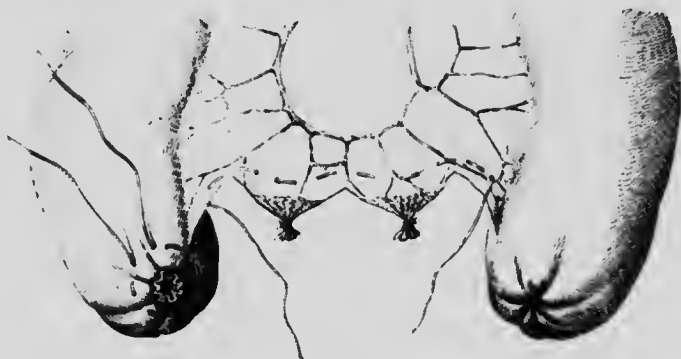


FIG. 270.—THE SAME.

On the right side the double purse-string suture is finished; on the left, the first suture is in place.



FIGS. 271 AND 272.—SCHEMA OF THE INTESTINAL CIRCULATION IN RECURRENT AND DIRECT ENTERO-ANASTOMOSIS.

The apposition of the two blind ends of the intestine is as a rule more favourable for the peritonization of the mesentery in the position shown in Fig. 271 than that in Fig. 272. Nevertheless, a similar result can be obtained in the second position by the complete burial of the mesenteric ligatures beneath a sero-serous suture, reuniting on either side the mesenteric folds with a longitudinal continuous suture.

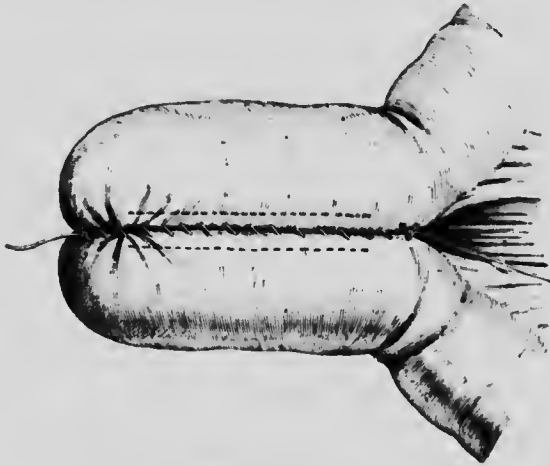


FIG. 273.—RECURRENT ENTERO-ANASTOMOSIS.  
First posterior sero-serous layer, dotted line representing second suture line.

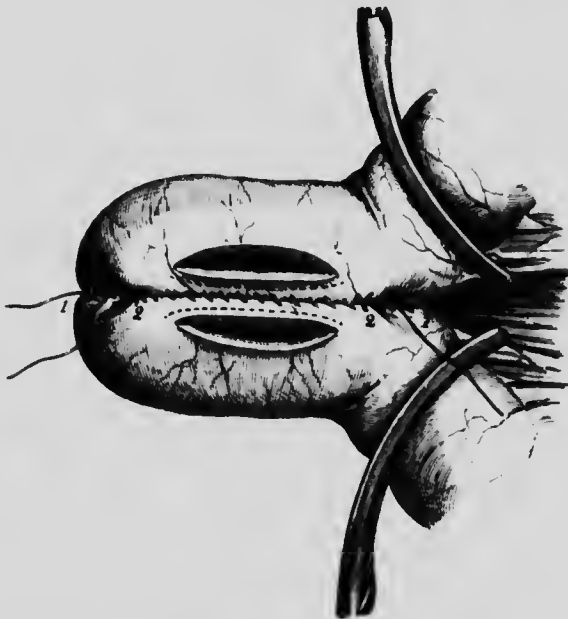


FIG. 274.—THE SAME.  
The two posterior sero-serous sutures 1 and 2 are finished. Incision of the two intestinal loops which are about to be anastomosed.

Let us suppose the intestinal loops to be placed as represented in Fig. 271. A first posterior layer of sero-serous sutures is made for a distance of 6 to 8 centimetres (Fig. 273).

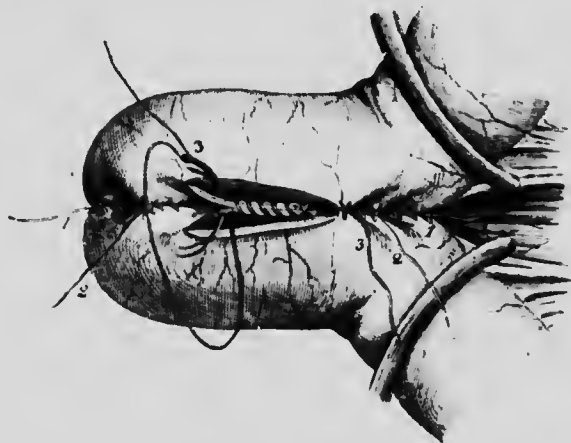


FIG. 275. THE SAME.

The third posterior or musculo-mucous layer is nearly finished (No. 3 thread).

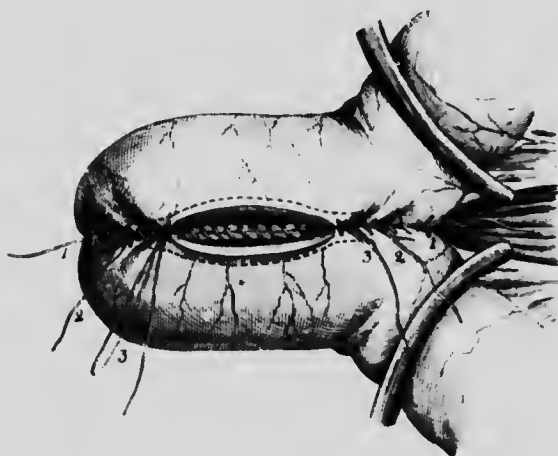


FIG. 276. THE SAME.

The third layer is finished. The dotted line outlines the position of the fourth thread, which unites the first and terminal ends of the second posterior layer.

The dotted lines in this figure represent the line of the second posterior suture layer. When this second sero-serous layer is finished (Fig. 274), the surgeon presses out the intestinal contents which remain in the two

intestinal cul-de-sacs, and closes the calibre of the intestine temporarily by placing on them two elastic-nosed forceps. The two first sero-serous layers are indicated by threads 1 and 2. The two approximated intestinal



FIG. 277.—THE SAME.

Thread No. 4 is tied to the free end at the commencement of thread No. 2, to constitute the first anterior sero-serous layer. The outer dotted line represents the line of coaptation of the second anterior sero-serous layer.

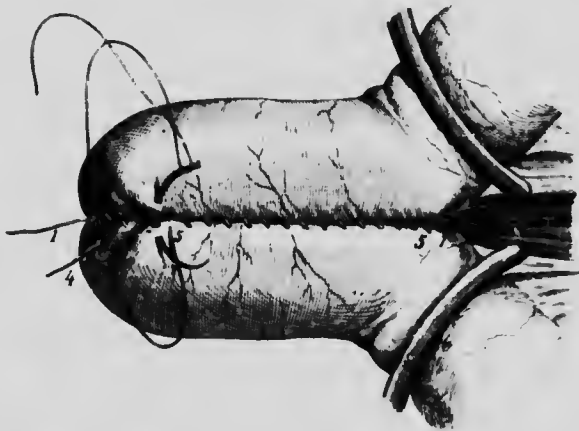


FIG. 278.—THE SAME. FINISHING OFF THE FIRST ANTERIOR SERO-SEROUS LAYER.

Its commencing and terminal free ends are tied to the corresponding ends of thread No. 1.

loops are now incised, 3 or 4 millimetres from the second posterior layer of sutures, for a distance of 30 to 35 millimetres (Fig. 274). A posterior muco-mucous suture must now be made. This suture which is shown

3-3 in Figs. 275 and 276 is finished in two or three minutes. This is of the greatest utility, since it prevents later shrinking of the anastomotic

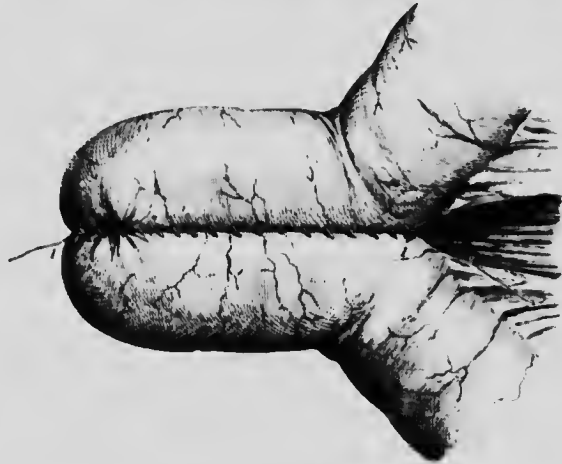


FIG. 279. THE SAME.

The anastomosis is finished, and the circulation of matters re-established. The two ends of thread No. 5 are tied to those of thread No. 1, and the redundant ends are cut.

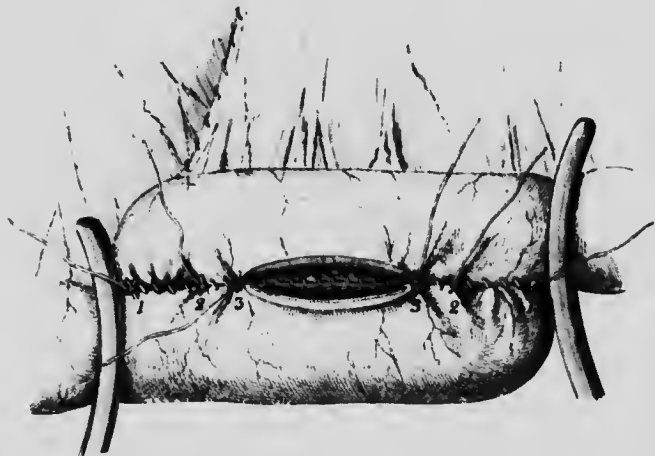


FIG. 280.—DISPOSITION OF THE INTESTINAL LOOPS IN THE PERFORMANCE OF DIRECT ENTERO-ANASTOMOSES.

The third posterior mucico-mucous suture is just finished.

orifice. The free loops of suture No. 3 are cut, and the two anterior sero-serous layers have to be arranged (Nos. 4 and 5). Thread No. 4 is stayed

by tying, and it is then united to the free end of the commencement of thread No. 2.

Fig. 277 shows the first anterior sero-serous layer nearly finished. Perfect coaptation is assured by thread No. 4 following the dotted lines in Fig. 276. The second sero-serous layer is then made, uniting thread No. 5 with the commencing free end of thread No. 1 (Figs. 278 and 279).

The anastomosis is now complete. The elastic forceps are generally removed after finishing the first anterior sero-serous layer (thread No. 4). The last anterior sero-serous layer is thus finished more readily.

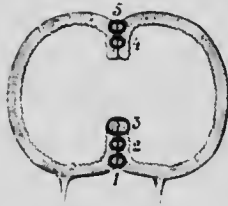


FIG. 281. TRANSVERSE SECTION OF THE ANASTOMOSED LOOPS, SHOWING THE FIVE LAYERS OF SUTURE: THREE POSTERIOR, INCLUDING TWO SERO-SEROUS AND ONE MUCO-COECOUS; AND TWO ANTERIOR SERO-SEROUS LAYERS.

The two loops may be approximated as in Fig. 280. Figs. 271 and 272 show the circulation of intestinal matter in either case.

Toilet of the field of operation is carried out and the abdomen is closed. In some cases, as a measure of prudence, the anastomosis is left in the neighbourhood of the wound, a small gauze mesh being placed between two points of suture. This partial tamponing of the wound is indicated in particular when the abdominal incision is lateral, and when the extent of intestinal resection is considerable, calling for a certain number of mesenteric ligatures. In all operations on stomach and intestine we shall find applications of the general technique which we have just described.

## TECHNIQUE OF OPERATIONS ON THE STOMACH.

### GASTROSTOMY.

Gastrostomy is the creation of a temporary or durable gastric opening. Temporary gastrostomy is an operation undertaken to allow of the extraction of voluminous foreign bodies from the stomach. These foreign bodies are visible as a rule to radioscopy and radiography. They can be discovered also by means of direct endoscopy of the stomach (see Esophagoscopy, Vol. 1.).

Gastric fistula is far from a satisfactory operation when undertaken with a view to feed patients suffering from an impassable stricture of the œsophagus or cardia. Patients with cancer of the œsophagus survive three or four months at the most; and the same is almost the case in fibrous stricture. Final cachexia may possibly be attributed to alteration in the pneumogastric nerves, which generally become involved by the neighbouring lesion.

#### Extraction of a Foreign Body.

The stomach is emptied of its contents by means of a large semirigid œsophageal sound.

**Operation**—*First Stage*.—Median subxiphoid incision, very exceptional incision on the external part of the left rectus sheath.

*Second Stage*.—When the skin is incised aseptic serviettes are fixed, and the linea alba and peritoneum are then incised.



FIG. 282.—GASTROSTOMY TO REMOVE A FOREIGN BODY: SECOND STAGE OF THE OPERATION.

*Third Stage*.—The stomach is seized with an oval-nosed forceps, and drawn outside. I have never found the slightest difficulty in recognizing it.

*Fourth Stage*.—Partial visceration of the stomach, the peritoneum being protected by aseptic compresses. The foreign body is recognized through the wall. It is made to bulge outwards, and it is extracted by means of a small opening, care being taken to avoid wounding visible vessels. The stomach is opened with the thermo-cautery, the orifice is enlarged by means of division, and the foreign body is extracted. The viscus is closed immediately, an elastic forceps being placed beyond the small opening.

*Fifth Stage*.—Closure of the stomach by a double purse-string suture.

*Sixth Stage*.—Reduction of the stomach, suture of the abdominal wall and the skin.



### Creation of a Gastric Opening.

**Operation.**—*First and Second Stage* as above.

*Third Stage.*—The stomach is drawn outside in order to choose the most movable part of the prepyloric antrum.

*Fourth Stage.*—A small vertical cutaneous incision is made 3 or 4 centimetres in extent and 3 or 4 centimetres to the left of the middle line beneath the costal margin. The abdominal wall is perforated at this point from behind forwards and from within outwards; an oblique tract is furrowed out with the end of a curved forceps 22 centimetres long, which is introduced through the median incision between the rectus muscle and its posterior aponeurosis. This opening is enlarged by division, the blades of the forceps being spread out.



FIG. 283. —GASTROSTOMY FOR CANCEROUS STRICTURE OF THE OESOPHAGUS: THIRD STAGE.

*Fifth Stage.*—An eccentric ringed forceps is introduced by the lateral cutaneous wound to emerge at the median incision. The stomach is seized in the blades of this forceps, and is drawn into the furrowed canal between the right rectus muscle and the posterior aponeurotic sheath, to emerge after traversing the muscular opening at the lateral cutaneous opening. Two deep silk sutures are placed in the middle of the gastric hernia, the serous membrane is sutured to the edges of the wound, and the median incision is closed. The herniated stomach is generally punctured on the third or fourth day with the thermo-cautery. If the patient be very feeble an egg and milk meal is immediately introduced, the stomach being punctured with a tubular needle.

*Sixth Stage.* Flat dressing.

**OPERATIVE SEQUELÆ.**—The gastric opening created in this manner does not allow the gastric contents to escape; a small red rubber catheter may be left in position, closed by means of a peg, which is folded in with the dressings.

#### **Retrograde Catheterization of the Œsophagus.**

In cicatricial stricture of the œsophagus, which cannot be passed by the upper route, retrograde catheterization may be necessary.

#### **EXTERNAL ŒSOPHAGOTOMY.**

External œsophagotomy is performed on a guide, which consists of the end of a curved forceps introduced by the mouth. The mucous membrane of the œsophagus is sutured to the skin, and gastrostomy is proceeded with.

#### **GASTROSTOMY**

*First and Second Stage* as above.

*Third Stage.*—Evisceration of the stomach and incision of the organ. The incision is enlarged by divulsion. I have found no difficulty in passing a long bougie into the cardia, which was pushed up from below, and seized with a curved forceps.



**FIG. 284. THE SAME. FIFTH STAGE.**

The stomach has been drawn beneath a band of the rectus muscle.

*Fourth Stage.*—The loop of a double silk thread is tied to the end of the bougie, to be drawn from above downwards, from the cervical to the gastric orifice. This double thread should be sufficiently long for the abdominal and cervical ends to be tied two by two without any dragging. A catheter

is passed by the mouth as far as the cervical wound; it is then fixed on one of the two threads and drawn into the stomach.



FIG. 285.—RETROGRADE CATHETERIZATION OF THE ESOPHAGUS AFTER EXTERNAL ESOPHAGOTOMY AND GASTROSTOMY.



FIG. 286. THE SAME.

A double silk thread has been fixed on the catheter, and is drawn along the esophagus.

*Fifth Stage.*—Closure of the stomach by purse-string suture. The two esophageal threads are allowed to pass in the centre of this suture, and suture of the gastric serous membrane to the circumference of the abdominal wound.

*Sixth Stage.*—Closure of the lower part of the parietal incision.

*Seventh Stage.*—Flat dressing.

As soon as the patient recovers from the operation one of the threads is used as a guide in the introduction of dilating instruments, whilst the



FIG. 287. THE SAME.

The fixed catheter introduced through the nostril has been drawn with one of the threads as far as the abdominal wound.

second remains knotted in case the first thread breaks or is removed by inadvertence. In such a case a double silk loop is passed by means of the remaining thread, and the same manœuvre is carried out as described above.

#### Closure of a Gastric Fistula.

*First Stage.*—The fistula is circumscribed by two vertical concave incisions. The skin is dissected, and the fistula is closed with an oval-nosed forceps.

*Second Stage.*—Arrangement of the aseptic field and opening the peritoneum.

*Third Stage.*—The fistula is drawn outwards, followed by the stomach. Two elastic forceps are placed on the stomach, the field of operation is surrounded with aseptic compresses, and the fistula is resected.

*Fourth Stage.*—Hemostasis of the stomach walls where necessary, and closure of the orifice by two purse-string sutures. These are fortified, if it be judged necessary, by a sero-serous continuous suture.

*Fifth Stage.*—Toilet of the field of operation, reduction of the stomach, and closure of the abdomen.

#### Gastric Stenosis. Operation on a Bilocular Stomach.

Narrowing of the central portion of the stomach is generally brought about by the retractile cicatrization of an ulcer of the lesser curvature, encroaching upon the anterior and posterior surfaces of the organ. In

certain cases the bilocular shape of the stomach seems to have been anterior to the production of the ulcer, which may develop on the retracted part.

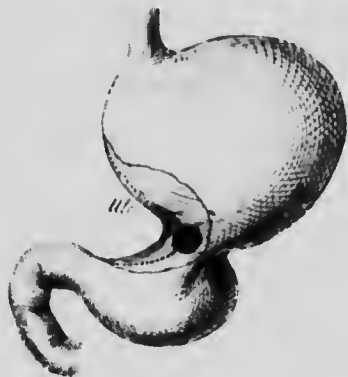


FIG. 288. BILOCULAR STOMACH CAUSED BY CICATRIZATION OF A PERFORATING ULCER.



FIG. 289.—THE SAME. LONGITUDINAL INCISION OF THE STRICTURE AND FIRST LAYER OF SUTURES.

The dotted line shows the second layer.

I observed a case of bilocular stomach with ulcerous stenosis for the first time in January, 1893. Pain was present to the left of the middle line, where a painful induration was observed. Laparotomy revealed that the



FIG. 290.—THE SAME.

The last sero-serous layer is finished.

stomach, attacked by a perforating ulcer, was adherent to the abdominal wall at this point. The abdominal wall was commencing to be perforated. I operated successfully on this case on January 4, 1893.

**Operation—First Stage.**—Incision of the abdominal wall.

*Second Stage.*—Exposure of the stomach and liberation of existing adhesions.

*Third Stage.*—The stomach is brought out of the wound. It is emptied if necessary with a large œsophageal sound.

*Fourth Stage.*—A transverse sero-posterior plan is first made on the side of the lesser curvature, and an analogous plan, if it seems useful, is made on the side of the greater curvature. The stenosed canal is incised longitudinally, and the two gastric lobes are united transversally by two superimposed sero-serous sutures.

*Fifth Stage.*—Toilet of the wound. Suture of the wall.

The topography of the bilocular stomach may vary in different cases. The above technique is followed, according to the different relations of the two gastric cavities and the extent of the indurated tissues, which are not properly disposed to union. Suture must be made on healthy parts of the gastric wall.

#### Partial Resection of the Stomach for Ulcer.

Resection of a small callous ulcer, and excision of a portion of the stomach wall may be necessary on rare occasions. These exceptional interventions are easy for surgeons who habitually practise gastro-enterostomy and pylorotomy. I have on one occasion performed partial resection of the stomach for hæmorrhagic ulcer. This operation gave an excellent result.

The following is a description of an exceptional case:

*Ulcer of the stomach. Resection of the ulcer; cure. Pyloric stenosis produced two and a half years later by a submucous circumpyloric abscess. Gastro-duodenostomy, cure.\**

Madame de C—, aged forty years, had a serious attack of scarlatina ten years previously. A short time afterwards she began to complain of violent gastric pain, and vomited frequently. There was no hæmatemesis. The progressive wasting and gastric intolerance called for surgical intervention which was performed on the 28th of November, 1904.

**Operation.**—The pylorus was healthy and admitted the index finger covered with the stomach tunics. At the lowest point of the greater curvature, 10 centimetres from the pylorus, was a callous ulcer of about 20 millimetres, deeply excavated, and encroaching upon the posterior surface of the stomach. I resected the ulcer after ligaturing all the neighbouring vessels. The stomach was closed *en surjet* (two sero-serous layers).

This operation was followed by complete disappearance of the dyspeptic phenomena, pain and vomiting. The patient gained weight until the spring of 1907. At this epoch she began to complain of slowness of digestion. There was no gastric pain. Soon a considerable dilatation manifested itself, and vomiting commenced. Wasting became rapid, the weight fell 25 kilogrammes in six months. Pyloric obstruction became almost complete, and a fresh intervention became indispensable.

\* *Revue critique de Méd. et de Chir.*, No. 4, p. 73, 1908.

Operation January 28, 1908. No trace of perigastric adhesions remained from the previous operation. A small white cicatrix, which was hardly visible, marked the seat of the old ulcer.

The pylorus when brought outside was found to be considerably thickened, and seemed to be cancerous. Three glands the size of beans were removed from below the pylorus. The ruddy tinge of the serous membrane led me to incline, in spite of the subjacent induration, towards an inflammatory lesion. The stomach and duodenum were closed with two elastic forceps, and I incised the pylorus longitudinally with the thermo-cautery. The pyloric canal was completely obstructed with swollen and tumefied mucous membrane. Upon the two edges of the section a caseous focus made its appearance, 3 or 4 millimetres in diameter, which emptied gradually. A curved grooved sound was introduced into this tract, and a circular submucous abscess was found, following upon a tiny ulcer of the pylorus. A fragment 12 millimetres thick was taken for histological examination, and I performed gastro-duodenostomy by my usual method, vertical incision of the stomach, then of the duodenum beyond the two ends of the pyloric section, reunion of the posterior, then the anterior edges of these incisions by two sero-serous sutures. Operative sequelæ were quite satisfactory. On the 28th of February the weight of the patient had increased by 3 kilogrammes. In May she weighed 47.500 kilogrammes. This observation is the more interesting since the husband of the patient, a distinguished physician, was able to record the symptoms. Dr. de C—— was present at both operations. At the first operation the question was discussed of completing the resection of the ulcer by a gastro-duodenostomy. The pylorus admitted the index finger covered with gastric tunics; and the resection of the ulcer, which was complete, seemed sufficient to cause the disappearance of the phenomena consequent on the reflex contraction of the pylorus. This prevision was exact. Resection of the ulcer was followed by complete disappearance of the contraction of the pylorus and the dyspeptic symptoms. When the vomiting recommenced after two and a half years Dr. de C—— at first thought that the ulcer had recurred. He noticed, nevertheless, that the symptoms were different from those before the first operation. In 1904 the pain was very pronounced, whilst at the end of 1907 the patient only suffered inconvenience owing to gastric repletion. The objective signs were then not those of a painful ulcer complicated by gastric intolerance, but those of true pyloric stenosis, where the stomach rejects its contents painlessly by the œsophagus at the moment when they should pass through the pyloric ring.

Diagnosis of pyloric stenosis being certain, we were obliged to reserve possibility of cancerous degeneration.

At first sight the pylorus appeared to us to be attacked with stenosis, due to a neoplasm; the neighbouring glands were grey and very much hypertrophied. It is in difficult cases such as this that the necessity for the surgeon to be familiar with the most delicate problems of anatomical pathology is appreciated to the full. The exposure of the sub-

mucous abscess to the inexperienced eye might be mistaken for a neoplastic lesion. Indeed, the thickening and induration of the mucous membrane at first led us to consider the case to be one of cancer. This error would have necessitated a pyloric resection, a more serious and less favourable operation than gastro-duodenostomy, which is the operation of choice in cases of simple pyloric stenosis. Histological examination confirmed the macroscopical appearance. Section of the pylorus revealed a submucous abscess containing alimentary debris, and surrounded by inflammatory oedema of the mucous and muscular coats. The glands were simply hypertrophied. This case of pyloric obstruction by a circular submucous abscess is quite exceptional.

The only case of a like nature which I can remember, was a case of temporary obstruction of the first portion of the duodenum by the evolution of a calculous cholecystitis. The patient, aged forty-two, presented all the signs of pyloric stenosis. She had experienced several attacks of hepatic colic. I diagnosed compression of the duodenum by the inflamed and possibly suppurating gall-bladder. The patient, who preferred death to operation, became very cachectic, and succeeded in expelling her calculi. She is now aged sixty years, and has felt nothing since this almost fatal attack.

#### OPERATIONS FOR STENOSIS OR SPASMODIC STENOSIS OF THE PYLORUS.

##### **Pyloroplasty.**

**HISTORY.** Unciform resection of the pylorus was invented by Czerny in 1882, to cure a case of fibrous stenosis. In 1886 Heinecke and Mickulicz invented the operation of pyloroplasty.

The contracted pylorus was incised along its anterior surface, and reunion was made perpendicularly to its axis. These two procedures cause the formation of mucous folds behind, which close the orifice thus created. These operations are only of historic interest.

##### **Gastro-Duodenostomy with Section of the Pylorus.**

**DOYEN'S OPERATION.**—This operation, which I invented in 1899, is applicable to spasmodic or fibrous stenosis of the pylorus when there is no extensive cicatrization nor adhesions. Indeed, anastomosis between the stomach and the extraperitoneal portion of the duodenum is only possible if the latter is free and mobile, and if there be no inflammatory adhesions. When gastro-duodenostomy is impossible a gastro-jejunostomy is performed.

**Operation—First Stage.**—Median subxiphoid laparotomy.

**Second Stage.** The prepyloric antrum, the pylorus, and the duodenum are brought outside the wound. In this way it can be judged if the duodenum be sufficiently mobile to allow of the operation.



*Third Stage: Gastro-Duodenostomy.*—A vertical sero-serous suture is made, beginning below the pylorus, and ending 3 or 4 centimetres lower, uniting the gastric and duodenal surfaces.

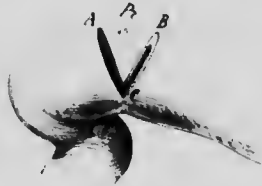


FIG. 291. CONEFORM RESECTION OF THE PYLORUS.

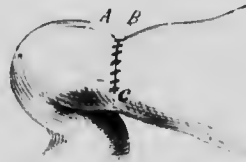


FIG. 292. —THE SAME. TRANSVERSE RESECTION.

A second vertical sero-serous suture is then made parallel to the first. This layer is optional. Elastic forceps are now placed on the stomach and duodenum to close them above and below the field of operation, and



FIG. 293. PYLOROPLASTY. LONGITUDINAL INCISION.



FIG. 294.—THE SAME. PLACING THE FIRST THREAD.

the duodenum and stomach are incised vertically 3 millimetres from the second deep suture.

The arterioles which bleed are ligatured. A curved forceps is passed



FIG. 295. THE SAME.

The suture is almost finished.

through the pylorus, and its anterior wall is incised transversely. A mucomucous suture is then made below the pylorus, and the two anterior sero-serous layers are then proceeded with. The ends of the two

anterior sutures are tied to the corresponding ends of the posterior sutures.

A gastro-duodenal orifice is thus obtained whose calibre is equal to the old pyloric orifice with the gastro-duodenal section in addition. In Figs. 297 and 298 the extent of this new opening can be appreciated. It functions as a true pylorus.

*Fourth Stage.*—Reduction of stomach and duodenum.

*Fifth Stage.*—Toilet of the wound and suture of the abdominal wall.

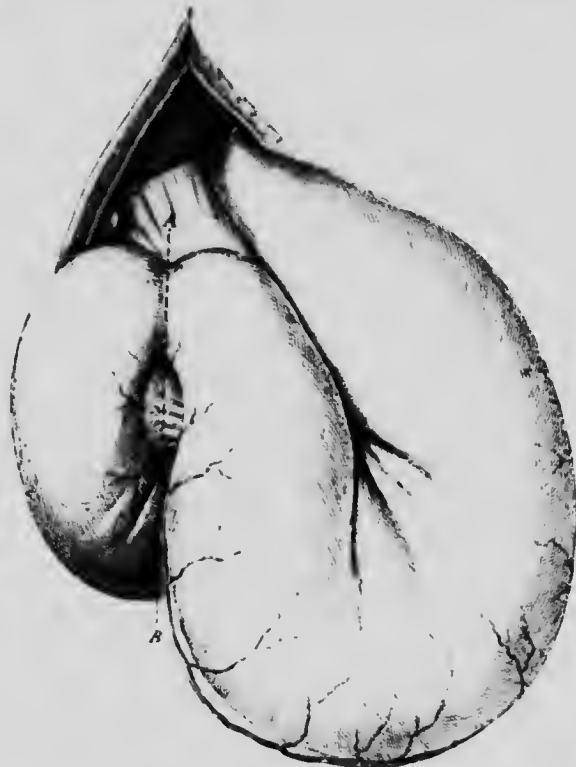


FIG. 296.—GASTRO-DUODENOSTOMY WITH SECTION OF THE PYLORUS. VIEW OF THE FIELD OF OPERATION WHEN THIS OPERATION IS POSSIBLE.

**OPERATION RESULTS.** The patient should drink after the first day small quantities of iced Vichy water. Feeding commences at the end of the first week. Gastro-duodenostomy with section of the pylorus by this method gives remarkable results in all cases of dilatation of the stomach.

The gastro-duodenal orifice is from 35 to 40 millimetres long, and is as lowly placed as is possible. This orifice never becomes contracted.



FIG. 297. THE SAME. THIRD STAGE: VERTICAL INCISION OF THE DUODENUM AND THE STOMACH.

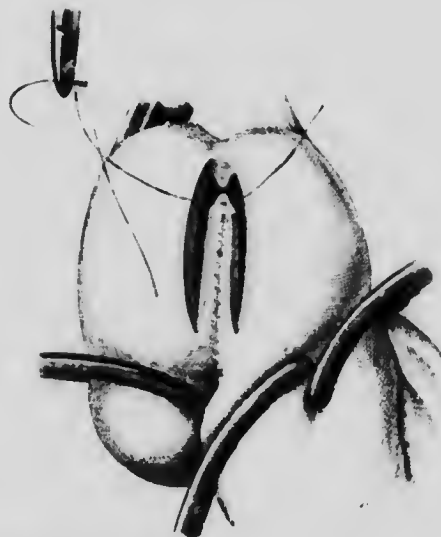


FIG. 298. THE SAME. COMMENCEMENT OF THE FIRST MUSCULO-MUCOSA POSTERIOR SUTURE.

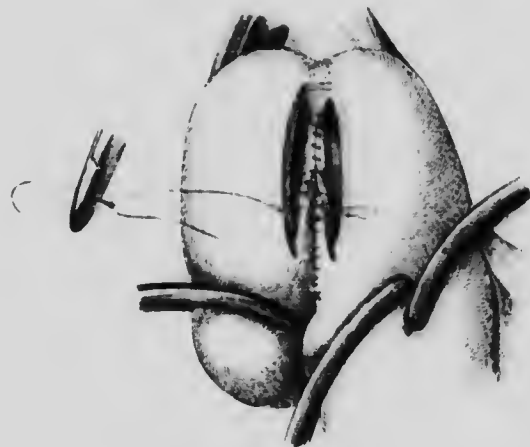


FIG. 299. THE SAME.

The second posterior musculo-mucous suture is almost finished.

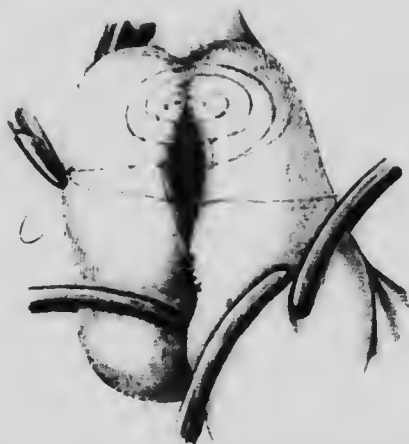


FIG. 300. THE SAME. FIRST ANTERIOR SUB-SEROUS LAYER.

The suture is not drawn tight in order to show the passage of the needle.

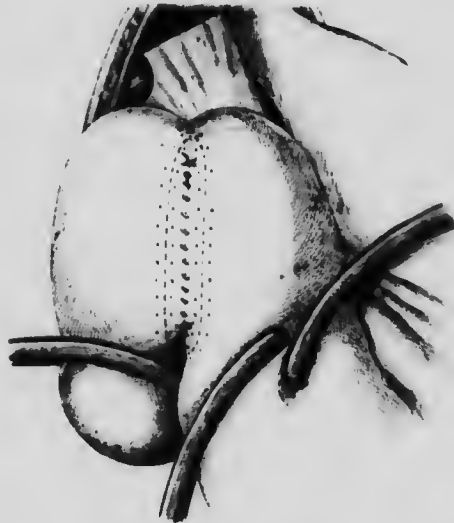


FIG. 301. -THE SAME.

The position of the second sero-serous layer is shown by the dotted line.



FIG. 302. FRONTAL SECTION OF PYLORUS AFFECTED WITH SPASMODIC STENOSING CONTRACTURE.

FIG. 303. FRONTAL SECTION OF NEW PYLORUS AFTER DOTEN'S GASTROPLASTY.



FIG. 304.—SAGITTAL SECTION OF STENOSED PYLORUS.  
The two lines show the section of pylorus and duodenum.



FIG. 305.—SAME SAGITTAL SECTION, SHOWING THE POSITION OF THE SUTURES AFTER GASTRO-DUODENOSTOMY BY DOYEN'S METHOD.

#### Gastro-Jejunostomy.

When the pylorus is thickened or very adherent, and when the duodenum is not sufficiently mobile, gastro-jejunostomy must be performed.

**HISTORY.**—Gastro-jejunostomy was first performed by Woelfler, the student of Billroth, in 1881, in a case of cancerous stenosis of the pylorus where pylorotomy seemed to be impracticable.

Rydygier applied this operation in 1884 to non-cancerous stenosis of the pylorus.

Woelfler drew a loop of the small intestine in front of the transverse colon in order to anastomose it to the anterior surface of the stomach. Anterior gastro-enterostomy has been unsuccessful in a number of cases; the weight of the transverse colon and omentum dragged upon the anastomosed loop, and the defective position of the orifice often caused a reflux flow of the stomach contents towards the upper end of the small intestine, obstructive phenomena developed, and the patient succumbed (Fig. 307).

Von Hacker, in 1885, no longer anastomosed an intestinal loop to the anterior face of the stomach, but anastomosed the origin of the jejunum to the posterior surface of the stomach, which was exposed by tearing through the transverse mesocolon. Von Hacker's operation was a considerable advance in the surgery of the stomach, and his operation has become the chosen procedure in gastro-jejunal anastomosis.

Gaboulay (1892), seeking to avoid the reflux of the stomach contents towards the duodenum after anterior gastro-enterostomy, proposed to perform a derivative jejuno-jejunal anastomosis between the ascending and descending loops. This procedure prolongs the operation for ten to

fifteen minutes, but it prevents with certainty the reflux of gastric fluid towards the duodenum.



FIG. 306. ANTERIOR GASTRO-ENTEROSTOMY.

The stomach contents and the bile should both follow the direction of the arrow.



FIG. 307. RESULT OF BADLY PERFORMED ANTERIOR GASTRO-ENTEROSTOMY: REFLUX OF THE GASTRIC CONTENTS INTO THE DUODENUM, AND STRANGULATION OF THE TRANSVERSE COLON.



FIG. 308. ANTERIOR GASTRO-ENTEROSTOMY.



FIG. 309. SHOWING SITUATION OF THE GASTRIC ORIFICE.

In 1892, in order to obtain the same effect, I fixed the jejunal loop above the orifice to the anterior surface of the stomach, in such a way as

to assure to it a descending direction from left to right and from above downwards.

Roux in 1893 proposed, in order to obtain the same result, a Y-shaped gastro-jejunostomy by double terminal implantation.

In 1892 I proposed a special technique for anterior gastro-enterostomy. I began by introducing the whole of the great omentum, lifted in front of the transverse colon, into the posterior cavity, which was opened by means of breaking through the transverse mesocolon, then I gave the jejunal loop a decided descending direction in anastomosing it to the anterior surface of the stomach.

I pass over other procedures, which have small interest, especially anatomical buttons and plates, including the anastomotic eyelet and sliding forceps which I had constructed in 1898, since their employment is not to be compared with the method of suture.

A description is generally given of *anterior* and *posterior* gastro-enterostomy. These two denominations are defective. For instance, a posterior gastro-enterostomy may be performed by passing the intestinal loop in front of the transverse colon, and piercing the gastro-colic omentum. In the same way successive tearing of the transverse mesocolon, followed by tearing through the gastro-colic omentum, allows performance of anterior trans-mesocolic gastro-enterostomy.

#### 1. Posterior Trans-Mesocolic Gastro-Jejunostomy.

The most rapid procedure, and that which best assures the functioning of the new pylorus, is the anastomosis between the posterior surface of the stomach and the superior portion of the jejunum, after perforation of the transverse mesocolon. This is the chosen procedure when the stomach, transverse colon, and commencement of the jejunum are mobile and free from adhesions.

**Operation** *First Stage.*—Median subxiphoid laparotomy reaching to 3 or 4 centimetres below the umbilicus.

*Second Stage.*—Evisceration of the transverse colon and the pre-pyloric region of the stomach, followed by the initial loop of the jejunum. This loop is fixed outside by placing a ringed forceps not too tightly fixed on the mesentery. The mesocolon is then perforated at the centre of the largest vascular arcade. This orifice is enlarged by division. Small vessels which bleed are ligatured, and the posterior surface of the stomach is drawn through this orifice, which is fixed to it by a horseshoe-shaped suture. The suture is commenced behind on the left; it is continued forwards, where it unites the greater curvature of the stomach to the insertion of the transverse mesocolon to the large intestine, and is terminated on the right close to the lesser curvature. This suture should be very loose and should not be continued too far, risk would be run of strangulating the stomach by an almost circular and tight suture.

*Third Stage.*—The jejunum is sutured transversely to the stomach at the centre of the opening in the mesocolon. The suture should be made in



the case of the jejunum about 6 to 8 centimetres below the ligament of Treitz.

I perform it *transversely*. The first sero-serous layer 35 to 40 millimetres long and a superimposed second layer. Two large elastic forceps are then placed on the stomach to isolate the region of the anastomosis and two elastic forceps are also placed on the jejunum, one above, below, right and left, as shown in the photograph, to protect the peritoneum.



FIG. 310. MEDIAN SAGITTAL SECTION, SHOWING POSTERIOR EPIPLIC CAVITY, THE TRANSVERSE MESOCOLON, AND BELOW IT THE ORIGIN OF THE DUODENUM.



FIG. 311. THE SAME.

The transverse mesocolon is perforated, and the edges of the orifice are fixed to the posterior surface of the stomach.

The stomach, and then the intestine, are opened with the thermo-cantery 3 millimetres from the second layer of suture, for a distance of 30 to 35 millimetres. Gastric and intestinal liquids are carefully sponged, and bleeding arterioles are ligatured.

A third posterior muco-mucous layer of suture is then made, which prevents any possibility of narrowing of the gastro-intestinal orifice. The two superficial sero-serous layers have now to be made. These commence and finish where the two posterior layers commence and finish. They



FIG. 312. THE SAME.

The origin of the jejunum has been anastomosed with the posterior surface of the stomach.



FIG. 313. THE SAME.

The operation is completed. The arrows denote the direction of the bile and that of the stomach contents.



FIG. 314. POSTERIOR TRANSVERSE MESOCOLIC GASTROENTEROSTOMY. GREAT VASCULAR ARCADE OF THE TRANSVERSE MESOCOLON.



FIG. 315. THE SAME.

The mesocolon has been perforated, the stomach herniates through the orifice; below is the first loop of the jejunum.



FIG. 316. THE SAME. SUTURE OF THE GREATER CURVATURE OF THE STOMACH TO THE EDGES OF THE PERFORATION IN THE MESOCOLON.





FIG. 317. THE SAME. FIRST POSTERIOR SERO-SEROUS SUTURE.

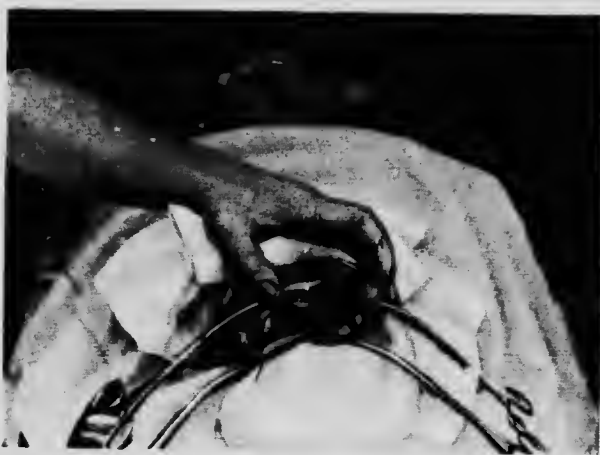


FIG. 318. THE SAME.

The two posterior sero-serous sutures are finished. The stomach and the jejunum are incised with the thermo-cautery.



FIG. 319. THE SAME. FINISHING THE POSTERIOR MUCO-MUCOS SUTURE.



FIG. 320. THE SAME.

The anastomosis is finished. The last anterior sero-serous suture is observed.

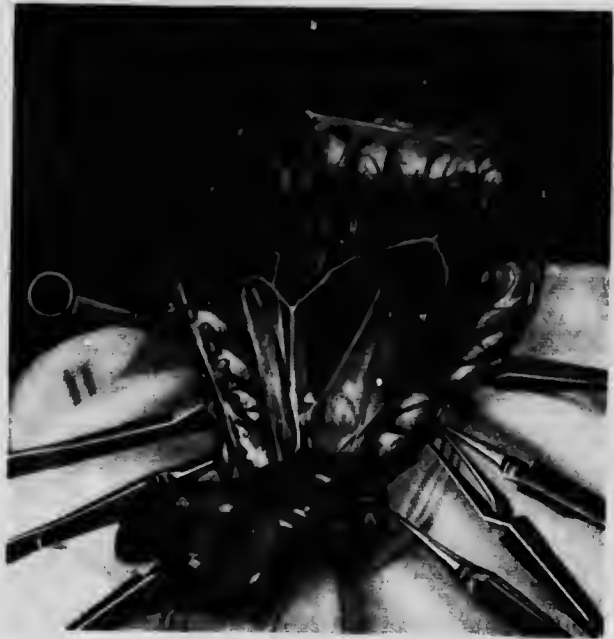


FIG. 321. POSTERIOR GASTRO-ENTEROSTOMY. ANOTHER CASE. VIEW OF THE GREAT VASCULAR ARCADE OF THE TRANSVERSE COLON.



FIG. 322.—THE SAME.

The stomach is drawn through the perforation of the transverse mesocolon.



FIG. 323.—THE SAME. SUTURE OF THE EDGES OF THE ORIFICE IN THE MESOCOLON TO THE STOMACH TUNICS.

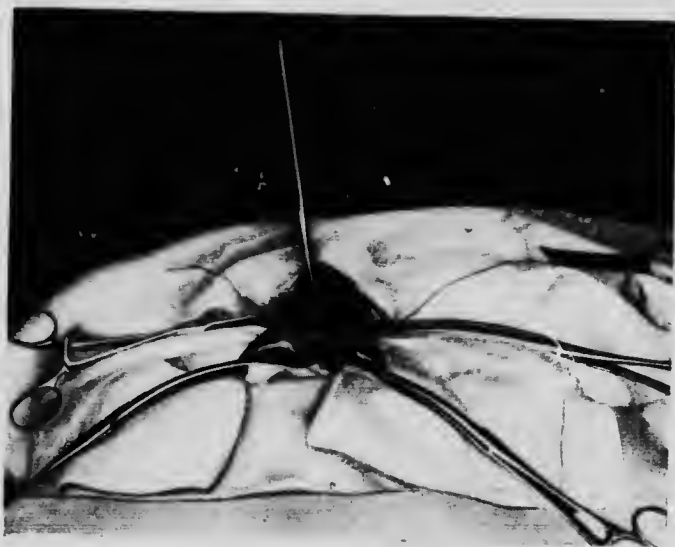


FIG. 324.— THE SAME.

The second posterior sero-serous suture is finished. Application of elastic forceps for coprostasis. Opening stomach and duodenum.



of the posterior sutures are tied respectively to the ends of the anterior sutures.

The superficial compresses and the forceps are removed after the first anterior sero-serous suture is finished, and the condition of the anastomosis is examined.

The jejunum should descend in a vertical direction. If the photographs 317 and 325 be examined, it would seem that a terminal implantation had been performed.

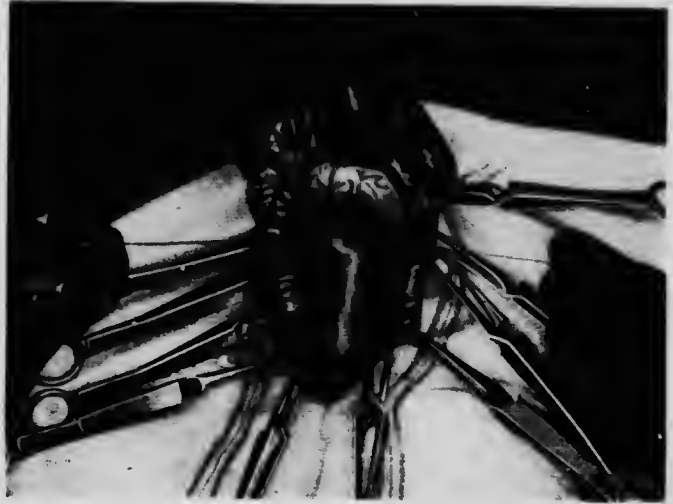


FIG. 325. —THE SAME.

The anastomosis is finished. The jejunum is seen to be implanted directly upon the stomach.

I lay great stress upon the position of the jejunum, which is very clearly shown in the illustrations. Finally, the second anterior sero-serous layer is made. Should the evacuation of the stomach into the jejunum seem uncertain to be carried out favourably, a derivative jejunostomy is immediately performed (see below).

*Fourth Stage.*—Toilet of the field of operation: reduction of stomach and duodenum.

*Fifth Stage.*—Closure of the abdomen.

#### ULCER OF THE DUODENUM. CLOSURE OF THE PYLORUS.

When gastro-jejunostomy is performed to cure a duodenal ulcer the operation is completed by closure of the pylorus, using two superimposed sutures placed longitudinally and transversely, in such a way as to prevent any passage of acid stomach contents over the ulcerated region.

**OPERATIVE SEQUELÆ.**—These are generally quite simple. This operation assures free evacuation of the stomach contents into the jejunum, and prevents reflux of bile, this liquid following the posterior wall of the



FIG. 326.—CLOSURE OF THE PYLORUS BY INVAGINATION.



FIG. 327.—CLOSURE OF THE PYLORUS.

small intestine. Patients after operation should drink iced Vichy water in small quantities. Alimentation commences between the fifth and eighth day.

### 2. Anterior Trans-Mesocolic Gastro-Enterostomy.

If the posterior surface of the stomach be indurated and adherent, the vessels of the gastro-colic omentum may be divided between several series of ligatures in order to draw the anterior surface of the stomach through the opening of the transverse mesocolon. An anterior trans-mesocolic gastro-enterostomy can thus be performed. This operation is only performed in exceptional cases.

### 3. Anterior Gastro-Enterostomy, with Retrofixation of the Great Omentum and Gastric Colopexy.

**DOYEN'S OPERATION.**—This operation is performed in cases where the condition of the transverse mesocolon and the origin of the jejunum do not allow of trans-mesocolic posterior gastro-enterostomy, which is the preferable procedure.

**Operation—First Stage.**—The same incision is made, ending slightly below the umbilicus.

**Second Stage.**—Evisceration of the pyloric region of the stomach and the transverse colon, and discovery of the first loop of the jejunum as above.

**Third Stage: Retrofixation of the Great Omentum.**—Perforation of the gastro-colic omentum and opening of the posterior cavity of the omentum (greater sac), into which the whole of the epiploic apron is introduced. The transverse colon is then fixed for the necessary length (12 to 15 centimetres) to the greater curvature of the stomach. The colon thus is slightly turned on its axis in an upward and forward direction.

This union of the transverse colon with the stomach after the introduction of the great omentum into the posterior cavity prevents any ultimate dragging on the anastomosed jejunal loop.



FIG. 328. —DIAGRAM SHOWING THE FORAMEN OF WINSLOW, THE POINT AT WHICH THE NEW PYLORUS IS TO BE FORMED, AND THE PERFORATION OF THE GASTRO-COLIC OMENTUM.

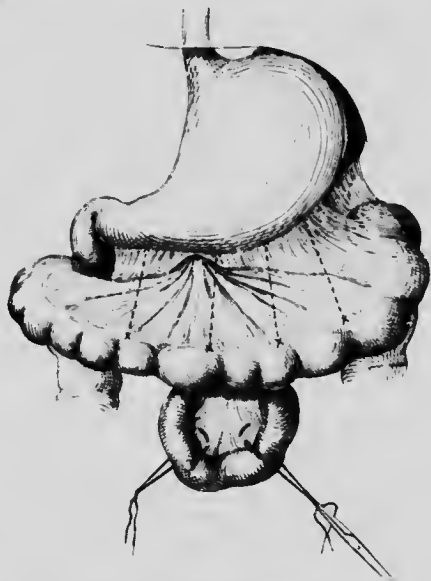


FIG. 329. — THE SAME. SCHEMATIC FIGURE SHOWING THE INTRODUCTION, INDICATED IN FIGURE 328, INTO THE POSTERIOR CAVITY.

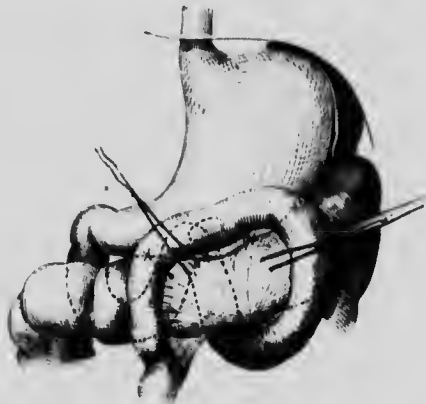


FIG. 330.—THE SAME.

The anterior gastro-enterostomy is finished. The transverse colon is sutured to the greater curvature of the stomach. The anastomosed jejunum has a downward direction.



FIG. 331.—DIAGRAMMATIC FIGURE SHOWING TRANSVERSE ANASTOMOSIS OF THE JEJUNUM WITH THE ANTERIOR SURFACE OF THE STOMACH, AND THE PLACE OF ELECTION FOR THE DERIVATIVE JEJUNO-JEJUNAL ANASTOMOSIS.

*Fourth Stage: Gastro-Jejunostomy.*—The most easily movable loop, at a certain distance below the ligament of Treitz, is chosen for gastro-jejunos-  
tomy—i.e., the loop with the longest possible mesentery. The anastomosis  
can be made quite conveniently 25 or 30 centimetres below the origin of  
the jejunum. The origin of the jejunum being made out, it is easy to  
arrange the chosen loop in such a way that the direction of the intestinal  
contents shall be made from left to right and from above downwards.



FIG. 332.—THE SAME.

The gastro-enterostomy-lia completed: derivative jejuno-jejunos-  
tomy allowing the bile to flow into the intestine instead of mounting towards the stomach.

Suture is made transversely, in the interval between the two groups  
of parietal vessels; a posterior sero-serous layer is made, followed by a  
second layer parallel to the first. Elastic forceps are applied on the stomach  
and jejunum; opening is made with the thermo-cautery, hæmostasis is  
assured, and the posterior muco-mucous suture is applied. The operation  
is terminated by the two anterior sero-serous layers.

DERIVATIVE JEJUNO-JEJUNOSTOMY.

*Fifth Stage: Jejunio-Jejunostomy.*—In former times I simply sutured the jejunal loop to the stomach in a descending and very oblique situation, as represented in Fig. 330.

This procedure is marred by the possibility of a reflux of bile into the stomach. This drawback may be averted in a sure way by completing jejunio-gastric anastomosis by a derivative jejunio-jejuno-stomy. As soon as the gastro-jejuno-stomy is completed the stomach and colon are



FIG. 333.—ANTERIOR GASTRO-ENTEROTOMY (HOYEN'S OPERATION). INTRODUCTION OF THE GREAT OMENTUM INTO THE LESSER SAC THROUGH AN ORIFICE IN THE GASTRO-COLIC OMENTUM.



FIG. 334.—THE SAME

The colon is swung upwards, and its inferior border has been sutured to the lower part of the greater curvature of the stomach.

returned, and a vertical jejunio-jejuno-stomy is performed. This anastomosis should be made 12 or 15 centimetres below the gastric orifice, when the ascending and descending jejunal loops are in nearest juxtaposition.

This jejunio-jejuno-stomy requires but eight to ten minutes to accomplish. The orifice should have a length of 30 to 35 millimetres. The two posterior sero-serous layers are first made; coprostatic forceps are then applied, one above and one below the position of the anastomosis, each forceps com-

pressing the two intestinal loops at the same time; double incision of the intestinal walls with the thermo-cantery is then made, and the two anterior sero-serous layers are made.

*Sixth Stage.*—Reduction of the intestine and closure of the abdomen.

#### 4. Antecolic Posterior Gastro-Jejunostomy.

When a cancer invades at once the whole of the anterior surface of the stomach and duodenum, and extends as far as the region of the ligament of Treitz and the transverse mesocolon, it is impossible to perform either



FIG. 335.—THE SAME.

The gastro-jejunal and derivative jejuno-jejunal anastomoses are finished.



FIG. 336. THE SAME.

The arrows show the circulation of stomach contents and bile.

a posterior trans-mesocolic gastro-enterostomy or an anterior antecolic gastro-enterostomy. In a case of this nature I adopt the following method, which I devised in 1892: I incise the gastro-colic omentum transversely, dividing the principal vascular groups between two ligatures. By this orifice the whole of the posterior surface of the stomach is exposed. The great omentum is raised, and introduced by this orifice, and the transverse colon is sutured to the posterior surface of the stomach. I then anastomose the lowest portion of the posterior surface of the stomach, either with the first loop of the jejunum or with a jejunal loop 30 or 40 centimetres distant



FIG. 337.—DERIVATIVE JEJUNO-JEJUNOSTOMY. FIRST POSTERIOR SERO-SEROUS LAYER.



FIG. 338.—THE SAME.

The second posterior sero-serous layer is finished. Incision of the two adjacent loops.  
The coprostatic forceps are hidden by the compresses.





FIG. 339.—THE SAME. LAST ANTERIOR SERO-SEROUS LAYER.  
The jejunostomy is finished.



FIG. 340.—THE SAME. RELATIONS OF THE POSTERIOR SURFACE OF THE STOMACH,  
THE TRANSVERSE MESOCOLON, AND THE JEJUNAL LOOPS AFTER TRANS-MESO-  
COLIC GASTRO-JEJUNO-JEJUNOSTOMY.

from the ligament of Treitz, and in the latter case I perform a derivative jejuno-jejunostomy.



FIG. 341.—ANTECOLIC GASTRO-JEJUNOSTOMY. INCISION OF THE GASTRO-COLIC OMENTUM AND EXPOSURE OF THE POSTERO-INFERIOR SURFACE OF THE STOMACH.



FIG. 342.—THE SAME.

The stomach is swung upwards. Suture of the transverse colon to its posterior surface. Posterior antecolic gastro-jejunostomy and derivative jejuno-jejunostomy.

When the operation is completed the great omentum is in the posterior cavity, and the transverse colon, rotated 45 degrees on its axis, as in anterior

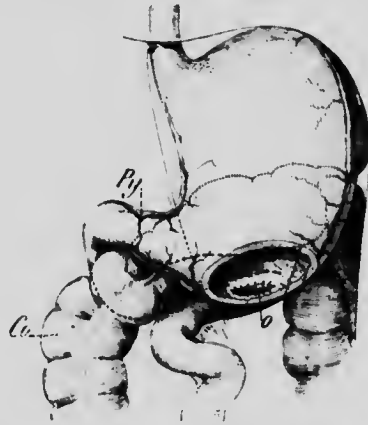


FIG. 343.—SCHEMATIC FIGURE SHOWING THE RELATIONS OF THE TRANSVERSE COLON AND JEJUNUM AFTER POSTERIOR ANTECOLIC GASTRO-ENTEROSTOMY.



FIG. 344.—MEDIAN SAGITTAL SECTION, SHOWING THE RELATIONS OF THE GREAT OMENTUM AND THE TRANSVERSE COLON IN THE POSTERIOR EPIPLOIC CAVITY AND THE POSTERIOR SURFACE OF THE STOMACH AFTER POSTERIOR ANTECOLIC GASTRO-JEJUNOSTOMY.

The arrows indicate the circulation in the jejunum.

gastro-enterostomy with retrofixation of the great omentum, is sutured to the central part of the posterior surface of the stomach. The jejunum is attached to the lowest part of the posterior surface of the stomach in front of the transverse colon. The stomach contents pass into either of the two jejunal loops, and the descending circulation is assured, owing to the derivative jejuno-jejunal junction (see Fig. 344, where an arrow marks the direction of the bile into the lower end of the intestine).

This special technique is only indicated in the exceptional cases, where neither posterior trans-mesocolic gastro-enterostomy nor anterior antecolic gastro-enterostomy can be performed. It is, therefore, of the greatest value, since it allows of the creation of a derivative gastro-jejunal junction in patients whose lesions are too extensive for the employment of the usual procedures.

### RESECTION OF THE PYLORUS.

#### Typical Pylorectomy.

**HISTORY.**—The first operation designed to remedy cancerous stenosis of the pylorus was a typical pylorectomy with direct anastomotic suture of the stomach to the duodenum. This operation was attempted for the first time by Péan in 1879. The patient died. Billroth, on the other hand, cured his first patient (February 28 1881). The first pylorectomies lasted



FIG. 345.—TYPICAL PYLORECTOMY PLAN OF THE GASTRO-DUODENAL SUTURE "EN RAQUETTE."

several hours, but a certain number of cases were cured. Billroth soon found that direct anastomotic suture of stomach to duodenum was very difficult in cases where the tumour was of large proportions. The gastric wound was much larger than the duodenal orifice, and the racquet suture necessary in such a case was very defective, owing to the possibility that the point of convergence of the longitudinal and circular sutures might perforate, and cause fatal peritonitis.

**Pylorectomy combined with Gastro-Enterostomy.**

Billroth designed in 1885, in a case of extensive tumour, an operation which completely closed the stomach and duodenum, and in order to evacuate the stomach he performed a gastro-jejunosomy.



FIG. 346.—PYLORECTOMY COMBINED WITH GASTRO-ENTEROSTOMY. PLAN OF RESECTION OF THE TUMOUR. COPROSTASIS BY DOYEN'S ELASTIC FORCEPS (1895).

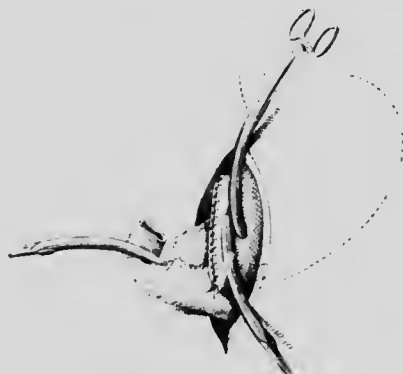


FIG. 347.—THE SAME.

The stomach is closed by a double sero-serous suture.

This triple operation—closure of the stomach, closure of the duodenum, and gastro-jejunosomy—was a lengthy proceeding, lasting three, four, and even six hours.

The author's improved methods for closing the stomach and duodenum have reduced the time occupied by the operation of pylorotomy combined with gastro-enterostomy to a minimum of forty minutes and a maximum of one hour and a half. Pylorotomy combined with gastro-enterostomy.

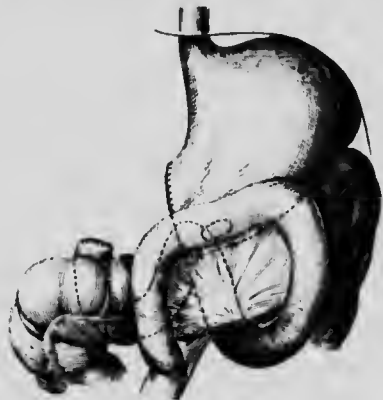


FIG. 348.—THE SAME.

The stomach and duodenum have been closed. Anterior gastro-jejunostomy (1895).



FIG. 349.—PYLORECTOMY FOR CANC. 'RUSHING THE DUODENUM.

when carried out in the method I will now describe, is the best operation for the extirpation of the pylorus. I omit the description of direct implantation of the intestine into the stomach, which is very inferior to lateral implantation.

**Pylorotomy combined with Gastro-Jejunostomy.**

**DOYEN'S METHOD.**

**Operation—First Stage.**—Median subxiphoid incision reaching 3 or 4 centimetres below the umbilicus.

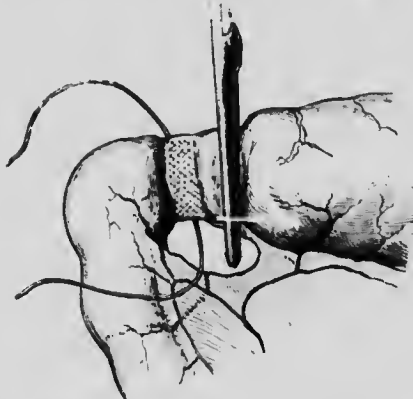


FIG. 350.—PYLORECTOMY WITH GASTRO-ENTEROSTOMY (DOYEN'S OPERATION). CRUSHING THE DUODENUM.

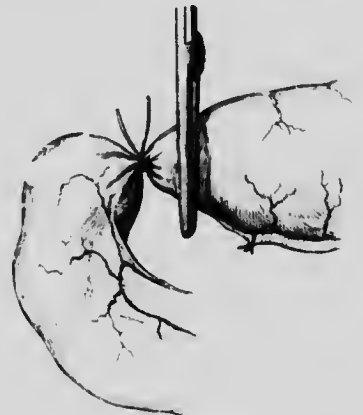


FIG. 351.—THE SAME. The forceps is placed below the tumour. Ligature of the duodenum in the groove formed by écraseur.



FIG. 352.—THE SAME. ASPECT OF THE DUODENUM AFTER PLACING THE FIRST PURSE-STRING SUTURE.



FIG. 353.—THE SAME. The purse-string ligature is tied; it covers in the small stump of the ligature *en masse*.

**Second Stage.**—Evisceration of the cancerous pylorus, transverse colon, and omentum, and search for the first loop of the jejunum. It is easy to judge if the cancerous tumour is sufficiently localized to justify extirpation.

Generally the cancer stops at the level of the pylorus, and the first portion of the duodenum is healthy. The region of the lesser curvature must be examined with care; in fact, pylorotomy is impossible if the cancer extends as far as the cardia, and if the gastro-hepatic omentum be invaded. On the other hand, if the cancer has left the lesser curvature intact, and invades a certain portion of the greater curvature, the operation is possible.

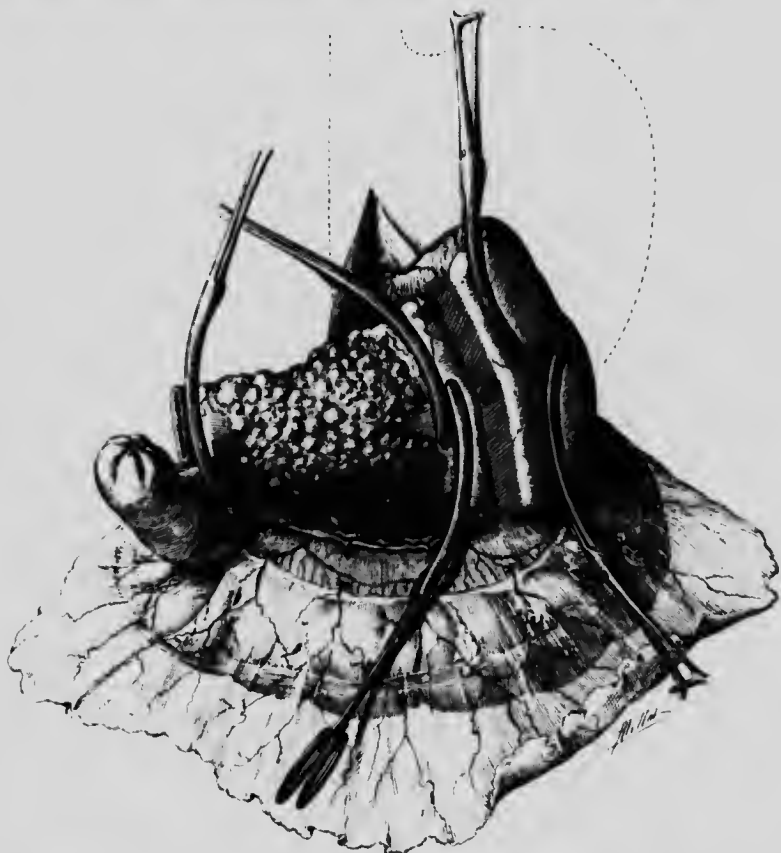


FIG. 354.—PYLORECTOMY WITH GASTRO-ENTEROSTOMY (DOYEN'S OPERATION).

The duodenum has been ligatured and detached from the stomach. Clamping the stomach above the tumour.

Widely extensive operation is useless, for it causes a high mortality, and is generally followed by a recrudescence of the cancerous infection. Antineoplastic vaccination being the only treatment for gastric cancer which is truly efficacious, I consider that it is useless to attempt pylorotomy when the stenosing tumour is very extensive. It is preferable in such a



case to perform a derivative gastro-jejunosomy and combat the extension of the cancer by means of the vaccine. This combination of derivative anastomosis and vaccination by cytolasé gives, even in hopeless cases, a remarkable series of durable cures.



FIG. 355.—LIGATURE "EN MASSE" OF THE STOMACH.

A safety suture is passed through the muscular coat in order to fortify the first ligature.



FIG. 356.—SECTION OF THE FIRST LIGATURE "EN MASSE" OF THE STOMACH PLACED IN THE GROOVE OF THE ÉCRASEUR.



FIG. 357.—THE SAME. SECTION OF THE STOMACH AT THE SAME POINT AFTER PLACING THE SECOND SAFETY SUTURE.

*Third Stage.*—Isolation of the tumour. Crushing and ligature of the duodenum and stomach. The omentum is perforated above and below

the tumour. The vasular pedicles are crushed with the small model *écraseur*, and are ligatured with No. 5 silk. A forceps is placed on each on the side of the tumour, and they are severed between the forceps and the ligature.

The duodenum is crushed beyond the tumour with the large model *écraseur*, as close as possible to the tumour without encroaching on the



FIG. 358.—POSITION OF THE FIRST PURSE-STRING SUTURE.



FIG. 359.—POSITION OF THE SECOND PURSE-STRING SUTURE.



FIG. 360.—SECTION OF THE STOMACH, SHOWING EXCLUSION OF THE LIGATURED STUMP BELOW THE TWO SERO-SEROUS PURSE-STRING SUTURES.

duodenum, which should be closed above the head of the pancreas. A ligature is placed in the groove of the *écraseur*, and a forceps is applied on the side of the stomach. Section is made between the forceps and the ligature, care being taken to avoid escape of the stomach contents, and a second safety ligature is placed on the side of the duodenum on the small stump. The gastric stump is enveloped in a large compress, which is fixed by means of a second forceps.

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The stomach is then pushed to the left. It is crushed above the tumour, after two large elastic forceps have been placed above it, and it is ligatured in the groove formed by the *écraseur*.



FIG. 361.—CLOSURE OF DUODENUM BY A PURSE-STRING SUTURE.



FIG. 362.—LIGATURE "EN MASSE" OF THE STOMACH IN THE GROOVE FORMED BY THE *ÉCRASEUR*.

This stage of operation, comprising the crushing and ligation of the stomach, must be carried out with the greatest care. My own model of *écraseur* alone allows of proper regulation of the hands' effort, and avoids



FIG. 363.—FIRST PURSE-STRING SUTURE.

The stump of the ligature *en masse* is pushed in with a forceps.



FIG. 364.—COMPLETE CLOSING OF THE STOMACH BY THE SECOND PURSE-STRING SUTURE.

tearing the muscular coat to too great an extent should this be hypertrophied and friable. I crush progressively from above downwards, then from below upwards, and I ligature in the groove formed by the *dérasseur*,



FIG. 365. ALMOST COMPLETE GASTRECTOMY FOR CANCER (DOYEN'S .00).  
LUXATION OF THE TUMOUR OUTSIDE THE ABDOMEN.



FIG. 366.— THE SAME. PERFORATION OF THE GASTRO-HEPATIC OMENTUM AND ISOLATION OF THE DUODENUM, WHICH IS LENGTHENED BY THE PROLAPSE OF THE TUMOUR.



FIG. 367.—THE SAME.

The gastro-hepatic omentum is pierced and tied; the hand draws outwards the superior cul-de-sac of the stomach.



FIG. 368. —THE SAME. LIGATION OF THE DUODENUM BELOW THE TUMOUR, WHICH IS SEEN TO BE OF CONSIDERABLE EXTENT.

removing the elastic forceps as I tighten the silk ligature. Very thick silk must be used for this ligature. This ligature assures at the same time the occlusion of the stomach and hæmostasis of the coronary arteries.

I make sure that the ligature is satisfactory; I then place two curved forceps on the side of the tumour, and I cut through in contact with the forceps, taking care to leave a fairly thick stump beyond the ligature. The whole of the field of operation should be protected by large sterile



FIG. 369.—THE SAME. LIGATION OF THE UPPER PART OF THE STOMACH, SHOWING THE UPPER LIMIT OF THE CANCER NODULES.

compresses before section of the stomach, in order to prevent any contamination of the region. The first ligature being apt to become loose, a second circular ligature is immediately placed on the stump. A third ligature is also made, passing the thread at four or five points in the thickness of the stomach walls to avoid slipping. Accidental tearing of the stomach and fall of the ligature causes evacuation of the viscus into the



FIG. 370.—THE SAME. CRUSHING AND LIGATURE "EN MASSE" OF THE STOMACH ABOVE THE TUMOUR.



FIG. 371.—THE SAME. THE DUODENUM IS SECTIONED; SECTION OF THE STOMACH BETWEEN TWO LIGATURES "EN MASSE."





FIG. 372.—THE SAME.

The section of the stomach is almost finished. A large musculo-mucous stump has been left below the upper ligature.



FIG. 373.—THE SAME.

The exuberant portions of the gastric stump have been resected. Placing the security ligature.

wound and contamination of the field of operation. Passing the last thread several times through the musculature is the only means of preventing this accident.

*Fourth Stage.*—Closure of the stomach and duodenum. The exuberant portion of the stump is now resected with scissors, and any debris of mucous membrane is destroyed with the thermo-cautery. The whole stump is then buried under a double purse-string suture.

Closure of the stomach with purse-string suture requires a large silk ligature (No. 8). This ligature should be strong enough not to break at the moment of tightening. The first thread is passed by means of a cutting



FIG. 374.—THE SAME. EXCLUSION OF THE STUMP AND THE LIGATURE "EN MASSE," BENEATH A DOUBLE SERO-SEROUS PURSE-STRING SUTURE.

needle as far as the limit of the muscular and cellular coats. As soon as the first purse-string suture is placed it becomes quite easy to place the second. This latter can be made with No. 5 silk if strong enough. This double purse-string suture is then covered by a third suture, which may be either purse or surjet (continuous), with No. 3 silk, and which firmly closes the serous coat.

The duodenum is closed by the same process: examination of the ligature of the small intestinal stump, cauterization of the debris of the mucous membrane, and burial of the stump under a double purse-string suture, using No. 2 or No. 3 silk.

*Fifth Stage: Gastro-Jejunostomy.*—Postero-transverse trans-mesocolic

gastro-jejunostomy is performed by preference. If this is impracticable an antecolic gastro-jejunostomy is performed, followed by jeuno-jejunostomy.

*Sixth Stage: Toilet of the Field of Operation.*—Repair of gastro-hepatic peritoneum (see Peritonization). Closure of the abdomen.

#### **Pylorectomy combined with Gastro-Duodenostomy.**

##### **DOYEN'S METHOD.**

When the pyloric tumour is very small it is removed by the same method, and the stomach and duodenum are closed as described above.

A vertical anastomosis is then made between the pre-pyloric antrum of the stomach and the duodenum, using a similar technique to that of gastro-duodenostomy (see above, p. 256 *et seq.*).

#### **Total Gastrectomy.**

This operation is very rarely indicated. Indeed, it is exceptional that the cancer should be localized to the totality of the stomach, leaving the cardia and first part of the duodenum intact.

The mortality of this operation is considerable, and the few patients who have survived have died from recurrence.



FIG. 375.—TOTAL GASTRECTOMY FOR CANCER. ISOLATION OF THE STOMACH.

**Operation—First Stage: Median Subxiphoid Laparotomy.**—The incision reaches 3 or 4 centimetres below the umbilicus.

**Second Stage: Evisceration of the Stomach.**—Exploration of the cardiac and splenic region. It will be seen if the cancer is sufficiently localized for the operation to be practicable.

*Third Stage: Crushing and Ligature of the Duodenum.*—Ligature of the stomach at the level of the pylorus, and section between the ligatures. Crushing and ligature of the gastro-hepatic omentum in several pedicles. Crushing and ligature of the gastro-splenic omentum. The stomach is now only attached to the œsophagus, the last few centimetres of which are subdiaphragmatic, and which can be drawn downwards for a certain distance. Crushing of the cardiac insertion of the œsophagus, ligature in the groove of the *écraseur*. Application of forceps to the stomach below the ligature, and section between the ligatures. The stomach is thus entirely detached.



FIG. 376.—THE SAME.

The duodenum is closed. The stomach is completely isolated, and the œsophagus is brought into view.

*Fourth Stage.*—Closure of the duodenum, as already described, and lateral implantation of the end of the œsophagus into the duodenum, if this is possible; failing this, into a mobile loop of the jejunum across the transverse mesocolon. In the latter case a derivative jejunostomy is performed. The implantation of the œsophagus into the jejunum has seemed to me to be more easy than implantation into the duodenum, owing to the fixity respectively of the extremity of the œsophagus and the second portion of the duodenum, which are normally distant 8 or 9 centimetres from one another.

*Fifth Stage: Toilet of the Field of Operation.*—Application of several reinforcing sutures in order to prevent any dragging of the œsophago-duodenal or œsophago-jejunal anastomosis and methodical repair of the

peritoneal breaches. The lower edge of the breach in the gastro-colic omentum is stitched to the abdominal wall, in order to shut off below the field of operation, and a light plug is placed in position.

*Sixth Stage.*—Closure of the abdomen, leaving room for the passage of the deep plug.

#### ULTERIOR RESULTS OF OPERATIONS UPON THE STOMACH.

##### Gastrostomy.

Gastrostomy has never given satisfactory results, except when it has been performed to extract a large foreign body from the stomach. In cases of stenosis of the œsophagus, even when cicatricial and not due to cancer, patients waste in spite of every precaution, and die in a few weeks or months. Survival for a year is quite exceptional.

##### Gastro-Duodenostomy and Gastro-Jejunostomy for Non-Cancerous Lesions.

Treatment of fibrous or spasmodic stenosis of the pylorus by anastomosis of the stomach with the duodenum or jejunum, on the contrary, give marvellous results. I cannot lay too much stress upon these results, for it is a surgical procedure which has a great future.

"Every non-cancerous affection of the stomach," I wrote in 1895, "*comes within the province of the surgeon when medical treatment is proved to be powerless to cure the patient.*" No existence is more miserable than that of so many unhappy individuals suffering from chronic gastropathy, with hyperacidity, ulcer, dilatation complicated with fermentations and attacks of colic. They suffer night and day, and waste since they cannot possibly obtain nourishment. Even if they can be brought to swallow an adequate supply of food, they still waste; their nourishment is ruined owing to abnormal fermentation and putrefaction of ingested food, which become the origin of toxic phenomena.

Surgical treatment of non-cancerous gastropathies has not come into everyday use; in the first place because physicians and many specialists keep their patients away from the surgeon as long as they can supervise them exclusively. The surgeon is their enemy. They exaggerate to the patient the dangers and risks of the operation.

Inexperience and incompetence on the part of many surgeons must also be cited. If rigid asepsis be observed gastro-enterostomy can be accomplished easily without much operative risk, but if the operation is badly performed the results are deplorable; the patient experiences no relief, and the physician is only too ready to conclude that operation is inferior to temporization. A wide experience of gastric surgery is necessary to enable the surgeon to remedy the accidents of round ulcer and hyperchlorhydria.

Removal of the stenosed pylorus, which is more difficult than gastro-enterostomy, gives, nearly always, a satisfying functional result, and the same may be said of gastro-enterostomy for complete stenosis of the pylorus. On the other hand, operations performed in cases of obstinate gastropathies for simple contracture of the pylorus are often followed by faulty function of the new pylorus. Since the stomach is irritable the gastro-jejunal orifice performs its function badly, and the patient continues to suffer. A certain number of these cases were due to a badly performed gastro-enterostomy, which I have been obliged to remedy by a second operation.

Young surgeons who will carefully and exactly follow my technique, and thus profit by my long experience, will certainly obtain good results, and their efforts will yet give to this surgery the vogue which it should have enjoyed for the past twenty years.

The formula which I established between 1892 and 1895 is formal: "*Suffering is only caused by the stomach when it empties with difficulty. Gastro-enterostomy is the sole remedy; this operation is always followed by satisfactory results when the function of the new pylorus is perfect.*" I have operated on cases of gastric ulcer complicated by repeated hæmatemeses dating from fifteen to twenty years. These patients, already in a state of advanced cachexia, have begun to digest a variegated diet fifteen or twenty days after the operation.

I have cured numerous cases of hyperchlorhydria, alcoholic gastropathy, and the so-called nervous dilatation with spasmodic contracture of the pylorus.

I demonstrated from 1892 to 1895 that spasmodic contracture of the pylorus may end in fibrous stenosis of the gastro-duodenal sphincter. What is the best operation in cases of spasmodic contracture of the pylorus? Gastro-duodenostomy with section of the pylorus, as I have designed, is the chosen operation in every case where it can be practised. If not, a trans-mesocolic gastro-enterostomy is performed or even an anterior or posterior antecolic gastro-enterostomy with jejuno-jejunostomy.

#### **Pylorotomy and Gastro-Enterostomy for Cancer.**

I have already stated that cancer of the stomach can be combated in an efficacious manner by antineoplastic vaccination with *cytolase*. Methodical employment of cytolase can prevent, and stop, a large number of commencing cancers of the stomach, and even a certain number where an appreciable tumour already exists without pyloric stenosis. As soon as the signs of stenosis become manifest a *derivative anastomosis* must be made, without ceasing the injections of cytolase. I presented recently to a meeting of colleagues two cases of cancer of the stomach incompletely operated on in 1903 and 1904, and treated successfully by injections of cytolase. A microscopical examination was made in each case, and the gastro-hepatic omentum was already invaded. A third patient, also operated upon using gastro-enterostomy in inoperable pyloric cancer, and recurrence in the cicatrix, in 1902, was attacked with a cancerous supra-umbilical fistula.

He was treated by vaccination with cytolase, and the fistula closed under the influence of this treatment. This patient had no further recurrence. He died in 1909 from valvular disease of the heart, from which he had suffered for twenty years. The results which I have obtained by this process of antineoplastic vaccination can be found in the archives of the Institute and publications. These results have stood the test of time. Surgeons who adopt the method which I have instituted for the treatment of cancer of the stomach by combined operation and vaccination are certain to obtain durable and unhoped-for cures.

#### DURATION OF TIME OF OPERATIONS ON THE STOMACH.

Gastrostomy lasts from ten to fifteen minutes; gastro-duodenostomy thirty minutes; gastro-enterostomy thirty to forty minutes; and pylorectomy combined with gastro-enterostomy forty-five minutes to one hour and a half. These times are very different to the early operations of Péan and Billroth, who required four, five, and even six hours.

#### OPERATIONS ON THE DUODENUM.

Ulcer of the duodenum or the arrest of a biliary calculus at the orifice of the common bile duct may need surgical intervention.

##### Duodenal Ulcer.

Duodenal ulcer is treated by exclusion of the duodenum.

**Operation**—*First Stage*.—Median subumbilical incision of the abdominal wall.

*Second Stage*.—Exposure of the duodenum and freeing of adhesions should they exist.

*Third Stage*.—Closure of the pylorus and upper part of the duodenum by transverse and longitudinal folding of the first part of the duodenum in the juxta-pyloric region of the stomach. Several sero-serous continuous sutures are placed in such a way as to obliterate as completely as possible the pyloric canal.

*Fourth Stage*.—Trans-mesocolic gastro-jejunostomy, or, if this is impossible, antecolic gastro-jejunostomy with derivative jejuno-jejunostomy, to assure the perfect flow of bile and stomach contents.

*Fifth Stage*.—Toilet of the field of operation. Closure of the abdomen.

##### Calculi in the Terminal Portion of the Common Bile-Duct. Stenosis of the Ampulla of Vater.

Calculous or cicatricial obliteration of the terminal portion of the common bile duct may call for incision of the duodenum. This operation



FIG. 377.—TRANSVERSE DUODENOSTOMY FOR THE EXTRACTION OF A CALCULUS IN THE AMPULLA OF VATER (DOYEN'S METHOD).



FIG. 378.—THE SAME. VERTICAL SECTION SHOWING THE POINT OF SECTION OF THE DUODENUM AND THE IMPACTION OF THE CALCULUS IN THE COMMON BILE DUCT.

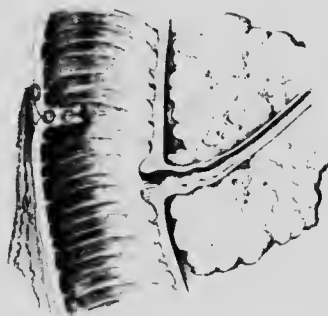


FIG. 379.—THE SAME. CLOSURE OF THE DUODENUM BY TWO SERO-SEROUS LAYERS AND A THIRD LAYER TAKING IN THE ORIGIN OF THE TRANSVERSE MESOCOLON.



is preferable to exterior retroduodenal choledochotomy, which necessitates wide disturbance, and causes risk of secondary infection.

**Operation—First Stage.**—Right, lateral, vertical incision on the parasternal line.

**Second Stage.**—Exposure of the duodenum and liberation of adhesions if these exist.

**Third Stage.**—Incision of the duodenum. The incision of the duodenum should be made as far as possible on the intraperitoneal portion. Transverse incision is to be preferred to vertical incision, as it allows the intestine



FIG. 380.—EXTIRPATION OF A NODULAR CANCEROUS OBSTRUCTION IN THE UPPER PART OF THE JEJUNUM.

to be closed without danger of stenosis. Indeed, the transverse union of the duodenal wound by two or three sutural layers is easy and sure. But longitudinal union, whatever be the precautions taken, produces a notable narrowing in the canal.

**Fourth Stage.**—Exploration of the ampulla of Vater. Incision or excision of the terminal extremity of the common bile duct, extraction of the calculus and duodenal choledochorrhaphy. This stage of the operation will vary according to the particular indications in each case.

**Fifth Stage.**—Toilet of the field of operation. Closure of the abdomen. Aseptic dressing.

## OPERATIONS ON THE JEJUNUM.

**Resection of the Jejunum.**

Stenosis of the jejunum may occur very high. Fig. 380 represents a very small occluding cancer of the upper part of the jejunum, situated only 12 centimetres below the ligament of Treitz. This case was treated by resection of the stenosed portion by the process of crushing and ligature *en masse* of the two ends of the intestine, followed by exclusion of the ligatures by a double purse-string suture and jejuno-jejunal anastomosis following the method already described.

## PALLIATIVE JEJUNO-JEJUNOSTOMY.

Should the resection of the cancer be useless owing to peritoneal generalization or extensive invasion of the mesenteric glands, a derivative jejuno-jejunosomy is performed, and the patient is submitted to vaccination by cytase.

## ARTIFICIAL ANUS OF JEJUNUM.

This operation is indicated in some cases of true or paralytic intestinal obstruction. The technique is the same as that for iliac colostomy (see below).

*Antineoplastic Vaccine.*

Whether the cancer be limited or extensive, specific treatment by antineoplastic vaccine should be instituted immediately. This treatment gives remarkable results in a large number of cases of cancers of stomach and intestine, even when it is not employed at the commencement of the illness.

## OPERATIONS ON THE ILEUM.

**Resection of the Ileum.**

Resection of the ileum for stenosis is performed according to the general technique already described. The intestinal anastomosis is disposed as indicated in Figs. 273-278; if the lesion is too extensive, all that can be done is to exclude the stenosed portion and make a derivative anastomosis.

Partial resection of the ileum and ileostomy can be realized with perfect asepsis. These operations are benign if carried out with a good technique. We draw special attention to the careful repair of the peritoneal breach and to the burying of the ligatures and mesenteric pedicles under the sero-serous sutures. The exclusion of ligatures and mesenteric pedicles beneath a sero-serous continuous suture or purse-string suture is indispensable, for this method prevents ultimate inflammatory adhesions.

## INTESTINAL OBSTRUCTION.

### INDICATIONS FOR OPERATION.

#### **Invagination. Ileus. Volvulus. Internal Strangulation.**

The complete arrest of circulation of intestinal contents causes the grave signs which are described under the term intestinal obstruction, ileus, volvulus, and internal strangulation. Stoppage of the course of the contents in the small intestine may be caused by an extraperitoneal cause: adhesions and kinking, strangulation by a band, hernia into an abnormal orifice. The cause may be parietal: volvulus, invagination, fibrous or cancerous stenosis. In other cases obstruction of the intestinal calibre is caused by a foreign body, such as a large biliary calculus evacuated by the gall-bladder after inflammatory perforation of the duodenum. In former times attempt was made to recognize, according to the shape of the distended abdomen, whether the obstruction was situated in the small or large intestine. In most cases the exact diagnosis was only made at the autopsy.

Since operation is able to cure almost every case of internal strangulation, if performed in time, it is imperative to make a diagnosis soon enough to intervene at the first symptoms and before the distension of the abdomen sets in. In volvulus and strangulation by band or hernia into an abnormal orifice the tipping of the intestine is sudden and causes violent pain. On the other hand, in invagination and in progressive stenosis the onset of the obstruction is more insidious.

Volvulus and strangulation by band are habitually accompanied by agonizing local pain. The facies becomes sunken, the eyes ringed, and the pulse is small and compressible. The belly is not distended, and does not present the exaggerated tenderness which is always observed in peritonitis by perforation. The symptoms calm down after several hours, and the patient would appear to be out of danger. This period of calm allows of a differential diagnosis with perforative peritonitis to be made, where it is not so noticeable.

Distension arises generally only after two or three days. Urine is scanty. One of the most important of the symptoms is the total absence of gas by the anus. This symptom, however, is not absolute; the lower part of the intestine may empty itself of its contents and gas during the first days.

Complete absence of gas by the anus is, therefore, a most important sign, whereas the evacuation of a little gas must not be interpreted as against obstruction.

Should there be any uncertainty between the diagnosis of internal

strangulation and peritonitis by perforation, indication for operation is all the more imperative.

Operation in either case, indeed, should be performed as close as possible to the onset and before distension sets in.

Distension is a consequence of intestinal paralysis. It is soon complicated by sero-sanguineous exudation into the peritoneum, and ends in general peritonitis.

#### Subacute Intestinal Obstruction.

Complete obstruction is often preceded by alternating incomplete obstruction and diarrhoea. This alternative distension by incomplete obstruction and foetid diarrhoea, which may be bloody, occurs in cancerous stenosis of the intestine, which advances slowly. The same occurs in a certain number of cases of invagination. But there is no absolute rule: a small occluding cancer of the intestine may manifest itself by no precise symptom before the signs of obstruction suddenly obtrude themselves.

**Operative Technique:** 1. *The Distension is Considerable.*—If distension exists, and is accentuated, the intervention is limited to the formation of an artificial anus.

The creation of an artificial anus is practically the same technique whatever segment of small or large intestine involved. This operation will be described later on in the formation of an iliac anus. We confine ourselves in this chapter to the question as to which is the most favourable point for forming a temporary anus. When we are in the presence of a case of obstruction a rectal examination is first made. The rectoscope is then used to expose the upper part of the rectum, in order to ascertain if a stricture is present in this region. If the stenosis is situated in the rectum an iliac artificial anus is made.

Should, on the other hand, the obstruction be situated in the upper portion of the large intestine, or in the small intestine, an artificial anus must be made in the ileum or even on the jejunum. I have already pointed out, in discussing the treatment of intestinal paralysis produced by subacute peritonitis, that of two artificial anuses created simultaneously, one at the end of the ileum in the right iliac fossa and the other in a superior loop of the jejunum in the left flank, the latter alone carried out its functions in a proper manner. This predominance of antiperistaltic over the peristaltic movements of the intestine is constant. If the situation of the obstruction is unknown, I consider that a right iliac incision should be made in order to examine the termination of the ileum. The ileum is brought outside if it is distended, and the mesentery is perforated with a forceps in order to fix the loop by transfixion of the mesenteric orifice with a compress. The intestine is then perforated, and a large rubber tube is placed in the upper end, which will be recognized by taking as a landmark the segment which ends in the caecum. If the ileum be not greatly distended, and if the antiperistaltic movements are distinctly predominating, a second vertical incision is made in the left flank in the anterior axillary line, in order to draw out an upper loop of the jejunum. This is fixed outside by

transfixion of its mesentery with a compress, and two tubes are introduced to allow the contents to flow, one in the upper the other in the lower extremity. These tubes should penetrate to a depth of 8 to 10 centimetres, in order to pass beyond the musculo-aponeurotic wall of the abdomen, where a bend of the intestine might be produced. If the right iliac anus and the left jejunal anus be not created at the same sitting, the surgeon should be in readiness to create the second should the first not function in a satisfactory manner.

**OPERATIVE SEQUELE.**—The flow of intestinal content is watched. Peritonitis is prevented by repeated injections of mycolysine, either subcutaneous or intravenous, and the patient's strength is maintained by means of stimulants.

The abdomen is covered with icebags, isotonic saline solution is injected, and camphorated oil. If the evacuation of the intestinal contents is satisfactory, and no complication occurs, the compress perforating the mesentery is removed after six to eight days and a flat-dressing is applied. Later on a laparotomy is performed, in order to remedy the obstruction if the cause still remains, and in order to close the intestinal fistula or fistulae. In a complicated case it is more prudent to re-establish first the circulation at the point of obstruction, and to close the intestinal fistula in a third intervention.

These different operations vary with each patient, and in order to carry them out under the most favourable conditions all that is necessary is to follow carefully the general technique of operations on the intestine, making the necessary adaptation to each particular case.

2. *There is but Slight Distension.* When the distension is but slight, an attempt should be made to cure immediately not only the symptoms of obstruction, but also their cause.

**Operation—First Stage: Opening of the Abdomen.**—If the diagnosis is doubtful and appendicitis is suspected, it is preferable to make a right iliac incision parallel to the crural arch. By this incision the caecum, the appendix, and the lower extremity of the ileum can be examined, and if the inner edge of the wound be raised with a large retractor a portion of the abdominal organs are brought into view.

I recommend this right iliac incision especially, inasmuch as it presents no danger. It should then be made if there is the least doubt, and should give a precise indication for the situation of the principal incision.

The right iliac incision is also to be recommended, as it is the best for capillary drainage of the peritoneum by the method of tamponing.

It can be prolonged upwards towards the liver if it is necessary to gain access to the right hypochondrium.

If the right iliac incision be not sufficient it is temporarily plugged, and, according to the technique already described in median laparotomy, a subumbilical incision is made, or an incision slightly longer reaching 4 or 5 centimetres beyond the umbilicus.

**Second Stage: Exploration of the Peritoneum.**—The serous exudate is sponged if present, and the distended intestinal loops are eviscerated. The

edges of the incision are protected with aseptic towels in order to protect the intestine against any exterior infection, and against the contact of the ringed forceps which fix the aseptic towels to the edges of the cutaneous incision.

If the point of obstruction be not discovered at once, the whole intestinal mass, including the pelvic loops, is eviscerated in order to follow the ileum as far as the ileo-cæcal valve. It will be seen immediately if the obstruction is situated in the small or large intestine, and the point of obstruction is found in a few moments.

*Third Stage: Volvulus, Band.*—If a volvulus is present the index finger finds the mesenteric cord; in the same way, in strangulation by band, the stenosing band will be found. The volvulus is reduced by rotating the twisted loops in a contrary sense; the band, if existing, is sectioned, after crushing, between two ligatures. The condition of the intestinal tunics is examined, and gentle descending pressure is used to cause the circulation of the contents from the upper portion beyond the narrowed or strangulated portion. Should an abnormal hernia exist, it is examined, and the strangulated loop is extracted, after division of the orifice by means of a curved ooreps (see Strangulated Hernia).

The orifice is then closed with a purse-string suture.

*Foreign Bodies.*—When an impacted biliary calculus is present it is removed by a transverse incision of the intestine, after assuring coprostasis by means of elastic-nosed forceps. Transverse incision is preferable to longitudinal incision, because it allows the intestine to be reunited without the slightest risk of narrowing its calibre.

*Intestinal Diverticula; Fibrous or Cancerous Stenosis.*—Should a diverticulum exist, or a fibrous or cancerous stenosis, the proper procedure is resection of the diverticulum or stenosing tumour. If the tumour cannot be removed, a derivative anastomosis is performed.

*Fourth Stage.*—Toilet of the field of operation.

*Fifth Stage.*—Closure of the abdomen.

## CONGENITAL AND ACQUIRED MALFORMATIONS.

### Congenital Malformations.

These malformations are remedied by following the general technique for interventions on the intestine. Congenital stenosis and diverticula are most generally met with.

### Acquired Malformations.

#### INTESTINAL FISTULA.

##### 1. *Cutaneous Intestinal Fistula.*

These fistulae follow either suppuration in a hernia or the creation of an artificial anus. Whether the fistula be single or whether there are

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several openings, the operative technique is the same. Every intestinal fistula can be closed when there is no obstacle below it, and when the intestinal wall is sufficiently healthy.



FIG. 381.—RADICAL CURE OF A FISTULA OF THE INTESTINE. DISSECTION OF THE INTESTINO-PARIETAL TRACT.



FIG. 382.—THE SAME.

The tract is removed. Aspect of the intestinal orifice.

In the simplest case, an inguinal fistula following gangrene in a strangulated hernia, it is certain that there is no obstacle below the hernia ring.

*Simple Fistula.*

**Operation—First Stage.**—An oval incision is made which circumscribes the fistulous opening, and the orifice is closed either in a ringed forceps or by means of a ligature.

**Second Stage.**—Dissection of the fistulous tract as far as the peritoneum, and liberation of adhesions.

**Third Stage.**—The fistulous loop is drawn outside the wound, an elastic forceps is placed beyond the fistulous tract, and this is cut through in contact with the intestine.

**Fourth Stage.**—Purse-string suture or continuous suture in two superimposed layers. If the orifice is small the purse-string suture is the better. Otherwise I prefer a continuous transverse suture. Transverse suture is preferable to longitudinal suture, as it causes no narrowing of the intestinal calibre.



FIG. 383.—THE SAME.

Double transverse continuous suture. The operation is finished.

*The Fistula is complicated by an Intestinal Stenosis.*

**Operation—First Stage.**—Oval incision circumscribing the orifice, which is closed by forceps or ligature.

**Second Stage.**—Dissection of the tract as far as the peritoneum, and freeing of adhesions.

**Third Stage.**—The fistulous loop is drawn outwards, the orifice is closed as above, and the wound is plugged.

**Fourth Stage: Examination of the Narrowed Portion.**—If the fistula is complicated by a stenosis below, which is most usually the case, when an



artificial anus has to be closed after strangulation, the whole of the lower end must be explored. The surgeon disinfects his hands, and changes his rubber glove.

The constrictor is removed, and the lower end of the intestine is drawn into the wound, which is enlarged if necessary. If the stenosed portion is not reached by this, median laparotomy is performed, the point of obstruction is sought for, and adhesions are freed, bands are cut, or the obstructed portion is resected in case of cancer, or a derivative anastomosis is made.

*Fifth Stage.*—Reduction of the intestine. Toilet of the field of operation and closure of the median incision.

*Sixth Stage.*—Closure of the original incision. The technique followed in this operation differs in each individual case.

**OPERATIVE SEQUELÆ.**—Subcutaneous injections of mycolysine to prevent peritonitis. Ice on the abdomen, stimulants. Circulation of intestinal contents only becomes re-established after two or three days, owing to the intestinal paresis. This is not of grave moment if the pulse is good, and there is no distension or tendency to vomit.

## 2. *Intestino-Vesical Fistula.*

These fistulæ are rare. Operation consists in a laparotomy with resection of the intermediary fistula and closure of the abnormal orifices by double purse-string suture. Such operations are extremely delicate, and great care must be taken not to infect the peritoneum.

## OPERATIONS ON THE CÆCUM.

### Resection of the Vermiform Appendix.

#### ANATOMICAL CONSIDERATIONS.

The operation for appendicitis has become one of the most frequently performed in surgery. We will consider here the various stages.

#### *Incision of the Abdominal Wall.*

The best incision is that which is parallel to the crural arch. This incision, indeed, gives a good approach to the peritoneum as well as to the extraperitoneal portion of the iliac fossa and the muscle compartment itself. The aponeurosis, the three musculo-aponeurotic planes, and the peritoneum, are incised successively. The peritoneal orifice is enlarged either by incision or by division.

#### *Exposure of the Appendix.*

The peritoneal wound is enlarged by traction on two powerful hook forceps fixed on either side. The cæcum comes into view and sometimes, in front of it, the appendix. If the cæcum alone appears it is caught up

in a circular ring-nosed forceps, drawn outwards, and the implantation point of the appendix is quickly recognized. The appendix is exposed and drawn outwards by means of the index finger.



FIG. 384.—ILIC APPENDICECTOMY. OPENING THE PERITONEUM.

*Resection of the Appendix.*

The appendix is furnished with a mesentery, which is very variable in dimension. This mesentery is first perforated in contact with the appendix close to its base; it is crushed with the small model éraseur, and ligaturred with No. 3 silk. The mesentery is cut beyond the ligature, and a second ligature is made in the groove of the first as a precautionary measure. The appendix is then crushed a few millimetres from its œcal insertion, a

ligature is applied in the groove formed by the *écraseur*, and it is cut through beyond the ligature, care being taken to let none of the contents escape.

The appendicular stump is excluded from the peritoneum by burying it beneath a double purse-string ligature, and the *cæcum* is reduced.



FIG. 385.— THE SAME.

Application of the first hook forceps to the internal edge of the wound.

*Suture of the Abdominal Wall.*

I commence the continuous suture with silk at the lower end of the incision. I follow my usual plan, uniting the musculo-aponeurotic layers and the peritoneum, with the exception of the superficial layer of the great

oblique. As soon as the suture reaches the upper part of the muscular wound I unite the aponeurosis of the great oblique, and continue this suture from above downwards. The ends of the silk are knotted at the lower end of the wound. This suture gives a perfect union. The skin is united with clips.



FIG. 386.—THE SAME.

Application of the second hook forceps on the external edge of the wound.

**Operation for Appendicitis.**—The operation will now be described as practised on the living subject. The appendix is removed either of deliberate purpose, to remedy precise symptoms, or as a complementary stage in a laparotomy practised for another infection.

*Iliac Appendicectomy.*

**Operation—First Stage.**—Cutaneous incision parallel to the iliac crest. Arrangement of sterilized towels, which are fixed by hook forceps to the edges of the wound; incision of musculo-aponeurotic layers and peritoneum.

**Second Stage.**—The peritoneal wound is enlarged by divulsion. Application of two or more hook forceps on the external and internal edge.

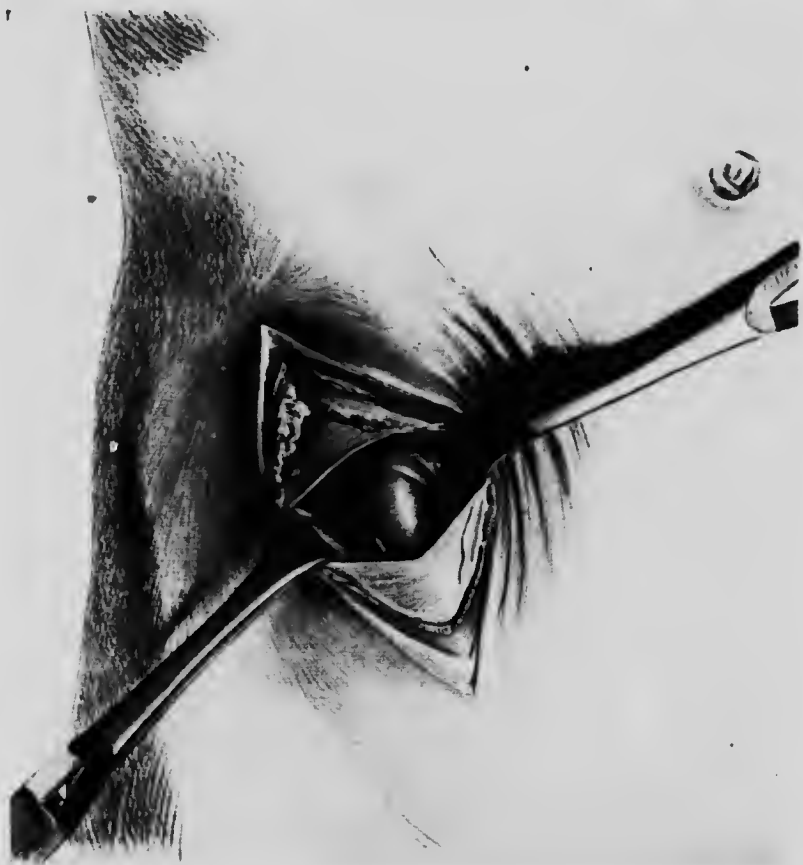


FIG. 387.—THE SAME.

Drawing upon the hook forceps exposes the cæcum.

**Third Stage.**—The serous exudate is sponged away if necessary. The cæcum is caught in a circular-nosed forceps, and drawn gently outwards. The implantation point of the appendix is found, and the appendix is

extracted with the index finger if it be not adherent. If it be adherent the peritoneum is carefully protected below on the inner side and above to avoid contamination by pus, which might erupt from a small encysted abscess. The appendix is then extracted, and any pus which appears is sponged carefully away. The finding of the caecum may be a delicate



FIG. 388. THE SAME.

More forcible traction brings the appendix into evidence.

matter, if this intestine has remained (*ectopié*) in the foetal position. In such a case it will not be found in the iliac fossa, and must be sought for in the upper part of the incision towards the liver.

The appendix itself may be difficult to find if its implantation be in a posterior position, and if it be in its pelvic or foetal position, the caecum being but slightly movable.

These particularities must be known in order to avoid all hesitation when they occur. The capital point is the recognition of the cæcum. The longitudinal bands must be sought for and recognized. The caecal cul-de-sac is then drawn out and the appendix appears.



FIG. 389.—THE SAME.

The appendix and its mesentery are drawn outside; the omentum appears above.

*Cæcum and Appendix in a Subhepatic Situation. Absence of Ascending Colon. Parietal Coalescence of the Mesentery of the Termination of the Ileum.*

We have operated on one of these exceptional cases. The patient presented the signs of an encysted suppurating lateral appendicitis. The incision of the wall a finger's breadth above the crural arch did not reveal

the cæcum. A loop of large intestine presented itself, characterized by its longitudinal muscular bands. I drew it outwards, and we observed that, far from ending in the cæcum, this loop of the large intestine was the origin of the transverse colon. This I reduced, and sought for the ileum.



FIG. 390.—THE SAME. CRUSHING AND LIGATURE OF THE MESENTERY OF THE APPENDIX.

I perceived that it crossed the iliac fossa in a subserous situation, and I arrived at its implantation in the cæcum. This organ was in contact with the kidney, in its foetal position.

The transverse colon was prolapsed in the shape of a V below the umbilicus, which explained its discovery in the iliac incision. The appendix and encysted suppurating point were exposed. The appendix was removed after toilet of the wound, which was treated by plugging.



This operation serves to show how careful one should be in operations which would seem to be of the simplest, and where a rare abnormality may suddenly present itself.

*Fourth Stage.*—The appendix is drawn outside with the corresponding part of the cæcum. The mesentery of the appendix must now be ligatured and cut, followed by the appendix itself. The meso-appendix is perforated



FIG. 341. THE SAME. CRUSHING AND LIGATURE OF THE APPENDIX.

tangentially to the wall of the cæcal diverticulum and close to its origin. The mesentery is crushed with the small *écraseur*, and a ligature is placed in the groove formed by the *écraseur*: the meso-appendix is cut beyond the ligature, and a second safety ligature is placed in the groove of the first.

The appendix is crushed in its turn close to the cæcum. A ligature is placed in the groove of the *écraseur*. Below the ligature a forceps is placed

from below upwards. A second forceps is placed from above downwards in such a manner as to push the septic matter towards the end of the appendix.

The first of these two forceps is removed, section is made close to the second, and the stump is cauterized with the thermo-cautery. Although

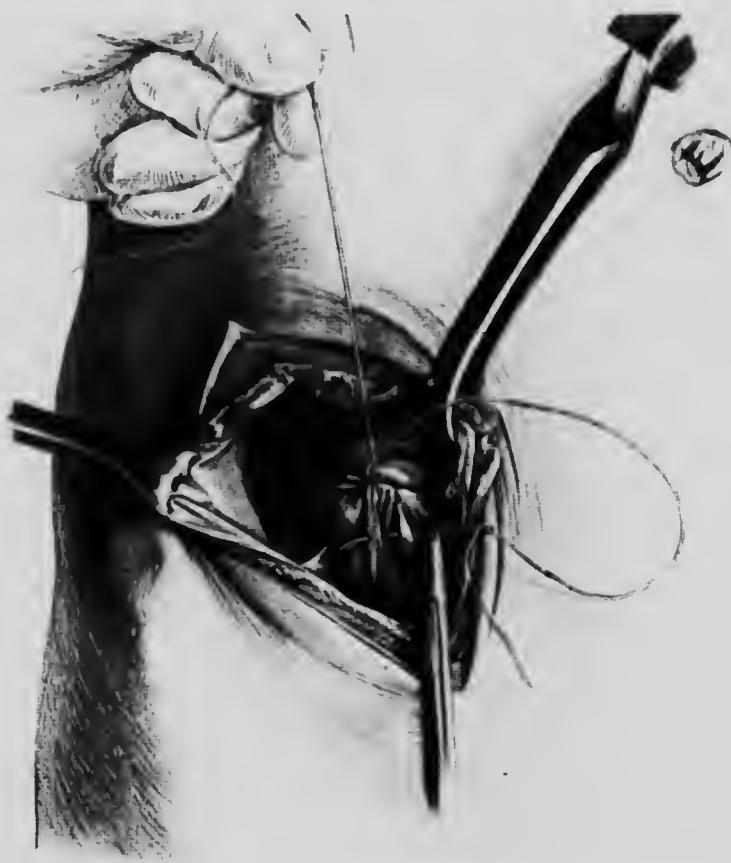


FIG. 392. THE SAME.

The first, purse-string suture is finished. The second is begun with the same thread.

this small stump is aseptic, it must be excluded from the general peritoneal cavity by burying it under a double purse-string suture. The first thread is passed circularly 6 to 10 millimetres from the ligature; it is tightened, care being taken to bury the stump under the umbilicus, which is thus formed; it is then tied. A second purse-string suture is immediately

superimposed on the first. The ligatures on the meso-appendix can be buried under the purse-string sutures.

*Fifth Stage.*—Toilet of the field of operation with sterile compresses, reduction of the caecum, and suture of the abdominal wall by means of two superimposed continuous sutures, the first peritoneo-muscular, and the second aponeurotic. Suture of the skin with clips.



FIG. 333. THE SAME.

Termination of the second purse-string suture.

*Modification of the Fifth Stage.*—Closure of the peritoneum should only be realized in aseptic appendicectomy. If the appendix is the seat of acute gangrene, or if a small encysted peritoneal abscess has been evacuated, it is indispensable to leave a sterilized gauze mesh at the corresponding point. Two silk sutures are placed above and below the mesh, and the

upper and lower parts of the incision are closed with silk. A small amount of pus may form under the mesh. It is left in position for three or four days, provided that there be no fever or distension. If the mesh is aseptic when removed it need not be replaced, and the small opening closes quickly. If there is a small amount of pus the mesh is replaced daily until cicatrization is complete.

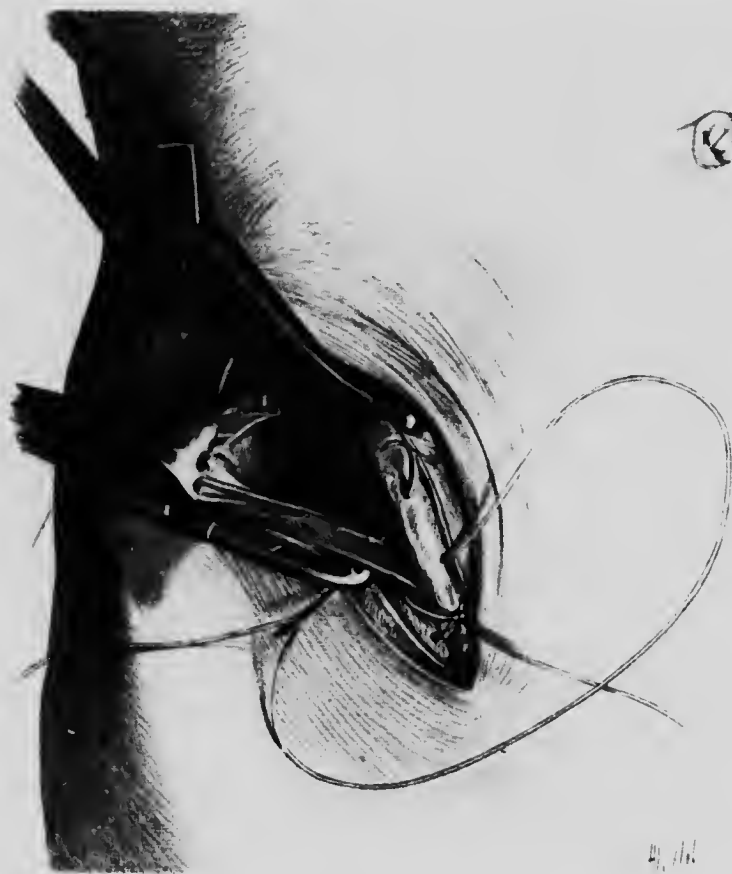


FIG. 394. THE SAME.

Deep sero-muscular suture from below upwards.

*Peri-Appendicular Abscess.*

It is a prudent precaution, before closing the abdomen, to search for an extra-appendicular subperitoneal abscess. I have seen several of these

eases following a subserous lymphangitis. The small abscess must be emptied, its cavity must be surrounded, and excluded beneath a double purse-string suture, a gauze mesh is placed as a drain.



FIG. 395. THE SAME.

The deep sero-muscular suture is terminated.

*Appendicectomy during the Course of a Median Laparotomy.*

Appendicectomy is fairly often performed in the course of a laparotomy performed for another abdominal affection. It may happen that during an operation for ovariectomy or abdominal hysterectomy a calculous or inflamed appendix may be encountered.

The plan of burying the appendicular ligature under a double purse-

string suture allows the appendix to be resected without any danger of infecting the serous cavity.

**Operation.**—The principal operation is completed. The field of operation is protected by compresses fixed by ring forceps, in the centre of which emerge the cæcum and appendix.



FIG. 396.—THE SAME.

Commencement of the superficial descending suture uniting the aponeurosis of the great oblique.

Crushing and ligature of the meso-appendix, then the appendix. Exclusion of the small stump under a double purse-string suture, following the same technique as in iliac appendicectomy. If a purulent peri-appendicular focus be revealed a right iliac incision is indispensable in order to drain directly the infected area.



FIG. 397. APPENDICECTOMY. FOURTH STAGE.

The cecum has been drawn outwards. Protection of the peritoneum with aseptic compresses. Crushing the meso-appendix.



FIG. 398.—THE SAME.

The meso-appendix is crushed, tied, and severed. Crushing the appendix with the small model Gerasur.



FIG. 399. ANOTHER CASE.



FIG. 400.—THE SAME. LIGATURE OF THE PEDICLE OF THE APPENDIX WITH NO. 2 SILK.

The ligature of the meso-appendix is seen below.





FIG. 401.—THE SAME. CAUTERIZATION OF THE STUMP WITH THE THERMO-CAUTERY.



FIG. 402.—THE SAME. PLACING THE FIRST PURSE-STRING SUTURE.



FIG. 403. THE SAME.

The surgeon draws upon the two ends to tighten the ligature.



FIG. 404. THE SAME.

A forceps pushes the stump under the purse-string suture.



FIG. 405.—THE FIRST PURSE-STRING SUTURE IS COMPLETED.



FIG. 406.—THE SAME.

The second sero-serous suture is passed 6 to 8 millimetres from the depression formed by the first.



FIG. 407.— THE SAME.

The second purse-string suture is in place.



FIG. 408. THE SAME.

The pedicles of the appendix and mesentery are entirely excluded from the peritoneal cavity by the second purse-string suture.



FIG. 409.—APPENDICECTOMY AFTER ABLATION OF AN OVARIAN CYST. CRUSHING THE MESO-APPENDIX.



FIG. 410.—THE SAME.

The meso-appendix has been ligatured and sectioned. Crushing the pedicle of the appendix.



FIG. 411. THE SAME.

The pedicle of the appendix has been ligatured, sectioned, and cauterized. Placing the purse-string suture.

#### COMPLICATIONS OF SUPPURATIVE APPENDICITIS

##### **Purulent Pleurisy and Peri-Appendicular Ileo-Cæcal Collections.**

I have observed one complication of suppurative appendicitis: a certain number of right purulent pleurisies, one case of pleurisy localized in the left pleura, and a case of bilateral purulent pleurisy. These rare cases I will describe.

Another complication which I described in 1899 is characterized by the formation of a tumour in the right iliac region, composed of the last coils of the ileum and the cæcum. These intestinal loops are gummed together by fibrous adhesions. The appendix is generally found in the centre of the mass, calculous, fistulous, or suppurating. I have seen several of these cases.

##### 1. PURULENT PLEURISY ORIGINATING IN THE APPENDIX.

*Peritonitis from Perforation of the Appendix. Laparotomy. Left Purulent Pleurisy. Empyema. Recovery.*

C—, aged eighteen, was seized on October 15, 1899, at five o'clock in the morning, with violent abdominal pains. The cause was a gangrenous appendix. Operation was proposed on the 18th, but was delayed until

the 20th owing to hesitation on the part of the family. The pulse, which had been full and strong, began to become compressible and to assume a "peritoneal" character; its rate was 120. The temperature was 40° C.; a distinct induration was felt in the right iliac fossa and along the course of the ascending colon. The moment the peritoneum was incised and the caecum adherent to the wall was detached from the iliac peritoneum a gush of thick and foetid pus occurred. This collection was encysted between the caecum, the ascending colon, and the iliac peritoneum, and reached upwards as far as the kidney. As soon as this collection was evacuated and plugged the deep adhesions of the caecum were broken down by the finger. A considerable quantity of suspicious fluid escaped from the peritoneal cavity, whose toilet was made with sterile compresses beginning with the pelvic cavity.

It was one of those peritoneal infections which, at first generalized at the moment of perforation, was localized after eight or ten hours, only to become secondarily generalized over the whole cavity. The caecum was drawn out, the appendix, nearly 15 centimetres long, was lying between the ascending colon and the abdominal wall. It was enormous, and there was a large loss of substance at the junction of its terminal and middle portions, through which escaped some faecal calculi. The appendix was removed in the usual manner.

The retro-caecal, purulent focus was plugged and the iliac incision was sutured in its lower half. The abdomen was covered with aseptic compresses, a leaf of gutta-percha, and five long ice-bags. The temperature fell on the 21st to 37·8° C., rising to 38·5° C. the same evening. On the 23rd the temperature was 37·8° C. in the morning and 38·4° C. in the evening; the pulse was 90. The abdomen was supple and the tongue moist. The general condition was satisfactory. During the night of the 31st, about midnight, a violent "stitch" occurred on the left side. The temperature rose to 39° C. On November 1, at eight in the morning, the patient breathed with difficulty.

The next day the rectal temperature was 40° C., and the respiratory disturbance had augmented. I was summoned in the course of my operations to see the patient, who was cyanosed. No abdominal symptoms. I found the patient at 7 p.m. in an alarming condition. The heart was to the right of the sternum, sonority was exaggerated on the left, and the vesicular murmur almost imperceptible. The pulse, very irregular, was 130, and there was imminent danger of syncope. I diagnosed a pneumothorax.

An exploratory puncture gave a small quantity of suspicious fluid. A large incision was immediately made in the sixth costal interspace. Three and a half litres of foetid sanious fluid were evacuated, containing *B. coli* and numerous micrococci (the preparations were identical with those of the peritoneal pus). Four large rubber drains were placed in the incision, and the pleural cavity was washed with several litres of artificial serum at 40° C. Injections were given of ether, caffeine, and artificial serum.

The operation was well supported, and the heart regained its rhythm

as it came back towards the left. Respiration was difficult for several weeks. On November 13 a small stercoral fistula appeared at the iliac wound, which became larger during the following days. The appetite returned, and the pleural wound admitted but 100 grammes of fluid.

November 26 three coccal fistulas existed, two fairly large in the lower angle of the wound, and another very small in the superior angle. The fleshy granulations had become red and healthy.

The patient desired to have the fistula closed. This was done on November 28, and the patient rose fifteen days later. The pleural fistula was completely closed on the 15th of March following.

This observation shows:

1. That a left purulent pleurisy may occur ten days after operation for gangrenous appendix, and when the peritoneal infection has almost disappeared.

2. The evolution of this pleurisy fifteen days after the onset of the appendicitis and ten days after the operation proves that a period of latent microbial infection may exist which is fairly long, and that after toilet of the peritoneum, full of suspected serous fluid evolving into general peritonitis, virulent bacilli may remain in the phrenic lymphatics which can journey towards the pleura and there set up, after eight or ten days, an infection more acute than the first infection.

*Encysted Purulent Appendicitis. Left Interlobar Purulent Pleurisy and Right Sero-Purulent Pleurisy. Bilateral Pleurotomy.*

In another case, aged thirty-five, suffering from purulent encysted appendicitis, a double pleural affection was produced fifteen days after the laparotomy, which was performed on March 4, 1912. The patient was attacked with diarrhoea and vomiting of bile; the tongue became dry and the face sunken.

On March 17 toilet of the peritoneal foci showed no retention. On the 20th pleural friction sounds on the left and behind in the fourth intercostal space. On the 22nd increasing dyspnoea and right pleurisy. Puncture gave a sero-fibrinous fluid rich in streptococci.

On the 23rd double posterior pleurotomy was performed; 1½ litres of cloudy serous fluid was obtained. An exploratory puncture in the fifth space on the left, where dulness was present, gave outlet to creamy pus containing the streptococci in pure culture.

The right thoracic wound was sutured, the air contained in the pleural cavity was aspirated by means of an air-pump, in order to cause expansion of the lung, which was free from adhesions. Auscultation immediately revealed that the right lung commenced to respire. Incision of the fifth costal interspace was then made, without fear of asphyxia; 100 cubic centimetres were obtained coming from an encysted interlobar focus. Drainage, dressing.



## 2. ILEO-CÆCAL PERI-APPENDICULAR COLLECTIONS.

I described in 1899 another complication of appendicitis, which was then but little known, and which I presented to the Société de Chirurgie under the title *Peri-Appendicular Cæcal Agglomerations* ("Des Agglomérations cæcales peri-appendiculaires").

These intestinal agglutinations are produced at the principal focus, and they unite together the last 60 or 80 centimetres of the ileum and cæcum into an inextricable mass.

As in the case of appendicular pleurisy, these ileo-cæcal peri-appendicular agglomerations must be considered as a direct complication of the microbial infection: they bear the same relation to the peritonitis as the pleuro-pulmonary adhesions to the empyema. Purulent pleurisy and ileo-cæcal agglomerations have this peculiarity: that each of these complications corresponds with one of the two great anatomical varieties of appendicitis, the ascending type of appendicitis and the pelvic type.

1. The ascending type, where the gangrenous focus is produced in the angle separating the ascending colon from the posterior wall of the abdomen, causes the evolution of a lateral abscess, which becomes easily limited and mounts towards the diaphragm. In these cases general peritonitis is fairly rare, and is hardly ever produced, except by extension of the primitive affection. These lateral types of lateral and ascending appendicitis are more prone to supra-diaphragmatic complications, particularly to purulent pleurisy, which in all cases hitherto published have been a right-sided pleurisy.

2. Pelvic appendicitis has a yet more insidious evolution, and when perforation occurs before the evolution of protective adhesions a fulminating peritonitis is very often the result. When the inflammatory focus remains circumscribed a secondary peritonitis is especially to be feared, should the abscess encysted between the mesentery and the adherent coils of the ileum be in relation with the parietal peritoneum. The intestinal loops become covered with false membrane, and completely lose their epithelial covering. When the inflammation has reached a certain degree the "restitutio ad integrum" is impossible, and the inflamed or adherent intestinal loops are destined to be gummed together.

Circulation of contents is at first free in the loops agglutinated about the purulent focus. When the pus is evacuated, either by spontaneous opening into the bowel or by surgical operation, the cavity of the abscess retracts and then cicatrizes. It is at this moment that the ileo-cæcal agglomerations are produced. The more extensive the surface exposed to the pus the more menacing is this cicatricial retraction, which agglomerates the intestines into a limited area, and which fixes around the calculous appendix (as I observed in two cases of spontaneous evolution of the pelvic collection) 60 to 80 centimetres of the end coils of the ileum, the cæcum, and ascending colon.

In several patients I have been obliged to resect veritable intestinal

tumours formed by the agglomeration around the appendix, which has sclerosed, of the cæcum, the ascending colon, and eight or ten large coils of ileum. The primitive abscess had evolved spontaneously and had opened into the intestine.

The following are the observations:

1. Mdlle. T—, aged nineteen years, suffered from sharp pain in the right iliac fossa. These attacks dated back for seven years, to a time when the patient was in bed several weeks with a non-typical attack of typhoid.

On palpation a mass was felt in the region of the cæcum which was resonant and indurated, presenting all the characters of a tumour of the intestine. Circulation of intestinal contents was difficult at this point, and the patient frequently exhibited the phenomena of obstruction.

Operation was performed on November 19, 1896. An incision parallel to the right crural arch allowed access to a tumour, formed by a tight agglomeration of the cæcum and the last loops of the ileum. The peritoneum having been protected by sterile compresses, I commenced to isolate the ileo-cæcal mass, whose lower extremity dipped into the cavity of the pelvis. A jet of pus came from the depths of the wound. The patient, indeed, had complained of obstinate pelvic pain on the right side, and the lower extremity of this collection had been perceived by vaginal examination under chloroform before operation. The purulent focus was sponged with sterilized compresses and disinfected. The ileo-cæcal mass liberated below was detached little by little from the iliac fossa, and soon it was possible to recognize, above, the afferent loop of the ileum, and, below, the ascending colon. The ileum and colon were sectioned between curved elastic forceps, and joined end to end by a circular enterorrhaphy. The pelvic focus was plugged.

The operative sequelæ were excellent. The patient recovered rapidly, but for several months had a tendency to diarrhœa. This disappeared gradually, and since the operation her health has been perfect. Examination of the part removed showed that it consisted of an agglomeration of the cæcum and the last 6 or 8 decimetres of the ileum around the appendix, which contained a large spherical calculus. The ileum and cæcum, tightly bound together by cicatricial knots, presented a series of strictures, which led me at first to believe that they were due to ulcerations of the mucous membrane.

Careful histological examination revealed that the mucous membrane itself had been folded and indurated, owing to lesions lying beneath the cellular and muscular coats, which had become converted into cicatricial tissue. But the epithelial lining was intact. The calculous appendix and the right tube were also found, the end of the latter being removed when the lower end of the tumour was being freed.

2. M— B—, aged forty, came to consult me at the end of August, 1899, complaining of constant pain in the region of the cæcum. A resonant tumour, the size of a fist, could be felt, which had none of the characters of a cancer of this region and seemed to be tuberculous in nature.

The patient had kept his bed for three months. He dated his suffering

in the right iliac fossa to an attack of typhoid fever six years previously. Operation was performed on September 11, 1899. The ileo-cæcal mass, which was strongly adherent to the iliac fossa, was liberated. The ileum and ascending colon were crushed, ligatured, and sectioned between the ligature, and a forceps placed on the cæcal end. The tumour was then removed after crushing and ligature of the mesenteric pedicle. I then closed the two ends of the intestine, the ileum, and the ascending colon, and performed a lateral anastomosis. The recovery was uneventful.

Examination of the part showed that it was a case identical with that observed in observation No. 1. The tumour was formed by a tight cicatricial agglomeration of the ileum and cæcum around the appendix. The preparation was dissected with care. The microscope alone could determine the state of the mucous membrane. Histological examination of the more characteristic fibrous knots and the portions where the mucous membrane appeared altered to the naked eye showed, as in the preceding case, that it was folded and retracted as a result of a cicatrizing process which had agglomerated the intestinal loops, but the epithelium was intact.

The exact interpretation of these two cases was quite impossible without histological examination. In fact, I had considered the ileo-cæcal mass in the first case as having supervened on an adhesive peritonitis around deep typhoid ulcerations of the ileum and cæcum, which had reached the neighbourhood of the serous membrane.

The localization of this adhesive peritonitis to the terminal extremity of the ileum and cæcum coincided with the classical localization of the most accentuated typhoid ulcers. When, several months after the operation, I examined the part, fixed by formol, the discovery of the calculus from the appendix in the centre of the agglomerated intestinal loops gave me the key to the problem.

These two observations are interesting from two points of view:

1. They exhibit another complication of appendicitis—long distant, it is true (seven years in the first case and six years in the second)—which henceforth must be taken into account in diagnosing tumours of the cæcum.
2. As far as the operative technique is concerned the procedure employed in the second case was crushing, ligature *en masse*, then closure by purse-string suture of ileum and ascending colon, followed by lateral anastomosis: this is superior to circular enterorrhaphy, since this method insures perfect asepsis of the field of operation, there being no fear of irruption of intestinal contents at the moment of intervention.

It may be added that the crushing of the mesenteric pedicles, which are ligatured with silk, greatly simplifies the stage of isolation of the tumour, and avoids ligature in series and large omental stumps, which are difficult of reabsorption.

CONCLUSIONS.—We may, then, conclude that, in addition to the well known acute and subacute forms of appendicitis, a chronic and prolonged form of appendicitis exists, which we may compare to those cases of chronic osteomyelitis or osseous encysted abscess in the centre of a diaphysis, and which remain indolent during two, four, and even fifteen years.

This prolonged appendicitis is characterized anatomically by an agglomeration around the inflamed appendix of the cæcum and last coils of the ileum. This agglomeration may evolve without appreciable suppuration at the moment of intervention (Observation No. 2), but it may also coincide with an appendicular abscess. This abscess will open in some cases into the cæcum, but it may become encysted in the pelvis, chiefly, perhaps, in women (Observation No. 1), in the same way as some peri-uterine suppurations. The progressive cicatricial process which draws the adherent intestines together may, at length, cause a series of acute kinks and retractions.

3. In another case I witnessed the formation of adhesions and ileo-cæcal agglomerations. The patient was a medical student attacked by generalized peritonitis, appendicular in origin and of the pelvic type, with multiple purulent foci reaching as far as the spleen. I was obliged to perform a double laparotomy—right iliac, and median. After several days an abscess opened spontaneously in the linea alba, between two points of suture. This abscess voided a large quantity of pus; signs of obstruction commenced owing to retraction of the walls of the abscess, which had formed in the midst of intestinal adhesions.

A second laparotomy was performed to remedy these signs of obstruction. This operation led me to observe that the symptoms had been caused by the agglomeration of inflamed intestinal loops.

These adhesions were so tight that it was impossible to break through them without tearing the muscular and even the mucous coats. Several small perforations forced me to apply sero-serous sutures and to abandon in the pelvis the agglutinated ileo-cæcal mass, in order to perform above a derivative ileo-colic anastomosis.

The ascending colon was full of hard voluminous matter. After two days I was obliged to incise the ascending colon and ileum below and above the entero-anastomosis. The colon fistula enabled me to break up with a long forceps, and to evacuate, by means of free washing, the matter contained in the transverse colon. After forty-eight hours stools commenced to be passed, and the ileo-colic fistula only allowed fluid matters to pass. A small intestinal fistula appeared at the linea alba.

These three fistulae were closed by a fourth operation. The ileo-colic anastomosis was enlarged, and the inextricable ileo-cæcal mass, which extended from the linea alba to the iliac fossa, remained definitely excluded from the intestinal circuit.

The patient recovered after showing for some months a tendency to diarrhœa, owing to the shortening of the intestinal tract and suppression of the cæcum.

4. On February 13 I removed twenty centimetres of the ileum in an old man of seventy, who had been operated on a year previously for an appendicular peritonitis, in order to remedy several cicatricial retractions complicated with fistulae.

This operation, by my usual procedure of crushing and purse-string closure, followed by lateral entero-anastomosis, was short, and succeeded perfectly in spite of the advanced age and feebleness of the patient.

**Resection of the Cæcum.**

Tumours of the cæcum and ascending colon are fairly frequent. The indurated mass generally enjoys a certain amount of mobility in spite of parietal and mesenteric connections. It is not exceptional, if the lesion mounts as far as the angle of the ascending colon, for the neoplasm to be in direct contact with the third part of the duodenum, which may be wounded in the course of operation.

Tumours of the cæcum and ascending colon give rise, almost without exception, to a well-marked stenosis of the calibre of the intestine and signs of chronic obstruction. Diagnosis is made by abdominal palpation. The nature of the lesion is variable. In the infant tuberculosis is observed frequently, and late in life cancer. Inflammations also are attended by



FIG. 412. RESECTION OF THE CÆCUM.  
Pushing the terminal portion of the small intestine.

complications of stenosis, owing to multiple kinking. Operation consists in resection of the whole of the altered segment comprising the last centimetres of the ileum.

Whether the disease be tuberculous, cancerous, or cicatricial stenosis, the operation must be widely undertaken, and the disposition of the cæcum and ascending colon hardly lends itself to the conservation of the caecal cul-de-sac.

**Operation—First Stage: Incision of the Abdominal Wall.**—A right lateral incision is made on the anterior axillary line. This incision is commenced over the most prominent part of the tumour. In the neighbourhood of the anterior superior iliac spine the incision runs parallel to the crural arch. Aseptic towels are placed in position, and the musculo-aponeurotic layer and peritoneum are incised in turn.



FIG. 413. —THE SAME.  
Crushing the ascending colon above the tumour.



FIG. 414.—ANOTHER CASE.  
Crushing the colon between two elastic forceps.

*Second Stage: Exposure of the Tumour.*—The peritoneum is seized in four or five short-nosed forceps, and the tumour is drawn outside. If its volume is considerable the incision must be carried, without hesitation, as far as the twelfth rib and, below, to the middle of the enral arch. The field of operation is protected by sterilized compresses, and the connections of the tumours are examined with care.

*Third Stage: Extraction of the Tumour.*—No attempt should be made at extirpation unless the surgeon can be sure, by a careful primary examination, that he can manage each step. The possibility of removing the neoplasm can be judged by the mobility of its upper limit, which is in direct relation with the kidney, liver, and third part of the duodenum. Here, in fact, is the key to the situation, and the less the tumour mounts on the ascending colon the more easy will be its removal.

There is no difficulty in isolating the caecum. If it be adherent to the abdominal wall the external tunic is detached for its whole extent, in order to allow the neoplastic mass to be drawn outside. The parietal peritoneum is detached, with the caecum and ascending colon, as far as may be necessary. Rarely it is necessary to employ one or two ligatures at this point.

The unsheathing of the caecum is rapidly accomplished as completely as possible. The ileum is then isolated from its mesentery several centimetres above the caecum, then this intestine is crushed and ligatured. Section is made below the ligature, after precautions have been taken to assure coprostasis, and the intestinal stump, enveloped in a sterilized compress, is placed outside the wound. The small stump of the ligatured ileum is examined, the mucous membrane which is left is shaved off with scissors and cauterized by the thermo-cautery.

The isolation of the caecum is now completed. It is detached from below upwards from the iliac fossa, followed by the ascending colon as far as a point above the neoplasm. The colon is then isolated at the most favourable point for its division. The mesentery is perforated with the index finger, and the intestine is crushed, ligatured, and divided above the ligature, care being taken to assure coprostasis. The stump is immediately cauterized. The central end is enveloped in a sterilized compress, which is fixed by forceps. All that are now left are the mesenteric attachments of the tumour: one, two, or three ligatures after the action of the écraseur allows of complete liberation.

As soon as the tumour is removed the ligature on the colon is examined, then that of the ileum. Each is generally buried under a purse-string suture.

*Fourth Stage: Repair of the Peritoneal Breach.*—The sutures on the colon and ileum are examined. The losses of substance in the serous membrane are immediately repaired. Purse-string or longitudinal continuous sutures are placed on the anterior edge of the sectioned mesentery. The subhepatic peritoneum is then united to the parietal peritoneum above, in such a way that no orifice remains at this point. The two ends of the intestine are approximated by means of fresh sutures placed on the same anterior portion of the mesentery, and, below, the peritoneum of the iliac fossa is sutured



FIG. 415. THE SAME.

Ligature *en masse* of the ascending colon in the groove formed by the cérasneur.



FIG. 416. THE SAME.

Section of the ascending colon above the ligature *en masse*.



and the mesentery of the last loop of the ileum to the parietal peritoneum. All the ligatures of the mesenteric pedicles also can be placed outside the serous cavity, between it and the fascia ilinea.

The peritoneal cavity is thus almost completely closed, with no breach of continuity in the peritoneum. All that remains to do is to re-establish the course of the intestinal contents by means of an ileo-colic entero-anastomosis.

*Fifth Stage: Lateral Ileo-Colic Anastomosis.*—The ileum is fixed to the ascending colon or, if this be resected, to the transverse colon, in the most convenient position, by a longitudinal sero-serous suture 40 to 50 millimetres in length.



FIG. 417.—THE SAME.

Exclusion of the intestinal stump from the peritoneal cavity under a double purse-string suture.

A second longitudinal suture is made over the same extent. Two elastic coprostatic forceps are then placed above on the ileum and, below, on the colon. The field of operation is protected with sterilized compresses. The colon and then the ileum are incised with the thermo-cantery 3 or 4 millimetres from the second line of suture. Any intestinal matter which could soil the field of operation is carefully sponged away, and the third layer of suture is proceeded with. A stronger (No. 2) silk is used for this layer. The third layer extends for the whole length of the anastomotic orifice, the thread traversing successively mucous and muscular coats of the ileum, then muscular and mucous coats of the colon.

When the other commissure of the anastomotic orifice is reached the thread is tied, the end is cut close to the knot, and the first anterior sero-serous suture is commenced. The coprostatic forceps are removed, and the second anterior sero-serous suture is made.

By this method a sero-serous union behind the anastomotic orifice is assured by means of two superimposed sero-serous continuous sutures and by a muco-mucous layer. In front of the ileo-colic orifice there are but two sero-serous continuous sutures. We find here an application of the general principles of operations on the intestine.



FIG. 418.—THE SAME.  
The lateral ileo-colic anastomosis is finished.

*Sixth Stage: Closure of the Abdomen.*—Closure of the abdomen is made by means of strong silk. In exceptionally grave cases separate silk sutures are used. The small retroperitoneal iliac cavity, which has been considerably reduced by the parietal and mesenteric peritoneal sutures, is treated by means of plugging. The skin is sutured above and below the compress.

*Dilatation of the Anus.*—I have considered it of use to dilate the anus forcibly with a Cusco's speculum immediately, in order to prevent retention of intestinal matter at this point as a result of contraction of the sphincter.

#### VERY EXTENSIVE RESECTION OF THE LARGE INTESTINE.

Very extensive resection of the large intestine has been attempted with a view to remedy inveterate chronic enteritis. This operation has been performed in England by Arbuthnot Lane. The technique is the same as that for the resection of the extremity of the ileum, caecum, and ascending colon. Liberation of the antero-posterior subhepatic colon is generally easy. The same may be said for the liberation of the transverse colon, which requires, nevertheless, fairly numerous ligatures on the part of the mesocolon and omentum. The most fixed and most difficult portion of the colon to resect is the postero-anterior subsplenic portion, which is firmly fixed to the posterior abdominal wall by its suspensory ligament.

Resection of the subsplenic colon and descending colon requires a technique analogous to that of the resection of the caecum and ascending colon. I believe that it would be preferable, in order to remove the caecum and the whole colon, including the sigmoid, to make at first a vertical right lateral incision on the anterior axillary line. After the caecum, ascending colon, and subhepatic colon have been isolated by this route a symmetrical incision is made on the left side in order to draw out the already liberated caecum, ascending and transverse colons. The subsplenic colon, descending colon, and sigmoid are then detached in their turn.

A double vertical incision on the anterior axillary line, first on the right, then on the left, without incision of the linea alba, is the best double means of access for almost total resection of the large intestine extending from the caecum to the superior part of the rectum. The ileum and the superior extremity of the rectum being closed in cul-de-sac by my usual procedure, the circulation of matter is re-established by forming an anastomosis between the ileum and the upper part of the rectum.

#### EXCLUSION OF THE LARGE INTESTINE.

Where multiple lesions exist in the length of the large intestine, complicated by adhesions, if resection cannot be practised, anastomosis should be made by the process already described, between one of the terminal loops of the ileum and the sigmoid flexure, or even with the upper part of the rectum.

#### TUMOURS OF THE SIGMOID FLEXURE.

If the tumour be small and very mobile an attempt may be made at extirpation, followed by closure of the two ends and a lateral anastomosis between the upper and lower ends of the sigmoid. Since remission of the large intestine is less sure than that of the small intestine to the large intestine, I consider that it is preferable to bring the upper end to the surface and to make a superior ileo-rectal anastomosis.

#### TUMOURS OF THE UPPER PART OF THE RECTUM.

Tumours of the upper or subperitoneal portion of the rectum can be treated by complete extirpation of the rectum, with junction of the sigmoid to the surface and the creation of a definite iliac anus. The ablation of the upper half of the rectum is not a difficult operation, but its results are generally very grave. An attempt can be made to draw the sigmoid, sufficiently liberated, by the anus, and to shut off the peritoneum at the level of the upper outlet by a technique analogous to that which I employ in total abdominal hysterectomy, and which has been described in discussing the surgery of the peritoneum. These operations are exceptional, and the technique will vary in each particular case. The resection of the upper part of the rectum in the female with vaginal drainage will be discussed in the section on Gynaecology.



FIG. 419.—OPERATION FOR ARTIFICIAL ANUS ON THE ILLAC SIGMOID. TRANSFIXION OF THE MESOCOLON BY A COMPRESS.



FIG. 420.—THE EXTREMITIES OF THE COMPRESS ARE TUCKED AROUND THE HERNIATED SIGMOID LOOP, CRUSHING THE INTESTINAL TUNICS.

## LEFT ILIAC COLOSTOMY.

Left iliac colostomy is performed in order to create an artificial anus in cases of obliterative stenosis of the rectum. This operation is performed in a few minutes, and in enfeebled patients may be carried out under local anaesthesia.

The iliac anus may be definitive or temporary. It should always be performed on the most mobile loop of the sigmoid flexure, in such a way that it leaves below a free intestinal segment long enough to allow of radical cure of the fistula should the closure become necessary or advisable.

**Operation—First Stage.**—Iliac incision 5 or 6 centimetres long, parallel to the middle third of the crural arch.

**Second Stage.**—Section of the aponeurosis. The muscles are incised slightly, and their fasciae are spread by divulsion. The peritoneum, when exposed, is seized in a toothed forceps. It is incised, and the orifice enlarged by divulsion. The sigmoid flexure is exposed, and the most accessible loop is drawn outside with a ring-nosed forceps.

**Third Stage.**—Perforation of the mesentery by a curved forceps, and transfixion of the mesentery by an aseptic compress whose extremity is tucked around the herniated loop in such a way as to plug the wound.

**Fourth Stage.**—The intestinal loops are crushed with the large round écraseur. If the case be not urgent the intestine is opened at the groove of the écraseur on the second or third day after the first period of adhesions are formed. If grave obstruction is present a large rubber tube is immediately introduced in the upper end. The tube conveys the contents beyond the dressing and the intestine is ligatured on to the tube.

**Fifth Stage.**—Plugging of the wound. Flat dressing.

*Radical Cure of the Iliac Anus.*

Radical cure of the iliac anus is indicated, when the artificial anus has been created in order to obtain cicatrization of wounds or fistulae implicating the rectum, and in cases where the cure of these maladies has been obtained without stenosis.

This operation includes the following stages:

**First Stage: Incision of the Soft Parts and Liberation of the Fistulous Intestine.**—The skin is incised parallel to the crural arch, above and below the artificial anus, as far as the aponeurosis. The intestinal orifice, which was for the moment plugged, is now closed by an oval forceps, and the incision of the soft tissues is continued as far as the peritoneum.

**Second Stage.**—The left index finger, introduced into the serous cavity, recognizes the surroundings of the herniated loop, and guides the blunt-nosed scissors in completing the circular section of the peritoneum. The complete loop is now drawn outside and three or four sterile compresses are introduced into the peritoneum in order to protect the field of operation from all contamination. Each is fixed by a ring forceps, and the closure of the intestine is proceeded with.

*Third Stage: Closure of the Intestinal Orifice.*—Circular enterorrhaphy is probably more defective in the region of the sigmoid than in any other part of the large intestine, above all in cases of artificial anus. The small calibre of the upper end and the frequently large volume of appendices epiploicæ greatly complicate the sutural confection. It is preferable here also to carry out my usual technique of lateral entero-anastomosis after closure by purse-string suture of upper and lower ends. The lower end being disinfected before the operation, coprostasis is only indicated on the upper end, where an elastic forceps is placed as high as possible after any stercoral matter which it contains has been pushed back. The mesocolon is perforated with the index finger above and below the artificial anus where the line of division is to be made. The sigmoid flexure is crushed, and a ligature is applied in the groove formed by the écraseur. The intermediary portion between the ligatures is resected with the scissors after the application of two curved forceps, which fix an aseptic compress around it, and the corresponding mesentery is in its turn crushed and ligatured. On the empty upper end the sigmoid may be crushed and severed in the groove of the écraseur without circular ligature. The divided surface is invaginated, and a double purse-string suture is applied. Each of the small intestinal stumps is cauterized with the thermo-cautery and then invaginated under a double purse-string suture.

*Fourth Stage: Lateral Entero-Anastomosis.*—To terminate the operation, a lateral entero-anastomosis must be made. Section should be made longitudinally on the lower extremity at the level of the largest of the circular bundles, and longitudinally or obliquely on the upper extremity at the level of a like bundle and at the most favourable point for a good union.

The first layer of sutures should be applied on the edge of the longitudinal band on the lower end, which is generally narrower owing to the old retraction of this part of the intestine. The second layer of sutures is placed, then the double incision with the thermo-cautery is made. The third posterior plane is then finished (muco-mucous), and then the two sero-serous superficial layers. A last thread, if necessary, unites the appendices epiploicæ and excludes the mesenteric ligatures.

*Fifth Stage: Closure of the Wound, Provisional Tampon.*—It is not prudent to close the peritoneum immediately. A large gauze mesh is left in contact with the intestinal suture, fixed to the superficies of the wound. An evolution of acute peritonitis is thus prevented should the suture become infected, which is to be feared in this region owing to the rich microbial flora in the large intestine. Intestinal sutures do very well under aseptic plugging. Should a small fistula be produced all peritoneal complication is averted. The abdominal wall should be united several weeks later. The anus is immediately dilated with a Cusco speculum. This procedure for the radical cure of an artificial anus carries with it, without exception, the resection of the spur—i.e., all the inflamed and indurated part which would be the principal obstacle to circular enterorrhaphy.

The technique described above has another advantage over circular

enterorrhaphy, in that it causes no narrowing at the point of union. The technique is very sure, since the anastomosis between the upper and lower ends is made exclusively in the region of the longitudinal muscular bundles, where the wall is thicker and gives a better holding ground for the sutures.

### OPERATIONS ON THE ANUS AND LOWER SEGMENT OF THE RECTUM.

#### Traumatic Lesions.

Wounds in the region of the anus involving the sphincter are repaired by immediate suture. If suppuration is present the wound is treated by plugging.

Foreign bodies of the anus, whether they be sharp-edged or voluminous, may necessitate a surgical intervention. Foreign bodies of small dimensions and sharp-edged are localized by digital examination and by the rectoscope, which allows of their extraction by means of an appropriate forceps.

Large foreign bodies may mount as far as the sigmoid flexure. One of my professors at the Rheims School of Medicine extracted, by means of a left iliac colotomy, a bottle of champagne which an idiot had managed to introduce into his rectum.

#### Inflammatory Lesions.

##### ACUTE INFLAMMATORY LESIONS.

Inflammation localized to the folds of mucous membrane of the rectal ampulla may give rise to peri-rectal abscess and phlegmons in the ischio-rectal fossa, which point on either side of the anus.

**Operation—First Stage.**—Incision of the skin.

**Second Stage.**—Perforation of the focus with the end of blunt scissors and enlargement of the orifice by divulsion.

**Third Stage.**—Toilet of the abscess cavity with compresses and examination of its anfractuosités.

**Fourth Stage.**—Aseptic plugging.

Cicatrization is as a rule rapid if no communication exists with the rectal ampulla. The cutaneous orifice must be kept wide open as long as the depths of the wound are not filled.

##### SUBACUTE INFLAMMATORY LESIONS.

As a rule these are tuberculous abscesses. These abscesses may undergo subacute evolution and point at the sides of the anus. It is a useful measure to open them before they have perforated the rectal mucous membrane. The cavity is treated by arocauterization and plugging.

**Congenital and Acquired Malformations.**

**CONGENITAL MALFORMATION.**

*Imperforate Anus.*

Congenital imperforate anus is always immediately recognized by the infant's nurse. I have on several occasions remedied this deformity.

**Operation.**—The infant is held by the legs, which are held almost vertical.

**First Stage.**—Longitudinal cutaneous incision 3 centimetres long at the point where the anus should be.



FIG. 421.—IMPERFORATE ANUS.

Diagram: The ampulla is close to the perineum.



FIG. 422.—THE SAME.

Descent of the cul-de-sac after incision of the intersphincteric space and dissociation of the subjacent cellular tissue.



FIG. 423.—THE SAME.

The rectal cul-de-sac is very highly situated, and is united to the sphincteric space by a cellular band.



FIG. 424.—THE SAME.

The rectal cul-de-sac appearing at the bottom of the wound has been perforated. Circular suture of mucous membrane to skin.

**Second Stage.**—Divulsion of the subcutaneous fat with blunt scissors and exploration of the wound with the index finger. The child is placed on its back. It cries, and makes efforts which help to reveal the rectal cul-de-sac in the depths. In one case I found the cul-de-sac at a depth of 5 centimetres. As a rule it is quite superficial. The cellular adhesions of the lower pole of the rectal cul-de-sac are freed, and under the infant's efforts it approaches the skin.



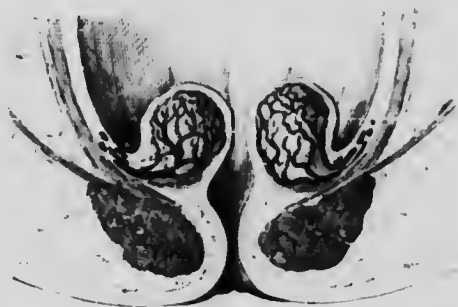


FIG. 125.—SECTION SHOWING RIGHT AND LEFT INTERNAL HEMORRHOIDS.

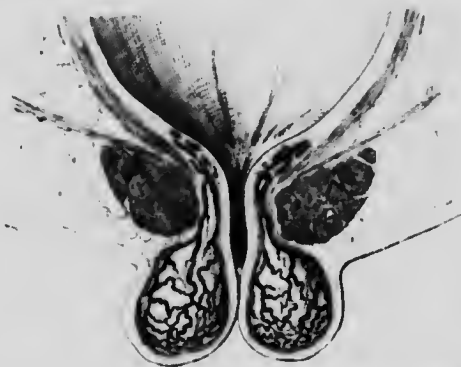


FIG. 126.—SECTION SHOWING TWO EXTERNAL HEMORRHOIDS.

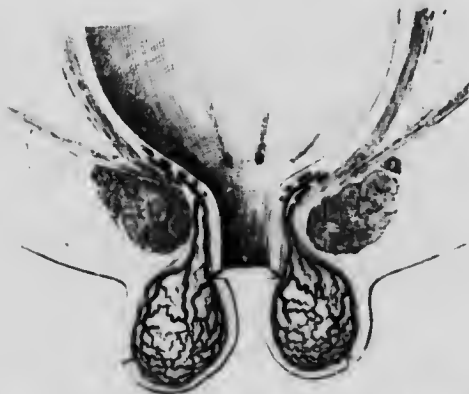


FIG. 127. EXCIPIATION OF TWO EXTERNAL HEMORRHOIDS.  
Schema of the incision of the muco-cutaneous covering of the varicose tumours.

*Third Stage.*—Puncture of the cul-de-sac. The meconium, which is aseptic, is expelled.

*Fourth Stage.*—Washed with Ringer's solution, the intestine is sutured circularly to the skin. This operation prepares the external sphincter.



FIG. 428. —SUBCUTANEOUS AND SUBMUCOSAL ENUCLEATION OF THE LEFT HÆMORRHOID WITHOUT WOUNDING THE EXTERNAL SPHINCTER.

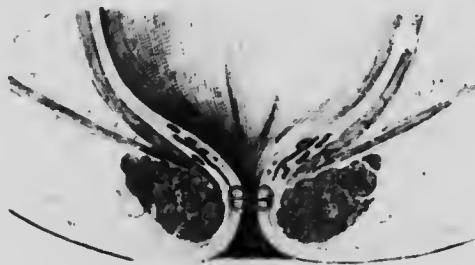


FIG. 429. —THE SAME.

The operation is finished. The mucous membrane is retracted, drawing the suture line into the interior of the anus.

#### ACQUIRED MALFORMATIONS.

##### *Hæmorrhoids.*

A varicose condition of the hæmorrhoidal veins is either external or internal with relation to the anal orifice.

Cauterization with the hot iron should be abandoned. It is not sufficient and incurs the danger of a cicatricial stenosis of the anus. Annular resection of the lower extremity of the rectum is no longer recommended; this operation is followed by an irreparable loss of tissue, and may cause incontinence.

*Enucleation of Hemorrhoids.*

**DOYEN'S METHOD.**—Submucous enucleation of hæmorrhoidal varices alone allows the anus to be returned to its normal conformation and function. My method consists in incising the mucous membrane circularly at its insertion to the skin, and in enucleating the varicose packets. When the mucous membrane is incised it is easy to enucleate the varicose veins by isolating them by division with the ends of blunt scissors.

If the hæmorrhoid is prolapsed and forms a pedunculated tumour, the mucocutaneous tegument is circumscribed by two incisions. Two conditions may present themselves:

1. The hæmorrhoids are localized.
2. They constitute an enormous perianal circular pad.

*1. Localized Hemorrhoids.*

*Preliminary Stage.*—Dilatation of the anus withusco's speculum, which is introduced closed and drawn out open. This dilatation immediately brings the hæmorrhoids into evidence. They become congested.

*First Stage.*—A hæmorrhoid is seized in the nose of an annular forceps. The exuberant tissues are circumscribed by two oval incisions made with the scissors parallel to the perianal circumference. The external edge is detached by division with blunt scissors, and the whole varicose mass is extracted as far as the point where it emerges from the muscular sphincter, preserving the mucous membrane.

*Second Stage.*—Interrupted sutures are used with No. 5 silk, the suture being sufficient to assure hæmostasis; very exceptionally a small arteriole has to be ligatured.

**OPERATIVE RESULTS.**—The skin and mucous membrane being preserved by this process, their reunion re-establishes the anus in its normal structure.

*2. Circular Hemorrhoidal Pad.*

The anus is dilated withusco's speculum.

*First Stage.*—I usually commence the operation at the anterior anal commissure and on the surgeon's right. The hæmorrhoidal mass is seized with an annular forceps, and detached between two V-shaped incisions starting from the middle line and directed outwards.

Care is taken now not to excise any but the exuberant integuments. The varicose mass is enucleated from the depths, preserving the cutaneous flap on the outer side and the mucous flap on the inner side. As soon as the hæmorrhoidal mass is detached for a length of 20 to 25 millimetres the suture is commenced and two or three silk sutures (interrupted) are applied.

*Second Stage.*—The enucleation is completed from above downward to the right of the anus for a length of 20 or 30 millimetres (middle third)—saving the skin and normal mucous membrane and resecting only the exuberant tissues. Three or four more sutures are placed.

*Third Stage.*—Extirpation of the lower third of the mass and suture.

*Fourth, Fifth, and Sixth Stages.*—Extirpation of lower third, middle, and upper thirds of the hæmorrhoidal mass, from below upwards on the other side, and immediate suture of the mucous membrane to the skin (Fig. 430).



FIG. 430. CIRCULAR HÆMORRHOIDAL PAD. EXTIRPATION BY HÖYEN'S METHOD OF PROGRESSIVE SUTURE.



FIG. 431. THE SAME (FROM A PHOTOGRAPH).

The mucous pad is detached in front to the left of the anus. Placing the first suture uniting the rectal mucous membrane to the skin around the anus.



FIG. 432.—THE SAME.

The superior third of the hemorrhoidal pad is removed. The sutures can be seen. Enectation of the middle third, preparing at the same time the mucous membrane and the skin.



FIG. 433.—THE SAME.

The operation is almost at an end. The circle of perianal sutures can be seen. The surgeon detaches the last hemorrhoidal varice. The anus is reconstituted.

Rarely it is necessary to ligature a few arterioles. Supplementary sutures are placed if necessary.

**Flat Dressing, T Bandage.** The sutures which have not fallen out of themselves are removed on the twelfth day. It is not necessary to constipate the patient if the function of the intestine is normal.

**LATER RESULTS.**—It is necessary at times to resect or canterize, after three or four months, one or two small eversion of the mucous membrane. This small intervention can be performed under local anæsthesia. Generally the line of union of the skin to the mucous membrane is almost invisible, and it is impossible after ten to twelve months to find an appreciable trace of this wide operation. The exuberant teguments alone are removed, and the union of the mucous membrane and skin is re-established in their



FIGS. 434 AND 435. PHOTOGRAPH, ACTUAL SIZE, OF TWO HEMORRHOIDAL PADS REMOVED BY DOYEN'S OPERATION.

normal relations—that is, in the state of repose of the anus no trace of mucous membrane is found outside. The perianal special tegument, which has been preserved, is again invaginated into the sphincterian orifice. It presents its normal coloration, and its radiating folds are re-established in their integrity.

This result can only be obtained if this method of progressive suture be carried out. Indeed, this procedure allows each point of the cutaneous section to be united with the corresponding point of the mucous section. An analogous procedure of enucleation and progressive suture has been described for small tumours on the edge of the tongue. It is also applicable to the extirpation of polypi in the rectal ampulla and of certain syphilitic annular suprasphincterian retractions.

*Prolapse of the Rectum.*

Simple prolapse of the mucous membrane, if it recurs in spite of reduction, is treated by several deep canterizations with the thermo-cautery. In-veterate prolapse may require the excision of the prolapsed mucous membrane. It must be remembered that this resection causes a fairly abundant loss of blood, a point to be considered in young children. In the adult my method of preliminary crushing, followed by section below the écraseur, can be applied to the resection of the prolapsed rectal mucous membrane, followed by circular interrupted suture. If the prolapse be considerable the peritoneum may be opened. If so, a sero-serous suture must be applied.

*Fistula of Anus.*

Anal fistulae are almost always tuberculous in origin. The only way to cure them is to remove the pathological tissues for their whole extent and thickness.

**Operation** *First Stage.*—Incision of the fistula on a grooved director or between the opened ends of a curved forceps.

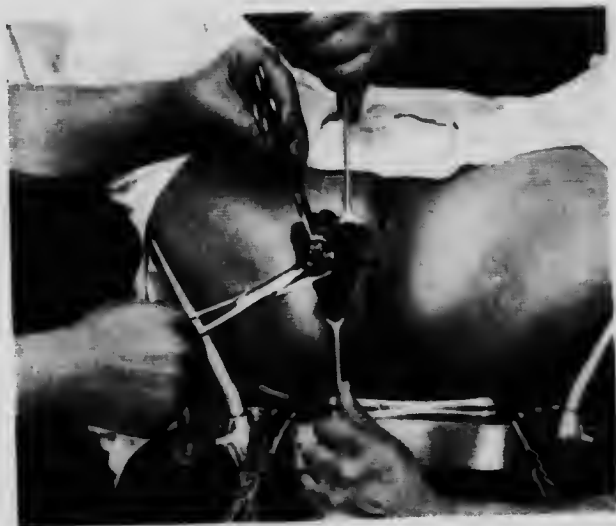


FIG. 136.—TOTAL EXTIRPATION OF AN ENORMOUS RIGHT PERIANAL FISTULA

*Second Stage.*—Curetting of the tract and careful search for secondary tracts.

*Third Stage.*—Excision of all the peri-fistulous tissue with dissecting forceps and scissors, hemostasis of wounded arterioles.

*Fourth Stage.*—Aerocauterization. *Plugging.* The operation always succeeds if it is complete. The incision of the sphincter is generally partial, and heals well by secondary union. Aerocauterization assures the destruction of the infectious germs.



FIG. 437. EXPLORATION OF MULTIPLE PERIANAL FISTULOUS TRACTS.



FIG. 438. THE SAME.

Aspect of the field of operation after complete extirpation of the pathological tissue.



*Fistula of the Ischio-rectal Fossa.*

**Multiple Perirectal Fistulae.**—Some perirectal fistulous tracts are multiple, very winding, surround the rectal ampulla, and extend from one ischio-rectal fossa to another.

**Operation—First Stage.**—Incision of the fistulous tract.

**Second Stage.**—Curetting of the incised tracts and search for deep ramifications.

**Third Stage.**—Extirpation of all the pathological tissues however deep. It is sometimes indispensable to make a horse-shoe incision around the posterior part of the anus, concave forwards, in order to open the ischio-rectal fossae widely. In some cases the ischium, which is carious, has to be resected.

**Fourth Stage.**—Aero-cauterization. Plugging. Cicatrization takes several months.

*Repair of the External Sphincter.*

When the external sphincter has been partially destroyed, or when it has been incised in the case of a deep extrasphincterian fistula, the patient suffers from incontinence.

I have repaired with success several incontinent external sphincters by carefully dissecting the two severed extremities of the muscular ring and suturing the two ends as is done for oblique tendinous suture.

Multiple fine silk sutures must be used. This operation only succeeds when asepsis is complete, a condition difficult to obtain in this region.

*Syphilitic Stenosis.*

The anal route may also be used to approach lowly placed syphilitic stenoses, which are treated by annular excision followed by progressive circular suture. This operation is performed after forcible dilatation of the sphincter, which ought not to be divided.

**Tumours of the Rectum.**

## BENIGN TUMOURS.

*Polypi.*

Polypi of the rectal ampulla or of the upper part of the rectum are not rare.

**Operation Preliminary Stage.**—Forcible dilatation of the anus and rectoscopy.

1. **PEDUNCULATED POLYPUS—First Stage.**—The polyp is seized with a ring forceps.

**Second Stage.**—Ligature of the pedicle with No. 40 silk. (The galvanic loop may also be employed.)

If the pedicle is broad it is extirpated by the sutural method described for the removal of small sessile tumours of the tongue and hemorrhoids.



FIG. 439.—REMOVAL OF A POLYP FROM THE LOWER PART OF A RECTUM BY THE PROGRESSIVE SUTURE METHOD.

**SESSILE POLYPL.**—Sessile polypi are often the first stage of epithelioma. They are best treated by electro-coagulation. If their point of implantation is high it is preferable not to operate by the natural route, but to make a posterior rectotomy (trans-sacral; see later).

#### MALIGNANT TUMOURS.

##### *Epithelioma. Colloidal Cancer.*

1. **CANCER OF THE ANAL ORIFICE.**—Excision with the bistoury is almost always followed by recurrence. These tumours should be treated by means of electro-coagulation.

**Operation** *Preliminary Stage.* Dilatation of the anus.

*First Stage.* Curetting of the epithelioma until the subjacent fibrous coat appears.

*Second Stage.*—Thermo-penetration of the whole surface of implantation, the temperature being carried to 65° or 70° C.

2. **CANCER OF THE LOWER EXTREMITY OF THE RECTAL AMPULLA.**—By the anal route, commencing cancer of the rectal ampulla may also be destroyed, especially those which as yet have not invaded the whole periphery of the intestine.

Electro-coagulation demands the forcible dilatation of the anus and the application of a cylindrical wooden speculum of large diameter (Vol. I., p. 496).



Direct electro-coagulation of cancer of the rectum will become of general application when doctors have accustomed themselves to examine their patients at the first opportunity, and to make timely diagnosis.

3. **CANCER OF THE UPPER PART OF THE RECTAL AMPULLA.**—When the lesion is situated high there should be no hesitation in creating a wide means of access by a posterior incision. I have modified the earlier technique of Kraske's operation.

*Posterior Trans-Sacro-Coccygeal Rectotomy.*

**DOYEN'S METHOD: Position of the Patient.**—The patient should lie on the right side and not on the left side. When the patient lies on the right side the surgeon's left hand, in a rubber glove, can penetrate the anus at the opportune moment, and help to push the tumour out of the wound. We will describe successively posterior rectotomy for the extirpation of small localized tumours of the rectum and for direct electro-coagulation of small cancers of the rectum, and then the excision of the rectum by the sacral route.

**Operation—Preliminary Stage.**—Forcible dilatation of the anus.

**First Stage.**—Incision 12 to 15 centimetres in length in the median line, commencing above the anal sphincter, which should remain intact.



FIG. 440. POSTERIOR TRANS-SACRO-COCYGEAL RECTOTOMY. SECOND STAGE. RESECTION OF THE COCCYX AND EXTREMITY OF THE SACRUM.

**Second Stage.**—Exposure of the coccyx and the lowest sacral vertebrae, section of the lateral fibrous ligaments with curved scissors, and transverse section with cutting forceps, either of the coccyx alone, or of the coccyx and lowest sacral vertebrae. There is no hæmorrhage as a rule. If they

bleed it is easy to crush the end of the middle sacral artery or the periostic arterioles.

*Third Stage.*—The cellular tissue separating the sacrum from the posterior surface of the rectum is dissociated. The rectum is raised by the index and middle fingers, which are introduced into the anus.

*Fourth Stage.*—The posterior wall of the rectum, raised on the index finger or on a long curved forceps, is incised and the orifice is enlarged by divulsion.



FIG. 441.—THE SAME. FOURTH STAGE.

The rectum is open. Exploration of the anterior mucous membrane. Application of a curved forceps below a sessile polyp, which is implanted on the anterior surface of the rectal mucous membrane.

The cavity of the rectal ampulla is explored, and the lesion necessitating operation is exposed.

**SESSILE POLYPI.**—Figs. 440-443 show the extirpation of a sessile polyp from the superior part of the rectal ampulla. The tumour is drawn outside and a curved forceps is placed below it. The tumour is resected with the scissors and a muco-mucous suture is immediately employed to reunite the intestine, tight enough to cause hæmostasis of the vessels at the surface of section. This technique is only applicable to small tumours of the extraperitoneal portion of the rectum. The small wound of the posterior rectal wall is then transversally sutured with two layers of No. 3 silk.

*Fifth Stage.*—Partial suture of the cutaneous wound, leaving room for the passage of a plug.

**ELECTRO-COAGULATION OF A CANCER IN THE MIDDLE OR UPPER PART OF THE RECTAL AMPULLA.**—The posterior wall of the rectum is incised

as for the removal of a polyp. The orifice is enlarged by divulsion and the whole tumour is brought into view, care being taken to bring it outside and to evert its borders should it be crateriform in disposition. Strong silk

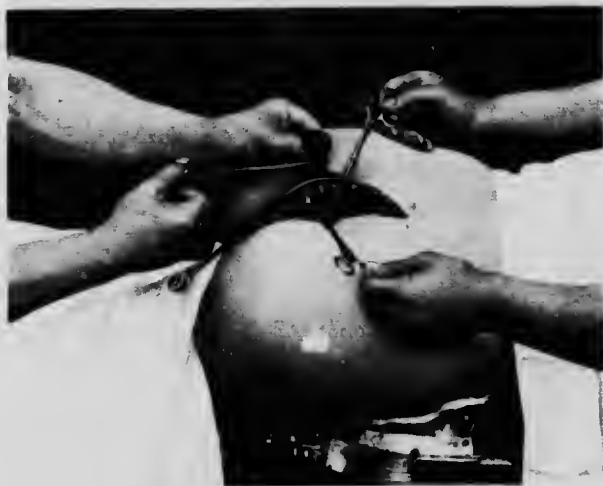


FIG. 442.—THE SAME. SECTION OF THE RECTAL MUCOUS MEMBRANE BETWEEN THE FORCEPS AND THE POLYP. The peritoneum is not opened.

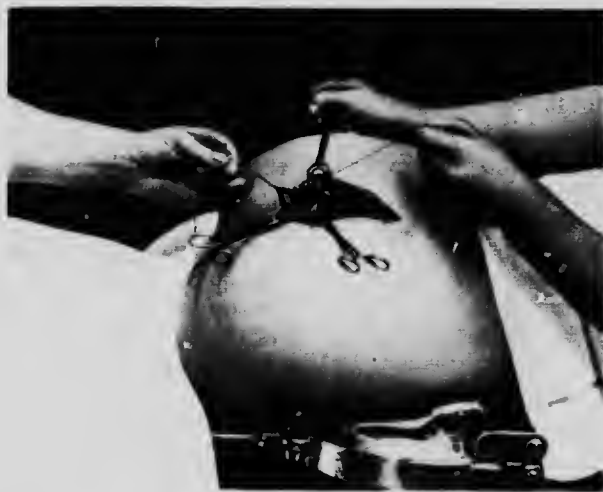


FIG. 443.—SUTURE OF THE MUCOUS MEMBRANE IS PERFORMED WITH NO. 2 SILK, AND IS FINISHED BEFORE REMOVAL OF THE FORCEPS.

loops are passed around the neoplasm to assure of its exteriorization, and electro-coagulation may be proceeded with, which may be combined with immediate ennetting in order to observe if the action of the penetrating heat has been propagated to the limits of the cancer.

*Fifth Stage.*—The edges of the rectal wound are fixed by silk threads to the cutaneous wound, in order to keep wide open the depths of the field of operation, and the wound is plugged.

**OPERATIVE SEQUELÆ.**—Separation of the portions mortified by the action of the heat is watched, and preparation is made to treat any eventual hæmorrhage. The cicatrization of the loss of substance is also watched to its perfection. Should suspicious points remain after three or four weeks, they are treated anew by electro-coagulation.

*Total or Partial Extirpation of the Lower Segment of the Rectum.*

**Operation.**—The three first stages are performed as above. Two conditions may present themselves.

1. **THE CANCER HAS INVADDED THE ANUS AND THE SPHINCTER:** *Fourth Stage.*—The rectum is completely severed from the anus to above the tumour. The antero-inferior part of the rectum is detached from perineal connections, and it is liberated from below upwards to a point above the tumour.



FIG. 444. ABLATION OF A CANCER OF THE ANUS AND OF THE RECTAL AMPULLA. SUTURE OF THE UPPER END OF THE RECTUM TO THE SKIN.

It frequently happens, when the tumour mounts very high, that the peritoneum is opened. A large aseptic compress is immediately introduced into the serous cavity, and advantage is taken of the opening of the peritoneum to draw out a certain length of the upper part of the rectum and even

to draw the sigmoid flexure downwards. The serous cavity is then closed by two superimposed continuous sutures of fine silk. The lower segment of the rectum is removed after preliminary crushing. Care must be taken to ligature the hæmorrhoidal arteries, which may be numerous.



FIG. 445.—REMOVAL OF A LARGE TUMOUR OF THE RECTAL AMPULLA. The rectum and the tumour are pushed out of the wound by the fingers introduced into the rectum.



FIG. 446.—THE SAME.

The rectum has been incised, the tumour is exposed.

*Fifth Stage.*—The upper end is then fixed to the skin in such a way that there is no dragging on the sutures.

Following the example of Gersmy, torsion may be applied to the upper end before suturing to the skin, in order to form a sort of adventitious



sphincter. The remainder of the wound is sutured, leaving room for the passage of a compress to plug the depths of the wound.



FIG. 447.—THE SAME. EXCISION OF THE TUMOUR.



FIG. 448.—SUTURE OF THE UPPER PART OF THE RECTUM TO THE SKIN.

2. THE ANAL EXTREMITY OF THE RECTUM IS INTACT.—In this case the sphincter ani is respected, and the cancerous mass is extirpated. Should the cancer reach a high point the peritoneum should be opened without

hesitation in order to draw down the upper part of the rectum and even the lower part of the iliac sigmoid.

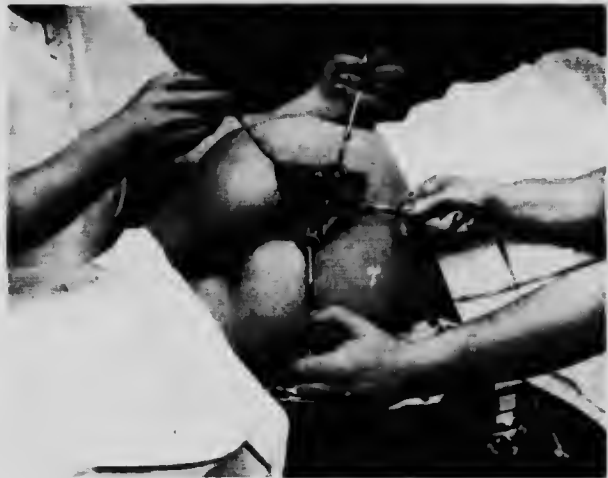


FIG. 449. ABLATION OF A SMALL CANCER OF THE RECTUM.



FIG. 450. THE SAME. TRANSVERSE SUTURE OF THE RECTUM.

*Fifth Stage.*—Either transverse union of the rectum may be made, as in Fig. 450, or the upper end is brought down to the anus, whose mucous

membrane has been removed, respecting the sphincter, and the lower end is sutured to the skin in the anal region. This is the best method when the upper end is sufficiently movable. When the cancer is very high the surgeon is reduced to fixing the upper end to the upper commissure of the cutaneous wound (Fig. 448).

#### *Radical Cure of Sacral Anus.*

Radical cure of the sacral anus may be attempted in certain rare cases.

**Operation—First Stage.**—Oval cutaneous incision circumscribing the fistula and dissection of its circumference.

**Second Stage.**—Liberation of the rectum above and below the fistula, and opening of the peritoneum in order to liberate the sigmoid flexure, the mobile part of which is drawn into the wound.

**Third Stage.**—Suture of the upper end to the mucous membrane at the anal extremity of the rectum, or which is to be preferred, suture of the sigmoid flexure to the skin surrounding the anus after extirpation of the mucous membrane. If there be no dragging, union is good. As the sphincter is intact, a normal anus is thus obtained whose function is satisfactory.

**OPERATIVE SEQUELÆ.**—The small mucous hernias which may appear outside are resected or cauterized later.

#### *Lateral Transplantation of the Sacral Anus.*

**DOYEN'S METHOD.**—When the upper end is too short for radical cure a fairly satisfactory result may be obtained by the creation of a lateral anus through the gluteus maximus.

**Operation—First and Second Stages.**—Dissection and isolation of the upper end as above, opening the peritoneum as is necessary.

**Third Stage.**—Perforation of the gluteus maximus 4 or 5 centimetres from its inner border, in its thickest part, and incision of the skin at the most convenient point.

A ringed forceps is made to penetrate from the surface towards the deep parts, and the extremity of the intestine is drawn out from within through the buttonhole musculo-cutaneous opening. The orifice of the intestine has been closed by a temporary ligature.

**Fourth Stage.**—The ligature is cut and the end of the intestine is united to the skin with interrupted silk sutures. In the median wound the external wall of the intestine is fixed by sutures to the deep layers. The median wound is then closed, leaving an opening for the partial tamponing of the wound.

**OPERATIVE SEQUELÆ.**—This lateral transgluteal anus acts well. It retains the intestinal contents better than the simple torsion of Gersuny. Indeed, the intestine has now a double curve, the first at its emergence from the sacral region and the second where it penetrates between the powerful fibres of the gluteus maximus. A sort of external sphincter is produced at this point, owing to cicatricial contraction.

## OPERATIONS ON THE RETROPERITONEAL SUBUMBILICAL REGION.

## A. Median Retroperitoneal Region.

The surgeon is frequently called upon to intervene in this region, either for lipomata or myxomatous tumours, or for hydatid cysts, developing in the median or juxtamedian retroperitoneal region. These tumours, pushed aside by the vertebral column and limited behind by the posterior abdominal wall insinuate themselves between the two serous folds of the mesentery, where they may reach a considerable volume. The largest of these tumours, which have been wrongly named tumours of the mesentery, have been found



FIG. 451.—MULTILOCLAR HYDATID CYST IN THE RETROPERITONEAL SUBUMBILICAL REGION.

in the female; they spring from the region of the colon or kidney, and their origin is closely associated with a microbial infection emanating from these organs.

The removal of large lipomata and large retroperitoneal myxomata in the female is carried out by a technique analogous to that for the decortication of large tumours of the broad ligament. This operation will be described in the section on Gynæcology.

## RETROPERITONEAL HYDATID CYSTS.

Retroperitoneal multiple hydatid cysts in the subumbilical region form multilobular tumours with small mobility. Precise diagnosis is made by Weinberg's reaction, which is very sure in cases of hydatid cysts. If this reaction has not been made, the diagnosis will only be made at the time of operation.



FIG. 452. THE SAME. ENUCLEATION OF SUPERFICIAL HYDATIDS.

The operative manoeuvres are subordinated to the very variable topography of the lesion. The case shown in Fig. 451 is one of the most complicated which can be met with.

As soon as the tumour is brought outside the abdomen the peritoneum is protected with sterile compresses, the different cysts are incised, and the fluid and the membranes evacuated. The cellular cavity is then treated by marsupialization and plugging.

Several months later Weinberg's reaction is employed to ascertain if other cysts exist which are of new formation or which have escaped observation at the time of operation.



FIG. 453. —THE SAME. ENUCLEATION OF THE DEEP HYDATIDS.



FIG. 454. —THE SAME. SUTURE OF THE WOUND, ALLOWING ROOM FOR THE COMPRESS PLUGGING THE CELLULAR ENVELOPE.

### **B. Lateral Retroperitoneal Region.**

#### **ANATOMICAL CONSIDERATIONS.**

The kidney and ureter are frequently the seat of lesions, which necessitate the intervention of the surgeon. These organs are situated in the lateral retroperitoneal region. The right kidney and the left kidney are situated very nearly at the same level. The right kidney is often found to be slightly lower than the left kidney, owing to the volume of the liver. We have observed in our sections of the trunk (*Atlas of Topographic Anatomy*) a subject in whom the left kidney was slightly lower than the right.

The tendency of the right kidney to be more easily accessible than the left is accentuated when this organ increases in volume, for it is impossible for it to develop in an upward direction where the renal compartment is limited by the contact of the right lobe of the liver. On the other hand, on the left side the kidney can develop upwards towards the concavity of the diaphragm.

Thus the left kidney is rarely lowered, whereas the "floating kidney" is frequently observed on the right side, where the organ may slip as far down as the iliac fossa.

It must not be forgotten that cases of single and median kidney are not very rare, and the possibility of this abnormality should always be borne in mind when an exploration gives uncertain results.

#### **MEANS OF ACCESS TO THE KIDNEY.**

The kidney may be approached either by the lumbar route or by the abdomino-lateral route or lumbo-iliac route.

##### *Lumbar Route.*

When the kidney is not sensibly enlarged it is preferable to approach it by the lumbar route. The incision should start at the twelfth rib, on the edge of the sacro-lumbar muscular mass; it is continued downwards and forwards towards the anterior superior iliac spine. The bistoury divides the skin and the superficial aponeurosis of the sheath of the sacro-iliac muscle. The muscle is retracted inwards, and its deep aponeurosis is divided vertically. The anterior portion of the aponeurosis of the transversalis muscle is immediately found covering the perirenal fascia and the adipo-cellular tissue surrounding the kidney. The aponeurotic insertion of the transversalis muscle is incised on the inner side near the external border of the square lumbar muscle, for on the outer side there is a risk of opening the peritoneal cavity.

The kidney is easily found, if its position be not abnormal, by gently drawing the perirenal fascia into the wound with a curved forceps, and tearing it above and to the inner side. The perirenal fat escapes, and the kidney is discovered. Liberation of the kidney and its luxation are easy of execution when the organ is healthy and when no perinephritis exists.

In operations for floating kidney and in operations for mobile calculous kidney I draw the organ entirely out of the wound, in order to explore it carefully, and to carry out with greater ease the further stages of the operation.

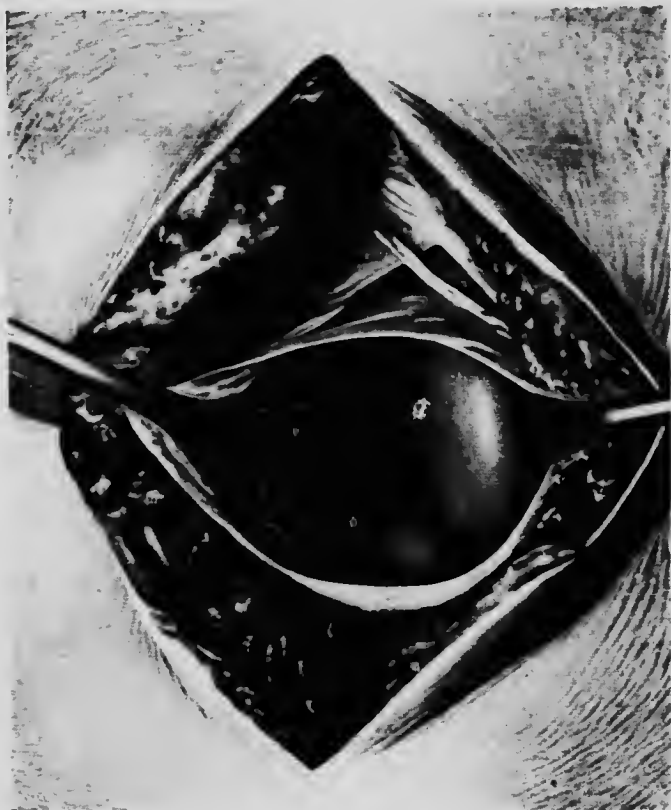


FIG. 455.—OPERATIVE TECHNIQUE. EXPOSURE OF THE RIGHT KIDNEY BY THE LUMBAR ROUTE.

The perirenal fascia is incised. The two abdomino-genital nerves appear above and the costo-transverse ligament of Henle.

#### *Transperitoneal Route.*

When the kidney is very voluminous it must be reached by the transperitoneal route on the anterior axillary line (Fig. 458). The incision starts at the tenth rib, and is directed towards the anterior superior iliac spine. The peritoneum is reached and the tumour is recognized. The external peritoneal sinus, which is hardly 2 or 3 centimetres deep, is then stripped



from the abdominal wall and the kidney is reached by the subserous route. The peritoneal wound is provisionally plugged, and the operation is terminated by the extraperitoneal method.



FIG. 456.- SAME OPERATION. SECTION OF HENLE'S LIGAMENT WHICH NARROWS THE FIELD OF OPERATION ABOVE.

The abdomino-genital nerves are intact.

#### *Exposure of the Ureter.*

The ureter can be exposed in its course by the subperitoneal route.

Figs. 461-464 are designed in order to show how easy it is to strip the serous membrane from the postero-lateral abdominal wall.

The incision of the wall in Fig. 459 has been made, for the purposes of this demonstration, slightly to the inner side of the vertical plane, passing through the anterior superior iliac spine. The cartilage of the tenth rib has been divided. The peritoneum has been dissected and attached to the external edge of the wound, and then pushed to the inner side and above

(Fig. 463). In the depths of the wound will be seen the abdominal portion of ureter which has been hooked upon a curved forceps, and, above, the lower pole of the left kidney. Fig. 464 shows the luxation of the left kidney and the forepressure of the pedicle.



FIG. 457.— SAME OPERATION.

The kidney has been isolated from its adipose cellular envelope; its lower pole is drawn outwards by a ringed forceps, care being taken not to crush it.

The pelvic ureter is reached by prolonging the incision parallel to the crural arch to the neighbourhood of the pubis, and by continuing the stripping of the peritoneum as far as the pelvic cavity.

The incision which allows of the removal of the kidney and, above all, the ureter by the retroperitoneal route should start at the twelfth rib, at the level of the external border of the sacro-lumbar mass; it is directed obliquely towards the anterior superior iliac spine. The incision then



FIG. 458. -APPROACH TO THE LEFT KIDNEY AND URETER BY THE ANTERO-LATERAL ROUTE. CUTANEOUS INCISION ON THE MAMMARY LINE.



FIG. 459.—THE SAME. SECTION OF THE TENTH AND NINTH COSTAL CARTILAGES AND OPENING OF THE PERITONEUM WHICH IN THE LIVING SUBJECT IS PLUGGED.



FIG. 460.—THE SAME. STRIPPING UP OF THE EXTERNAL LAYER OF PARIETAL PERITONEUM, WHICH IS EASILY DETACHED, CARRYING WITH IT THE DESCENDING COLON.



FIG. 461.—THE SAME.

The stripping of the peritoneum is continued outwards in order to reach the kidney and the ureter by the subserous route.



FIG. 402.— THE SAME.

The stripping up is combined on the posterior peritoneum. The fat of the renal compartment is exposed.



FIG. 463.— THE SAME. EXPOSURE OF THE LOWER POLE AS FAR AS THE PELVIC CAVITY.



becomes parallel to the crural arch. The exposure of the abdomino-pelvic ureter in the living subject does not call for so long an incision.

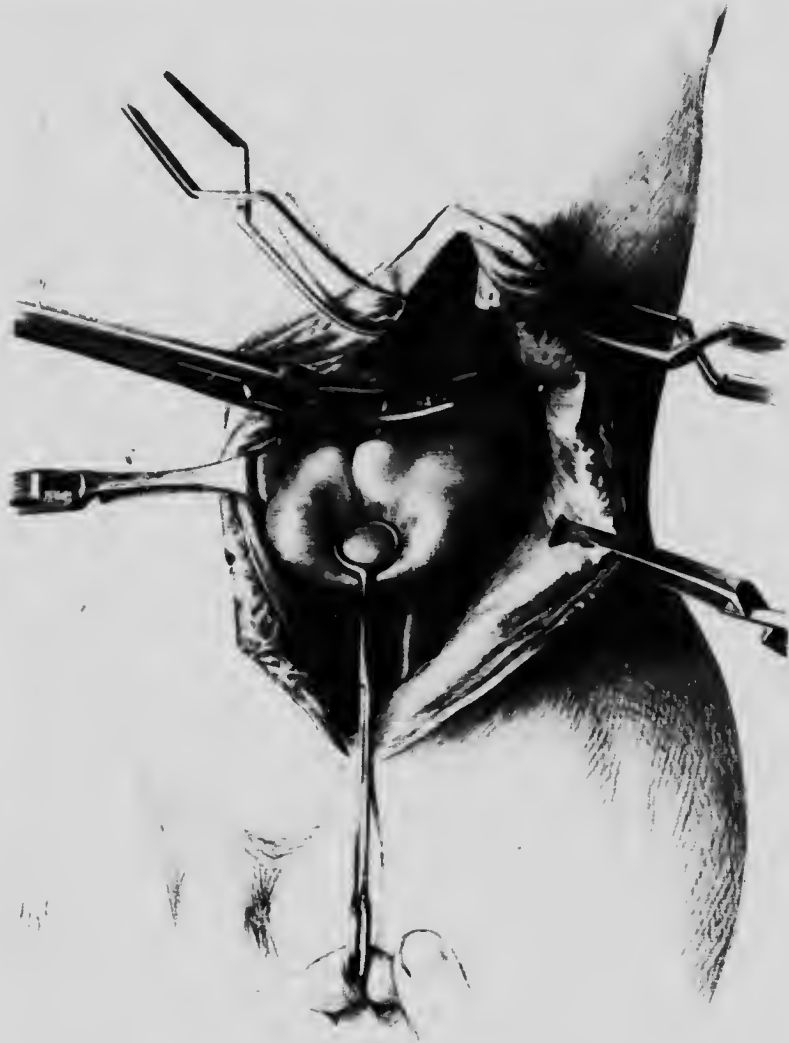


FIG. 464.—THE SAME. REMOVAL OF THE KIDNEY. APPLICATION OF TWO CURVED FORCEPS TO THE PEDICLE.

It is preferable to divide skin and musculature as recommended in lumbar nephrectomy, and to prolong the incision obliquely downwards towards the crural arch. The pedicle must be crushed with an angiotribe.

## OPERATIONS ON THE KIDNEY AND URETER.

## Exploration of the Kidneys and Urinary Secretion.

## BIMANUAL PALPATION.

By palpation of the hypochondrial regions and bimanual palpation it can be ascertained if the volume of the kidneys is normal. If the volume of the kidney is increased, and it remains mobile, renal ballottement can easily be perceived.

A floating kidney descends in a vertical situation and under the influence of a cough, but it regains its compartment under manual pressure in the dorsal decubitus with a characteristic jerk.

The discovery of a median and single kidney is a delicate matter. This malformation should always be sought for as it is not very rare.

Large tumours, whether they be hydronephrosis, pyelonephritis, renal cysts or renal tumours, are easily localized. Doubt seldom exists except on the left side when the tumour is developed forwards and may resemble a splenic cyst.

## CATHETERISM OF THE URETER.

Catheterism of the ureters is performed either with the aid of a prismatic cystoscope or with the Luys' direct vision cystoscope. This small operation is generally quite easy. It becomes almost impossible if there exist a deep ulceration at the opening of either of the two ureters.

Catheterism of the ureters with the prismatic cystoscope is performed in the dorsal decubitus. The cystoscope is lubricated with glycerine.

Direct catheterism with Luys' cystoscope is performed in Trendelenburg's position. The bladder is filled with air by direct aspiration.

The urine of either kidney is collected directly for quantitative and qualitative analysis.

At times the ureter on the diseased side is catheterized and the urine from the opposite kidney is collected by a bladder catheter, at other times both ureters are catheterized simultaneously.

The ureteral sound may be pushed very far if the ureter is free, and may penetrate as far as the pelvis of the kidney.

If a calculus exists, lowly situated, the sound does not penetrate.

## CYSTOSCOPY AFTER SUBCUTANEOUS INJECTION OF INDIGO-CARMINE.

Catheterism of the ureters may be supplemented by a cystoscopic examination, using the prismatic cystoscope, after a subcutaneous injection of 5 c.c. of a sterilized solution of 2 per cent. indigo-carmin.

A catheter is left in the bladder in order to observe the moment when the urine commences to be blue in tint.

The bladder is washed out with sterilized warm water, 150 c.c. are then injected and the cystoscope is introduced.

The ureter on the healthy side is examined and four or five ejaculations of blue tinted urine are observed. The quantity ejected and the intensity of the tint are easily appreciated. The ejection on the other side is then compared.

When a kidney does not function it will be noticed, after several minutes, that the corresponding ureter emits but little urine and that this urine is but faintly coloured. It is compared both in quantity and coloration with the urine emitted by the ureter on the healthy side.

This indigo-carmin process which was first shown to me by Dr. Luys is of great value when the orifice of the ureters have to be searched for in the base of an ulcerated bladder.

This orifice is indicated on either side by the little blue jet.

#### RADIOGRAPHY.

The latest radiographical installations are of great use in photographing renal and ureteral calculi area in fat subjects.

#### TRAUMATIC LESIONS.

Wounds of the kidney by pointed or blunt instruments or even by fire-arms call for immediate operation, and the plugging of the wound in order to avoid infiltration of urine.

Action should also be taken if crushing of the kidney be feared, and if the patient has not other lesions of such gravity that an operation is contra-indicated.

#### INFLAMMATORY LESIONS.

##### *Acute Inflammatory Lesions.*

**PERINEPHRITIC ABSCESS.**—Perinephritic abscess is manifested by deep and obstinate pain, then by tumefaction in the lumbar region, which is painful and clammy. Fever and the infectious condition confirm the diagnosis.

**Operation—First Stage.**—Vertical incision over the external border of the sacro-lumbar mass and incision of the deep sheath.

**Second Stage.**—Incision of the anterior aponeurosis of the abdominal transversalis muscle. Puncture of the focus with blunt-nosed scissors and enlargement of the orifice by division.

**Third Stage.**—Toilet and plugging of the focus. This operation takes but three or four minutes. Bacteriological examination of the pus is made and subcutaneous injections of mycolysine are given.

##### *Chronic Inflammatory Lesions.*

**SIMPLE OR CALCULOUS PYELONEPHRITIS.**—Calculous pyelonephritis necessitates nephrotomy and the removal of the calculi. The condition is often bilateral, and the state and function of the other kidney should be investigated.

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Renal calculi are often microbial in origin, especially phosphatic calculi, which may attain a considerable size. Their ramifications penetrate the calices.



FIG. 465.

Above: Large uric and phosphatic calculi. These calculi were impacted in the pelvis and engaged in the juxtapelvic portion of the ureter. Below: Small calculi from the pelvis and abdominal ureters. Reduction 20 per cent.

Uric and oxalic calculi are generally rounded. At times one or several large calculi, at others a large quantity of very small calculi, are found.

If the calculous kidney hardly functions and the other is healthy, a nephrectomy may be performed.



FIG. 466.- REMOVAL OF A URIC CALCULUS FROM THE RIGHT KIDNEY BY LUMBAR NEPHROTOMY.



FIG. 467.- REMOVAL OF A PHOSPHATIC CALCULUS FROM THE LEFT KIDNEY BY LUMBAR NEPHROTOMY.

If suspicion exists that the other kidney is not in a sufficient degree of integrity, it is preferable to perform a nephrotomy, and remove the calculi, sparing the renal tissue. The whole organ can be easily explored in its

entirety if my technique is followed, which consists in bringing the kidney completely outside and incising it if necessary along its whole length.

Renal calculi can penetrate into the dilated ureter, and they may be arrested or accumulate at any point in its course.

**TUBERCULOUS PERIRENAL ABSCESS. TUBERCULOSIS OF THE KIDNEY.**—Purulent tuberculous collections of the perirenal region may point towards the exterior. These collections present the well-known characters of cold abscess.

Incision of the abscess should be followed by an exploration of the kidney, whose state may call for nephrotomy or nephrectomy. Tuberculosis of the kidney often exists without perirenal suppuration. It is recognized by observing the tuberculous pus emerge by the ureteral orifice. A tuberculous kidney may attain a considerable volume. The large tuberculous kidney becomes reduced to a fibrous shell, containing a thin layer of atrophied renal tissue covering a considerable thickness of caseous substance. If the condition be unilateral a nephrectomy is performed.

#### CONGENITAL AND ACQUIRED MALFORMATIONS.

##### *Congenital Malformations.*

**SINGLE KIDNEY.**—Single or median kidney is a relatively frequent abnormality, which must always be suspected where the exploratory signs are abnormal.

**STENOSIS OR BENDING OF THE URETER.**—Congenital stenosis or abnormal kinks of the ureter cause hydronephrosis, which it is possible as a rule to remedy by operation. The operative technique is appropriated to each particular case. This operation is easy to the surgeon who is familiar with the technique of operations on the intestines and bile-ducts.

##### *Acquired Malformations.*

**FLOATING KIDNEY.** Floating kidney is observed above all on the right side, and particularly in women who have wasted after repeated pregnancies. Floating kidney when painful may justify a nephrorrhaphy (see below).

**LUMBAR URINARY FISTULE.**—Lumbar urinary fistula following either a perinephritic abscess or a wound of the kidney generally requires nephrectomy, which is not performed until it is certain that the other kidney functions well.

#### TUMOURS.

Cysts and cancer of the kidney justify its removal. In a special chapter we will describe the general technique of nephrotomy and nephrectomy by the lumbar and abdomino-lateral routes.

## TECHNIQUE OF OPERATIONS ON THE KIDNEY.

## 1. Lumbar Operation.

## NEPHROPEXY. NEPHROTOMY. NEPHRECTOMY.

**Operation—First Stage.**—Vertical incision on the edge of the sacro-lumbar mass reaching from the twelfth rib to the region of the iliac crest, to take a direction obliquely downwards and forwards towards the anterior superior iliac spine. This incision is the best of all for the approach to the kidney by the lumbar route because, if the incision is prolonged towards the pubis, the whole course of the ureter may be explored by the retroperitoneal route.

**Second Stage.**—Opening the muscular sheath. Incision of the deep aponeurosis and incision of the anterior leaf of the transversalis aponeurosis. The transparent perirenal fascia immediately makes its appearance and the subjacent fat. In the lower part of the wound, near the iliac crest, the external and inferior border of the square lumbar muscle is exposed, whose insertions may be divided to increase the size of the field of operation.

**Third Stage.**—The peritoneal fascia and the subjacent fat are seized on the inner side with forceps and are torn through, drawing them outwards. The lower pole or the posterior surface of the kidney is immediately recognized, and it is examined to see if it is movable or adherent. All manœuvre on the outer side of the field of operation should be avoided where the peritoneum, which is very accessible at this point, may be wounded. As soon as the lower pole of the kidney is laid bare, the capsule proper of the organ is isolated by divulsion with the fingers, and the upper pole of the organ is sought in order to bring it outside. When the operation is not difficult it takes but two minutes for the complete exteriorization of the kidney. If the kidney be not adherent care must be taken not to tear its capsule, and to preserve the vessels of the hilum and the origin of the ureter, which must not be imprudently dragged upon. Toilet of the wound is then made with aseptic compresses, and the field of operation is examined. Luxation outside of the kidney is obligatory to every intervention by the lumbar route, whether for floating kidney, calculous pyelonephritis, tuberculous or cancerous kidney. The kidney traverses successively the breach in the anterior aponeurosis of the transversalis and the two aponeuroses which limit the sacro-lumbar muscle.

**Fourth Stage.**—This stage of the operation will vary according to the operative indications which result from the examination of the kidney.

## NEPHROPEXY.

DOYEN'S OPERATION: *First and Second Stages* as above.

**Third Stage.**—If a floating kidney be present exteriorization is easy, provided that the kidney is pushed during the third stage by an assistant

who presses on the antero-lateral abdominal wall. As soon as the kidney is outside it is examined to see if it is healthy and contains no calculi, and the pelvis is palpated.

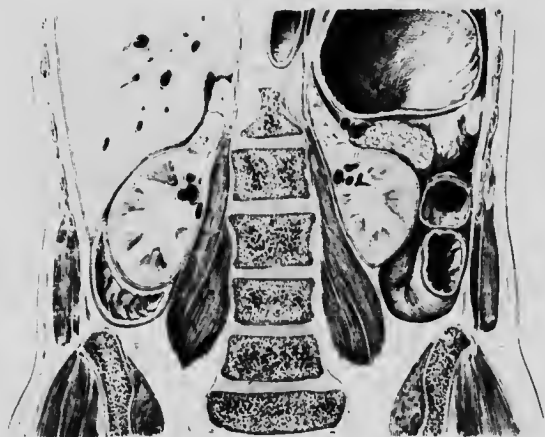


FIG. 468.—FRONTAL SECTION FOLLOWING THE POSTERIOR BI-AXILARY PLANE IN THE FEMALE.

The two kidneys are at about the same level, and correspond with the eleventh rib.

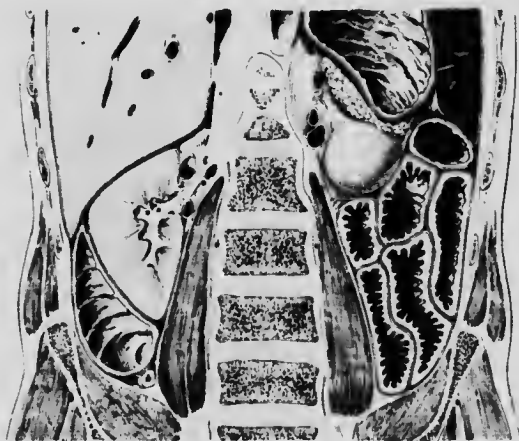


FIG. 469. THE SAME FRONTAL SECTION IN A CASE WHERE THE LEFT KIDNEY IS VERY HIGH AND CORRESPONDS WITH THE ELEVENTH RIB.

The right kidney is prolapsed and compresses the caecum.

*Fourth Stage : Fixation of the Kidney.*—I fix the kidney without wounding either the capsule or the parenchyma. The organ, when it has been brought outside, has traversed the opening in the anterior aponeurosis of the trans-



versalis muscle. Before reducing the kidney I suture the lower two-thirds of the aponeurotic wound with several interrupted silk sutures, in such

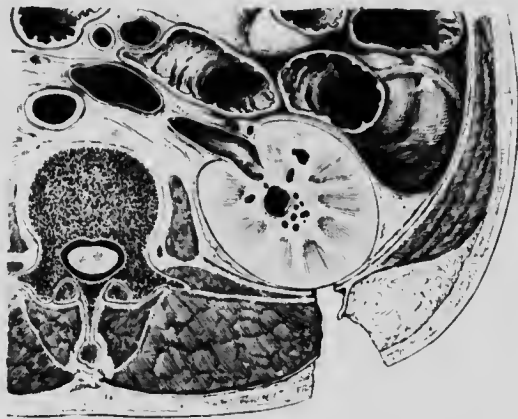


FIG. 470.—TRUNK SECTION PASSING THROUGH THE UPPER THIRD OF THE RIGHT KIDNEY.

Tracing of the lumbar incision which permits of approach to the kidney across the compartment of the retro-lumbar muscle.

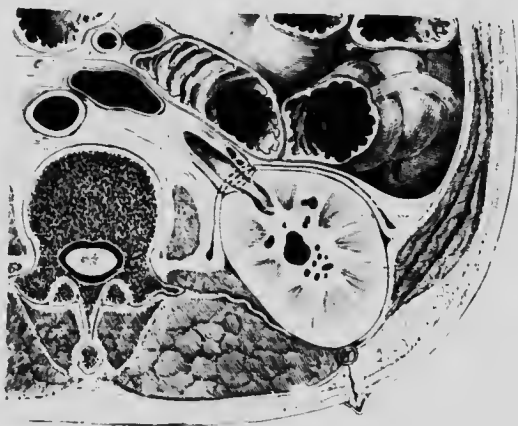


FIG. 471.

The operation is finished. The kidney has been brought outside. The breach in the anterior aponeurosis of the transversalis has been sutured below the renal pedicle. Reduction of the kidney has pushed this aponeurosis forwards.

a way as to leave above an opening for the passage of the renal pedicle. When this suture is finished I reduce the kidney, which remains behind this aponeurosis and which becomes fixed at this point in contact with the

external border of the sacro-lumbar muscle, whose posterior aponeurosis is not incised (Figs. 473 and 474).

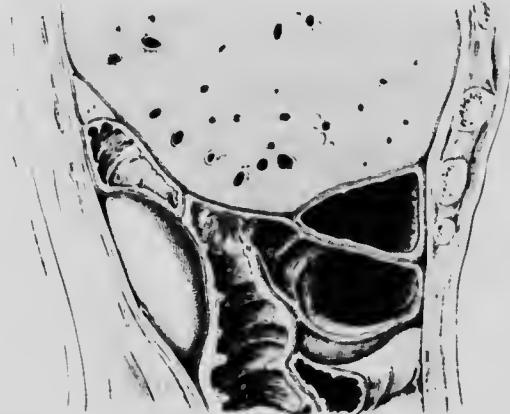


FIG. 472.—RIGHT MAMMARY SAGITTAL SECTION, INTERNAL SEGMENT. RELATIONS OF THE PROLAPSED KIDNEY WITH THE HYPERTROPHIED LIVER, THE SUPRARENAL CAPSULE, AND THE CECUM.

An intestinal loop is interposed between the kidney and suprarenal capsule.



FIG. 473.—THE SAME.

The kidney is brought outside, and has traversed the three aponeuroses. Suture of the anterior leaf of the aponeurosis of the transversalis muscle below the renal pedicle by three separate silk ligatures. A fourth point unites it with the lumbar compartment.



FIG. 474.—THE SAME.

The kidney has been replaced. It has pushed in front of itself the aponeurosis of the transversalis muscle. The new renal compartment is limited below by the suture of this aponeurosis to the anterior surface of the aponeurosis of the square lumbar muscles.

My operation for nephropexy thus consists in placing the kidney, which is normally situated in front of the anterior aponeurosis of the transversalis

muscle, behind this same aponeurosis, where it is fixed in a special compartment. I devised this technique in 1899.

This operation gives excellent results; it risks neither recurrence of the renal ptosis nor the accidents attending those methods of nephropexy where the capsule of the kidney is wounded and the glandular parenchyma.



FIG. 475. NEPHROPEXY. SUTURE OF THE ANTERIOR APONEUROSIS OF THE TRANSVERSALIS MUSCLE BELOW THE PEDICLE OF THE KIDNEY, WHICH IS BROUGHT OUTSIDE.

*Fifth Stage: Suture of the Wound—Drainage.*—I have operated upon more than a hundred cases presenting painful nephroptosis. These pains disappeared completely and definitely. Since the operation I recently had occasion to see my first patient operated on in 1897. She told me that since her operation she has not had the slightest trouble.

#### NEPHROTOMY. PELVIC LITHOTOMY. LAVAGE OF THE URETER.

*First, Second, and Third Stages* as above.

*Fourth Stage: Exploration and Incision of the Kidney.*—Direct palpation of the kidney and pelvis will reveal the presence of one or several calculi. I generally incise the kidney without compressing the vascular pedicle. This compression, indeed, incurs the risk of a secondary oozing hæmorrhage, as is observed in amputations of the limbs, after the application of an elastic band. If a large single calculus be present direct incision is made on to the calculus, which is extracted with a ring forceps. If the calculi are multiple the kidney is incised on two-thirds of its greater circumference, and the calices and pelvis are directly examined. The calculi are extracted, toilet is made of the kidney and pelvis, and then the permeability of the ureter is examined by catheterizing this duct from above downwards, and

an assistant with a cystoscope verifies the entry of the catheter into the bladder.

I have extracted by renal section large calculi which were arrested in the dilated ureter 10 or 12 centimetres below its origin. This extraction of ureteral calculi is performed in this way and without incision either of

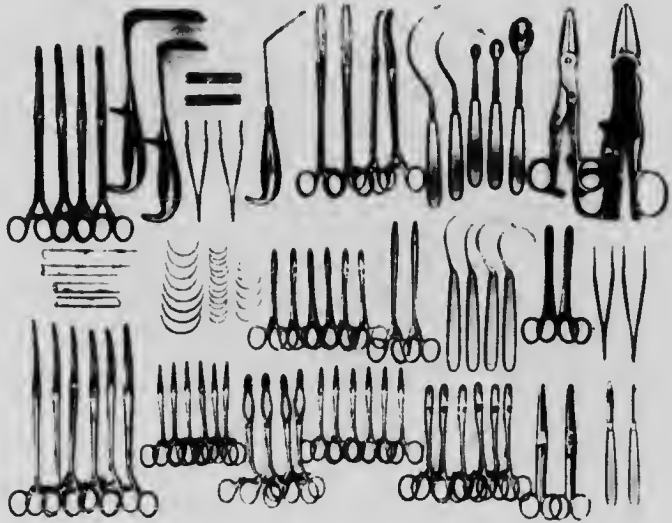


FIG. 476.—INSTRUMENTS NECESSARY FOR OPERATIONS ON THE KIDNEYS.

ureter or pelvis, which are preferably left intact. I have designed a special forceps for the extraction of calculi from the ureter by the renal route, which is modelled on that which is designed for the extraction of urethral calculi.

#### *Section of the Pelvis.*

Section of the pelvis is only indicated when it contains a calculus which is too large to be extracted by renal section. The pelvis is incised about its middle at a point most convenient for the suture; the small orifice is enlarged by divulsion. The calculi are extracted, toilet of the pelvis is performed, the permeability of the ureter is examined, and a suture is applied. Union is preferably made by purse-string suture, as has already been described in surgery of the gall-bladder and intestine. If not, a double continuous suture is applied.

#### *Treatment of Renal Incision after Nephrotomy.*

I never suture the kidney after renal section. I simply place between the two valves of the renal parenchyma the extremity of an aseptic com-

press, and I replace the kidney with the compress, whose end passes outside. I plug the field of operation, and unite the upper three-fourths of the wound. The intrarenal compress suffices for hæmostasis. It is removed after four or five days. The urine escapes at first almost totally by the wound, which closes spontaneously after four to six weeks.

*Lavage of the Ureter from Above Downwards.*

In suppurative pyelitis I practise for fifteen to twenty days a lavage of the pelvis and ureter from above downwards, using a solution of Labarraque's fluid diluted to 1 in 200 or 1 in 100. For this purpose I arrange a rubber drain, which is introduced into the pelvis by a small perforation in the renal parenchyma, and which is fixed to the capsule by a silk suture. The lavages are commenced towards the fifth or sixth day.

I have obtained by this process, after two operations, the cure of an obstinate case of bilateral suppurative pyelitis.

NEPHRECTOMY.

*First, Second, and Third Stages* as above.

*Fourth Stage.*—Should we find a tuberculous kidney with almost complete destruction of the renal parenchyma, a kidney affected with calculous



FIG. 477.—RIGHT LUMBAR NEPHRECTOMY. INCISION OF THE SKIN AND CELLULO-ADIPOSE LAYER.

pyelonephritis and almost entirely destroyed, or malignant tumour, nephrectomy must be performed. As we have already mentioned, we must be sure beforehand of the proper function of the opposite kidney.

Nephrectomy also will have to be performed if, during the difficult

manœuvres for the extraction of calculi from the pelvis or upper part of the ureter, irreparable damage be done.



FIG. 478.—THE SAME. CRUSHING THE VASCULAR PEDICLE OF THE KIDNEY WITH DOYEN'S ÉCRASEUR.



FIG. 479. THE SAME. LIGATURE "EN MASSE" OF THE VASCULAR PEDICLE OF THE KIDNEY IN THE GROOVE FORMED BY DOYEN'S ÉCRASEUR.

As soon as the removal of the kidney is decided upon, the pelvis is isolated from the vascular pedicle, and a long curved forceps is placed on the vessels. The vascular pedicle is cautiously crushed with the large-model

écraseur, and a ligature is placed in the groove formed by the écraseur. The kidney is separated, leaving a large stump beyond the ligature. A



FIG. 480. RIGHT LUMBAR NEPHRECTOMY.

Another case. Preliminary crushing of the pedicle of an atrophied kidney affected with actinomycosis.



FIG. 481. RIGHT LUMBAR NEPHRECTOMY. MOBILIZATION OF THE KIDNEY.

From a cinematograph film.

second or safety ligature is applied in the groove of the first, and a third ligature is applied after transfixion, the blunt needle being passed between the vessels.



FIG. 482.—THE SAME.

The kidney, completely isolated from its cellular envelope, is brought outside the wound.



FIG. 483.— THE SAME. CRUSHING THE VASCULAR PEDICLE, WHICH IS NARROW, USING THE SMALL-MODEL ÉCRASEUR.





FIG. 484.—THE SAME. LIGATURE OF THE RENAL PEDICLE IN THE GROOVE FORMED BY THE ÉCRASEUR.



FIG. 485.—THE SAME. A SECOND SAFETY LIGATURE IS APPLIED.

The exuberant portions of the renal stump are cut away and the ligature is left in the depths of the wound.



FIG. 480. SUTURE OF THE SKIN. INTERRUPTED SUTURES.

The exuberant portion of the renal stump is resected and the ligature is left in the depths.

#### *Subcapsular Nephrectomy.*

No mention has as yet been made of subcapsular decortication of the kidney, since this operation is exceptional. I never employ it except in cases where old perinephritic adhesions render the isolation of the kidney covered with its own capsule impossible. In these cases the capsule of the kidney is incised, and the decorticated organ is extracted. The vascular pedicle is then ligatured once or several times after crushing with the large-model écraseur.

#### PARTIAL EXTIRPATION OF THE URETER.

As soon as the kidney is removed the pelvis is seized in the teeth of an annular forceps, and drawn outside for a long distance by the employment of slow methodical traction. It is detached from the depths by the index finger, and it is continually drawn outside and stretched until it breaks, at as great a distance as possible, in the neighbourhood of the bladder. If the ureter is tuberculous the incision of the abdominal wall is continued downwards and forwards, and it becomes possible to extract the ureter entirely as far as its implantation into the bladder.

*Fifth Stage: Tamponing the Wound.*—Suture of the skin, leaving room for the compress. We have published an observation describing the application of this technique to a case where lumbar nephrectomy and ureterectomy were performed for calculi of the right kidney and ureter.

*The following is the case:* Dr. C——, aged forty, suffered from the right kidney for five years. He presented very characteristic attacks of renal colic and hæmaturia. The urine contained a certain quantity of pus, and microscopical examination showed a multiple microbial infection, evidently caused by catheterization.

Several radiographs showed a large calculus, probably uric, in the right pelvis, and two small elongated ureteral calculi situated 5 centimetres lower, in the ureter.

Examination by the prismatic cystoscope fifteen minutes after an injection of indigo carmine (5 c.c. of a 4 per cent. solution) revealed the fact that the left kidney alone was functioning; a slight trace of coloured liquid only escaped from the right side.

The patient was placed in Trendelenburg's position, and submitted to the direct catheterism of the right ureter. The catheter gave in one and a half hours 6 c.c. of urine, whereas the opposite kidney secreted 90 c.c. Analysis of the urine from either ureter showed that the urine from the right ureter, which was almost colourless, contained but 3.40 grammes of urea per litre, whilst the urine from the left ureter contained 25 grammes per litre of urea.

The right kidney, therefore, could be removed without danger.

The luxation of the kidney outside the wound was difficult, for it was small, very deeply placed, and adherent to the neighbouring fibro-cellular tissues. When the kidney was brought outside I found in the lowest calyx a uric calculus 18 to 20 millimetres in diameter. This calculus was removed after incision of the cyst; the glandular tissue subjacent was atrophied. The ureter was isolated, the vascular pedicle of the kidney was crushed and ligatured with silk, and the organ was removed.

The ureter was then seized in the teeth of an annular forceps, and I prolonged the incision of the abdominal wall in an oblique direction towards the anterior superior iliac spine. I soon was able to touch the impacted ureteral calculi with the end of the index finger.

The ureter was drawn into the wound by methodical traction, and the pelvis was partially removed with the two impacted calculi. The lower extremity was left free, and the wound was plugged after a partial reunion.

Examination of the ureter showed that it contained two impacted calculi, to which the walls of the duct were very adherent. This explained the atrophy of the kidney, following almost complete obliteration of the corresponding ureter. Recovery was quite uneventful.

#### DECONTICATION OF THE KIDNEY IN UREMIA AND ANURIA.

I only mention this operation to classify it amongst the incoherences of surgery, with exothyropexy and resection of the great sympathetic.

## EXPLORATION OF THE URETER. URETEROTOMY, AND URETERORRHAPHY.

Exploration of the iliac ureter is carried out by preference by the sub-peritoneal route. The incision includes the chief portion of the external part of the sheath of the sacro-lumbar muscle at the level of the twelfth rib, and is directed below towards the iliac crest and then towards the anterior superior spine and the pubis. This long incision allows the ureter to be exposed from its origin to its implantation in the bladder.

If a calculus discovered by radiography is to be removed, an incision of 15 to 18 centimetres along the indicated course over the foreign body is all that is necessary. The least possible damage is done in detaching the peritoneum, and great care is taken to avoid infecting the field of operation.

Preventive injections of mycolysine are given against infection.

*Incision of the Ureter.*

Incision of the ureter in the transverse sense is more favourable for reunion than longitudinal incision.

*Ureterorrhaphy.*

Continuous suture is made in two layers superimposed, with a round needle and No. 1 silk.

*Uretero-Ureteral Anastomosis.*

If the ureter is broken, or if it becomes necessary to divide it to remedy a kink, the upper and lower ends must be anastomosed together. This anastomosis is easy if it be performed in the region of the renal pelvis, which is wide. It becomes difficult when it has to be performed where the ureter is narrow and deeply situated. I perform by preference direct implantation of the upper into the lower end, which can easily be dilated. I ligature the upper end on a small catheter, which is introduced through the lower end. I push this catheter as far as the bladder, and I make it emerge by the urinary meatus. The direct flow of urine being thus assured, I resect the mucous membrane of the lower end for a distance of 8 to 10 millimetres, and I suture the cellular coat of the lower end to that of the upper end. Accessory sutures are placed which fix the external tunics of the upper and lower ends to the musculo-aponeurotic planes, on which the ureter rests. This prevents all dragging on the line of union. The ligature fixing the upper end to the catheter, having passed into the tissues of the catheter itself, comes away with the catheter when this is removed on the twelfth or fifteenth day.

Direct implantation may be also attempted without conducting catheter, but the result is less certain.

Mention should also be made of lateral anastomosis of superior and inferior ends. The surgeon is guided by the particularities of each case. He will find no difficulty in deciding which is the best technique, especially if he is accustomed to perform intestinal anastomoses.



FIG. 457. HYDRONEPHROSIS OF THE LEFT KIDNEY. TRANS-PERITONEAL OPERATION. The edges of the renal cyst are seized in toothed forceps. They are everted in order to examine the interior of the pocket.

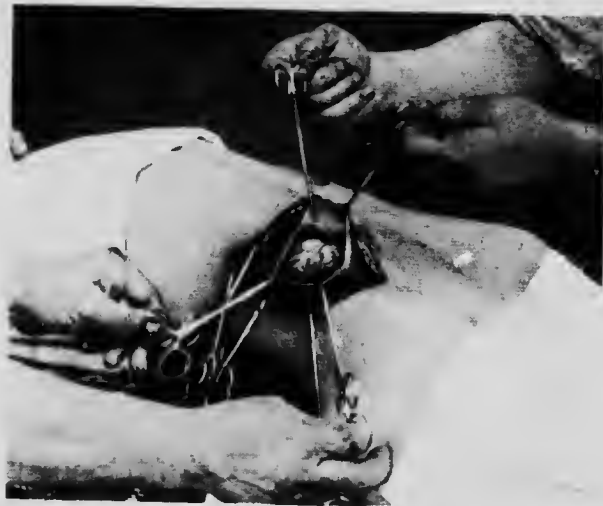


FIG. 458. EXPOSURE OF A LARGE CANCEROUS TUMOR OF THE RIGHT KIDNEY BY THE TRANS-PERITONEAL METHOD. INCISION OF THE CELLULAR CAPSULE. The neoplasm makes its appearance.

2. Transperitoneal Route.

NEPHROTOMY. NEPHRECTOMY.

**Operation**—*First Stage*.—Vertical incision in the anterior axillary line, beginning at the level of the tenth rib.

*Second Stage*.—Opening of the peritoneum and exploration of the



FIG. 489. THE SAME. CRUSHING THE VASCULAR PEDICLE.



FIG. 490. REMOVAL OF AN ENORMOUS POLYCYSTIC KIDNEY BY THE TRANSPERITONEAL METHOD. CRUSHING THE VASCULAR PEDICLE.



FIG. 491. THE SAME.

The vascular pedicle is ligatured and divided. The kidney is brought outside, and brings with it the upper half of the ureter.



FIG. 492.— ENUCLEATION OF A CYST OF THE LEFT KIDNEY BY THE TRANSPERITONEAL METHOD. LEXATION OF THE TUMOR.

tumour, whose relations with neighbouring organs are studied. The small external peritoneal sinus is immediately stripped up in order to reach the kidney by the extraperitoneal route, and the serous cavity is protected by three or four large aseptic compresses.

*Third Stage.*—The stripping of the peritoneum is continued on the surface of the tumour, which is then detached from its superior and posterior connections. The field of operation is packed with large aseptic compresses.

*Fourth Stage.*—This stage varies according to the indications in each particular case.



FIG. 493. THE SAME. INCISION OF THE RENAL CAPSULE AND EXPOSURE OF THE CYST WALL, WHICH WAS VERY RESISTANT.

#### NEPHROTOMY FOR UNILOCLAR CYST.

I have removed several large cysts of the kidney which developed in the cortical substance, and which were easy to enucleate without much damage.

In some cases it may be necessary simply to incise the cyst, and treat it by marsupialization.

One of these cysts, which was very voluminous, could be removed





FIG. 494.—THE SAME.

The cyst is detached from the renal substance proper, where it had dug itself a compartment in the central part of the organ.

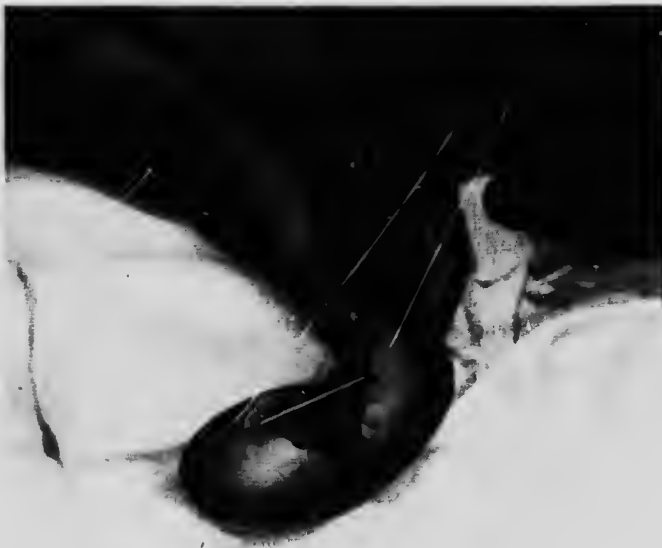


FIG. 495. THE SAME. COMMENCEMENT OF THE TRANSVERSE SUTURE OF THE INTRA-RENAL SPACE LEFT AFTER THE REMOVAL OF THE CYST.

intact with its proper wall, after incision of the fibrous capsule of the kidney which covered it. The kidney was replaced after repair of the breach produced by the removal of the cyst. The following is an account of the operation.

*Cyst of the Left Kidney. Decortication of the Cyst and Plastic Nephrorrhaphy.\**

The patient, aged thirty-two, suffered from a voluminous tumour in the left hypochondrium for two years. The tumour had rapidly increased in size during the last few months. On palpation a deeply placed cystic tumour was found about the size of a full-time foetal head; the tumour was mobile, and could be made to mount by pressure under the costo-chondral border. This very evident ascension towards the renal compartment led at first to the diagnosis of a floating kidney. At the left of the umbilicus,



FIG. 496.—THE SAME.

The transverse reunion is finished.

where the tumour ended, a distinct swelling was noticed, which seemed to be the lower end of the spleen. Another possibility was a hydatid cyst of the upper part of the spleen or left lobe of the liver, pushing the spleen downwards. Weinberg's reaction was negative. Examination of the blood gave a normal proportion of red cells and polymuclear leucocytes, mononuclear and eosinophile cells.

Examination of the urinary apparatus gave no particular indications.

\* *Revue Crit. Med. et Chic.*, No. 2, p. 25, 1910.

There was no hematuria, and the urine was normal. Manual exploration confirmed the localization of the tumour to the renal compartment. The spleen was displaced, and seemed to be slightly hypertrophied.

**Operation—First Stage.**—Vertical cutaneous incision on the mammary line at the level of the eighth costal cartilage, dividing the eighth, ninth, and tenth cartilages and ending at the level of the umbilicus.

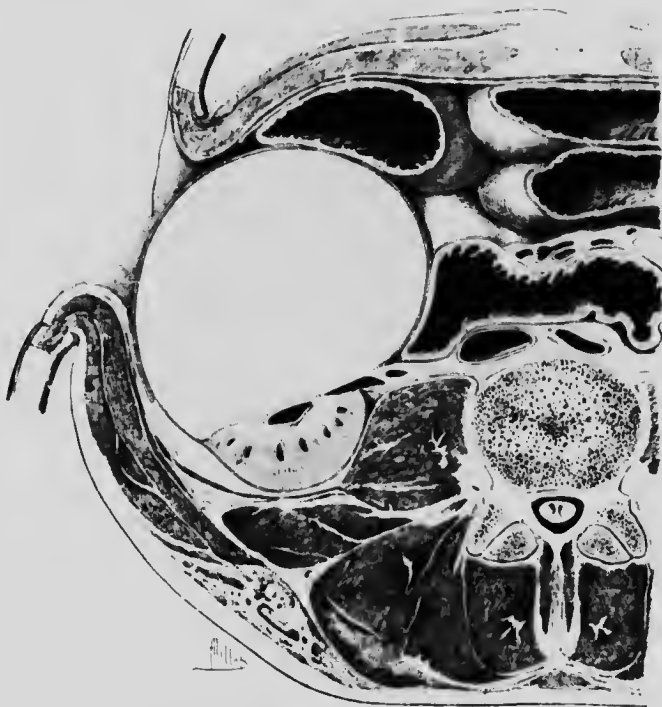


FIG. 407.—THE SAME OPERATION.

Section passing through the first lumbar vertebra, and showing the relations of the renal cyst.

**Second Stage.**—Opening the peritoneum and retraction of the edges of the wound with ring forceps. The epiploic apron and transverse colon were pushed aside with large compresses. The tumour came into view covered by the posterior peritoneum; it was situated in the renal compartment.

The spleen was normal, as was the left lobe of the liver.

**Third Stage.**—Incision and stripping of the parietal peritoneum. The tumour was brought outside. It was a large serous cyst, which had developed in the centre of the renal parenchyma; the lower pole of the kidney was recognized below.

*Fourth Stage.*—Enucleation of the cyst. The cyst was subcapsular and possessed a proper wall. This case is comparable to a cyst of the broad ligament. I carefully incised the fibrous capsule of the kidney, and proceeded to the enucleation of the cystic compartment, which was easily detached from the renal parenchyma in spite of the thinness and transparency of its walls. It was extracted without rupture. I examined the

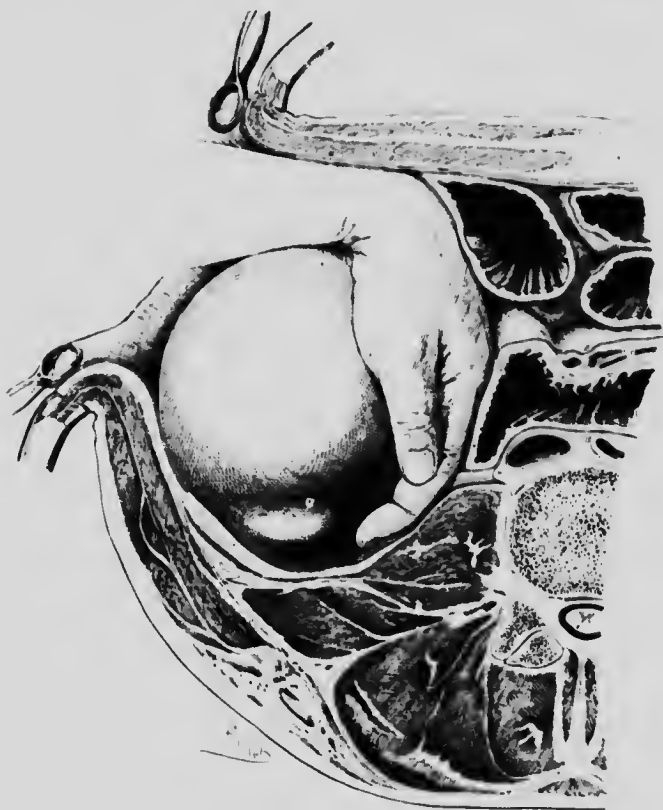


FIG. 498. —THE SAME.

The hand, which has penetrated below the parietal peritoneum, isolates the internal part of the tumour.

kidney, which lay open at its middle part. At the base of the renal tear three calices and the pelvis appeared intact. I considered the wound could be sutured without risk of a urinary fistula.

*Fifth Stage: Nephrorrhaphy.*—The exuberant parts of the fibrous capsule were resected, and the edges of the renal wound were freshened, as they were irregular. The kidney was repaired with catgut (No. 2). No hemorrhage

took place. The kidney was returned to its compartment, which was plugged and drained with a large glass drain.

*Sixth Stage: Suture of the Peritoneum.*—In this case I realized (1) marsupialization of the renal compartment; (2) closure and fastening of the lateral peritoneum, which was isobited in its pre- and retro-colic portions; and (3) suture of the musculo-aponeurotic wall, which is complicated in the left costo-iliac region.

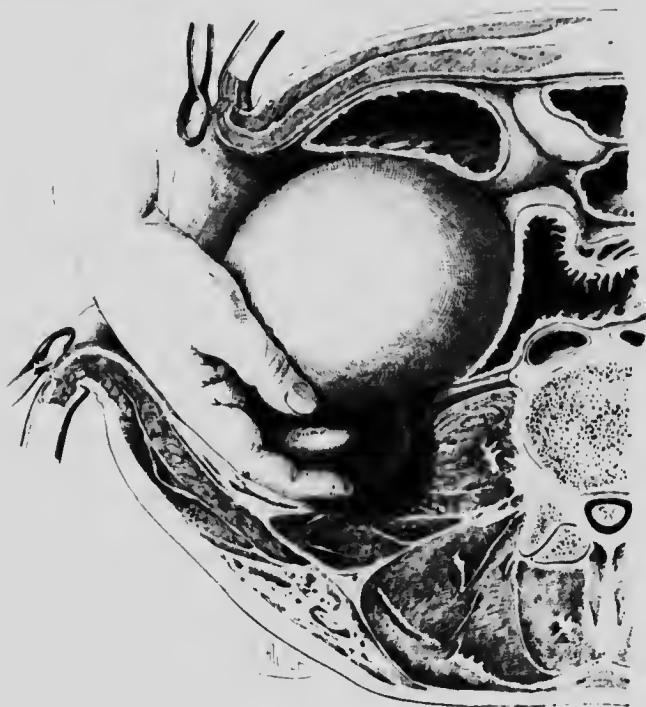


FIG. 499.—THE SAME.

The hand penetrates behind the tumour in order to bring it outside.

I commenced by repairing the operative wound from the upper angle as far as the renal compartment. The costal cartilages hindered reunion, so they were torn away with an oval-nosed forceps. I then made the parietal suture *en masse*, with catgut, taking on the needle, on the outer edge of the wound, the great oblique aponeurosis, the small oblique, the transversalis, and the pericolic peritoneum, care being taken not to wound the descending colon, the omentum, the inner edge of the serous, and the whole of the musculo-aponeurotic wall on this side. The stomach, which protruded into the wound, was pushed aside with a large compress.

#### 412. SURGICAL THERAPEUTICS AND OPERATIVE TECHNIQUE

The suture was interrupted at the centre of the wound to allow room for the passage of the mesh which plugged the renal compartment. The lower two-fifths of the incision were repaired by an analogous suture. This repair was easier than that of the upper portion. Each sutural point was terminated by a superficial point in figure of 8, in order to assure the perfect fastening of the superficial aponeurosis.



FIG. 500. THE SAME. FLEXATION OF THE TUMOR.

The cyst is detached from the capsule proper of the kidney.

The ends of the catgut sutures above and below the plug were employed to complete the closing of the peritoneum in front of the plug.

The internal lip of the suture thus comprised in front of the compress and from without inwards the posterior precolic peritoneum, the omentum, the anterior parietal peritoneum, and the musculo aponeurotic planes. The renal compartment was perfectly isolated. Finally, above and below a superficial aponeurotic suture was made, and the skin was closed above and below the compress with clips.



FIG. 501.—THE SAME.

The hand passes between the capsule of the kidney and the wall of the cyst.



FIG. 502.—SCHEMATIC FIGURE SHOWING THE HORIZONTAL SECTION OF THE CENTRAL PART OF THE KIDNEY AFTER THE DECORTICATION OF THE CYST.

#### 44 SURGICAL THERAPEUTICS AND OPERATIVE TECHNIQUE

**OPERATIVE SEQUELÆ.**—Complete apyrexia. Slight hematuria for forty-eight hours. The quantity of urine was normal; there was no leakage of urine by the wound. The patient rose from bed eleven days after the operation. Coarctization by first intention.

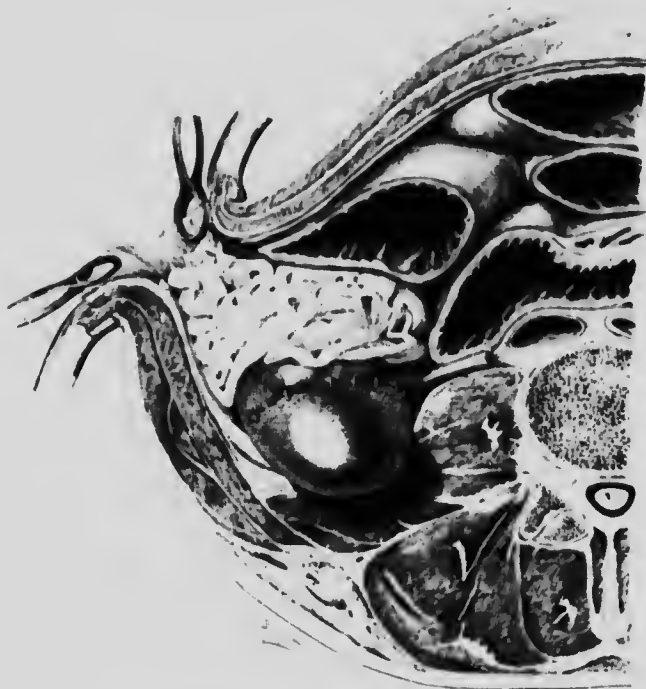


FIG. 592. PEGGING THE WOUND AFTER SUTURE OF THE KIDNEY.

#### TRANSPERITONEAL NEPHRECTOMY.

*First Stage.* Transperitoneal nephrectomy is indicated in cases of very extended tuberculosis and in cases of cancer, when the kidney is too large to be extracted by the lumbar route. The vascular pedicle is carefully isolated, separated from the pelvis, and ligatured after crushing.

The ureter may be torn away as described above. If tuberculous, it may be followed as far as its vesical implantation, the abdominal incision being continued as far as the pubis, as already described. The removal of large cancers of the kidney on the right side exposes the risk of wounding the duodenum and gall-bladder which may be adherent to the surface of the tumour.



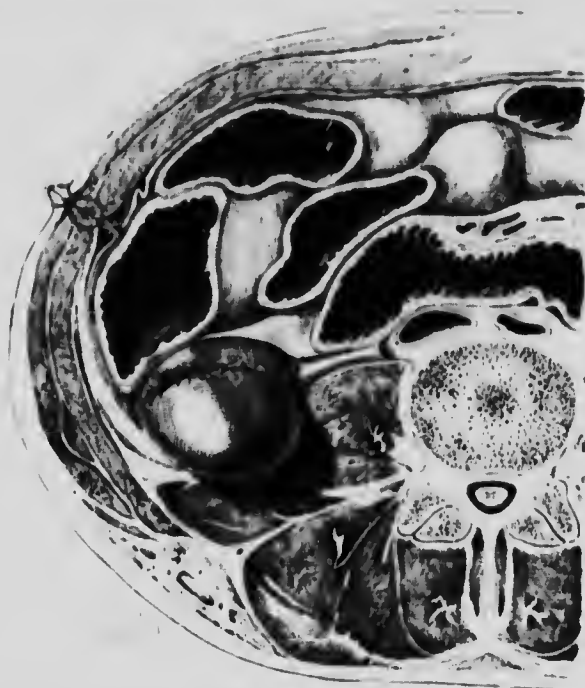


FIG. 504. SUTURE OF THE PERITONEUM AND ABDOMINAL WALL.  
A mesh and drain are left lower down at the lower pole of the kidney.

#### OPERATIONS ON THE MEDIAN LUMBAR REGION.

##### Cavernous Lymphangioma.

In August, 1900, I observed a very extensive cavernous lymphangioma of the lumbar region, forming an acolar tumour, which was partially reducible and whose areolæ were freely anastomosing on either side by means of multiple lymphangiectases in relation with the collecting trunks of the inguinal region.

**Operation.**—The tumour, which invaded the skin behind and all the subjacent cellulo-adipose layers, was circumscribed by two horizontal oval incisions, which circumscribed the lymphangiectases.

The diseased skin and the group of lymphangiectases were removed to a height of 4 centimetres. The lymphatic spaces extended as far as the superficial aponeurosis. The lymph contained in the areolæ of the cavernous mass was cloudy in tint and almost milky. The lymphatic tumour was prolonged chiefly on the right side towards the inguinal regions. The skin was intact in these two regions. It was incised as far as the

right inguinal fold. The subcutaneous cellulo-fatty layer contained the same fibrous bands which shut off large lymph spaces converging towards the inguinal canal. Incision was not made on the left side, where the lesion was less extensive. Union was obtained by skin suture and several deep sutures. Drains allowed the opalescent lymph to flow during the first eight days, and complete union resulted. I saw the patient several months later. There was no recurrence.

The removed parts, which I presented to the Société de Chirurgie, consisted of a skeleton of fibrous tissue surrounding large lacunæ and freely anastomosing areolæ. These vascular lacunæ can be best compared to certain points of the sinus of the dura mater. The dermis had been invaded by the lesion in the median lumbar region, where lacunæ 8 to 10 millimetres in depth were found sustained by fibrous columns of remarkable resistance.

#### OPERATIONS ON THE LUMBAR VERTEBRÆ.

##### Traumatic Lesions.

##### PENETRATING WOUNDS.

Operations on the lumbar vertebral column are exceptional. Rarely a search has to be made for a foreign body planted in a vertebra, and lumbar laminectomy is also rare. It is performed in the same way as a dorsal laminectomy.

Radioscopy and radiography are used as guides.

##### Inflammatory Lesions.

##### ACQUIRED INFLAMMATORY LESIONS.

Infectious osteitis of the bodies of the lumbar vertebræ may be met with. This osteitis is the cause of some acute suppurations in the sheath of the psoas muscle (psositis). Incision of the focus and plugging are carried out as soon as possible. Signs of infection are treated by mycolysine.

##### CHRONIC INFLAMMATORY LESIONS.

##### *Tuberculosis of the Lumbar Vertebræ.*

Tuberculosis of the lumbar vertebræ gives rise to purulent collections, which may burrow backwards into the sacro-lumbar compartment or laterally and forwards in the sheath of the psoas muscle.

I have cured a number of these cases by opening the collection with an iliac incision, and making a large counter-opening behind in order to scrape the diseased vertebra. The field of operation is treated by plugging.

**Congenital and Acquired Malformations.**

**CONGENITAL MALFORMATIONS.**

*Spina Bifida.*

Spina bifida is a grave condition when the tumour is large.

**Operation—First Stage.**—The cyst is circumscribed by two curvilinear incisions, transverse in direction. The skin is preserved as much as possible to enable union to be accomplished without dragging.

**Second Stage.**—Dissection of the meningeal cyst as far as the vertebral orifice.



FIG. 505.—MULTILOCLAR LUMBAR SPINA BIFIDA OPERATION.

First Stage: The skin is incised transversely above and below the polycystic mass.

**Third Stage.**—Evacuation of the cyst and resection of the exuberant part of the wall. An extravertebral collarette is spared, sufficient for union by invagination by two superimposed fine continuous sutures. These sutures are made with extra-fine arteriorrhaphy needles.

**Fourth Stage.**—Suture (continuous) of the suprajacent fibrous layers, which are very resistant.

**Fifth Stage.**—Suture of the skin with clips. This is a very delicate operation. The transverse incision is much superior to the vertical, which is less easy of union. Success depends on the double meningeal suture being so perfect that there is no leakage of cerebro-spinal fluid.



FIG. 506.—THE SAME.

Third Stage: Suture of the cyst wall with extra fine arteriorrhaphy needles, finishing the second meningeal continuous suture.



FIG. 507.—THE SAME.

The operation is over. Suture of the skin with clips.

## ACQUIRED MALFORMATIONS.

Amongst the acquired malformations of the lumbar spine we will mention the sublaxations of the lumbar vertebræ.

*Lumbar Laminectomy for Traumatic Paralysis. Cure.*

M., X., thirty-nine years, in perfect health, fell from his horse fifteen months before on to the lumbar region. The patient immediately after the accident suffered from sphincter troubles, characterized by retention of urine and rectal paralysis. Paresis of the lower limbs was also noticed. The patient remained under treatment for three months, and the symptoms became gradually alleviated. The sphincter functions became re-established, and the patient was able to walk with the aid of a pair of crutches. From this point the condition remained stationary. A lumbar intrarachidian puncture, performed by a nerve specialist, was immediately followed by a reproduction of the paraplegic symptoms. For four months the patient remained in the same condition, lying in bed in the dorsal decubitus, for on attempting to place him on his side the lower limbs were seized with epileptiform tremblings. These tremblings were more marked on attempting to make the patient sit.

On admission the patient was in the following condition. He was lying in the dorsal decubitus, the lower limbs were paralyzed, the urinary incontinence was intermittent, which infirmity rendered it necessary to keep a urinal constantly between the legs. The paralysis was flaccid and the knee-jerk almost abolished. There was anesthesia in the gluteal region, the perineum, and the lateral portions of the thighs. Lifting the foot suddenly to a right angle with the limb caused a characteristic trembling.

Examination of the vertebral column revealed a slight deformity in the lumbar region. Radiography revealed a displacement of the second lumbar vertebra, which was luxated forwards.

**Operation.**—Resection successively of the laminae of the third and second lumbar vertebræ, in order to free the lumbar cord to a sufficient extent. Introduction of a grooved director into the spinal canal at the commencement of the operation revealed an abnormal bulging of the laminae of the second lumbar, which was sublaxated forwards. The antero-posterior narrowing of the canal was enough to explain the compression of the cord at this point. The wound was plugged. The epileptiform trembling persisted for the first few days after the operation, and disappeared as the wound commenced to cicatrize. Sensibility gradually returned in the anæsthetic areas, and on the twentieth day the patient could turn in bed by moving his lower limbs. After six weeks he was able to rise and walk with crutches. The mobility of the lower limbs then rapidly improved. He quitted the clinic on June 21.

## OPERATIONS ON THE GENITO-URINARY ORGANS OF MAN.

### OPERATIONS ON THE PENIS AND PENILE URETHRA.

#### Traumatic Lesions.

These lesions are, as a rule, of minor importance. Haemorrhage is easily arrested by suture. If there is extensive loss of substance and a fragment is detached, a plastic repair by sliding is attempted. Autoplasty by sliding is very easy in this region owing to the laxity of the integuments.

#### RUPTURE OF THE FRENUM.

This small accident may cause haemorrhage from the sub-balanic branch. The vessel can be tied. The simplest procedure is to anaesthetize with cocaine and crush the artery with a short-nosed Doyen's vein forceps (Vol. I., p. 182, Fig. 191).

#### FRACTURE OF THE CORPUS CAVERNOSA.

This may occur during erection. The rupture of the fibrous tissues can be remedied by the application of a large number of very fine silk sutures.

#### Acute and Chronic Inflammatory Lesions.

##### ACUTE INFLAMMATORY LESIONS.

##### *Balanitis and Balano-Posthitis.*

Balanitis and balano-posthitis may be caused by a variety of microbes. The suppuration is favoured by the narrowness of the preputial orifice.

Suppurating balano-posthitis is treated by free antiseptic washings, using a solution which is tepid and non-irritating.

Labarraque's solution 1 in 200 or 1 in 100, or even 1 in 50, may be employed. The lavage is made by means of a simple rubber syringe about the size of a fist. A conical red rubber cannula is used, and the lavages are carried out every two or three hours, except during the night.

The only radical cure is circumcision. This operation is performed when the preputial sinus is sufficiently disinfected (see below). General treatment by mycolysine by the mouth and by hypodermic injection is also employed.

Suppuration in the navicular fossa is treated by the same method of interrupted antiseptic irrigation.

*Blennorrhagia.*

Gonococcal infection starts with an itching sensation in the navicular fossa and interior portion of the urethra.

At this moment purulent discharge is hardly apparent. The infection can be arrested in two or three days by free washing of the anterior urethra with sterilized boric solution, heated to a temperature of about 40° C., to which has been added liq. Labarraque in the proportion of 1 in 100. If the urethra is irritable a weaker dose is employed at the commencement.

When the discharge is established the washings should be employed every two or three hours. The inflamed mucous membrane is now very sensitive, and an astringent injection might aggravate the case by pushing a drop of virulent pus into the prostatic urethra or even as far as the neck of the bladder.

The following is the technique for discontinuous irrigation of the urethra and bladder:

300 cubic centimetres of the boric solution are heated and 1 cubic centimetre of Labarraque's solution (0.33 per 100) is added. The temperature of the solution should be about 40° C.

A rubber ball syringe, No. 10, is used, and an ordinary cannula, to which is fitted a conical cannula of red rubber (see p. 464, Fig. 572). The patient stands or sits in an easy-chair.

1. He passes water.
2. Lavage of the anterior portion of the urethra.
3. He passes water again to clear the few drops which have passed from the ureters into the bladder.
4. The conical cannula is made to penetrate into the urethra, and the glans is pressed on to it. The syringe is compressed slowly and progressively. The urethra becomes distended, and suddenly the warm liquid is felt to pass over the neck of the bladder. The whole of the liquid is then introduced into the bladder.
5. The patient passes water after several minutes.

The Labarraque solution is titrated according to the tolerance of the mucous membrane. The injection should be neither irritating nor painful. It is better supported when it produces a slight sensation of heat.

It is quite easy to dose the Labarraque solution according to the tolerance of the urethra. If a solution of 1 in 300 or 1 in 200 causes scalding, a syringeful of boric solution is immediately injected, and the strength of the following injection is diminished. Six or eight injections are made in the twenty-four hours. A strength of 1 in 100 can generally be reached on the second day. The injections should be continued for fifteen to twenty days after the discharge has ceased.

The urethra is now no longer sensitive, and stronger doses such as 1 in 80 or 1 in 75 can be employed. A stronger dose than that which gives a slight burning sensation should never be employed. During this period three injections in the twenty-four hours suffice.

Some patients support better a solution of perchloride of mercury in a watery solution. A solution of 1 in 30,000 is employed, rising by gradual stages to one of 1 in 10,000 and 1 in 7,000, which dose is the strongest I have been able to employ. Permanganate of potash in solutions of from 1 in 5,000 to 1 in 3,000 also gives good results.

Labarraque's solution, however, is the best antiseptic for the urethra and bladder. It is generally better tolerated than the bichloride of mercury and permanganate of potash, whose destructive powers for the gonococcus and the microbes of the bladder are less active than the chloride solution.

#### *Posterior Urethritis.*

**CYSTITIS.**—Treatment for these complications of blenorhœa is the same as that for anterior urethritis.

**Internal Treatment.**—At all stages extract of mycolysine two to three teaspoonfuls three or four times during the twenty-four hours.

Mycolysine prevents articular complications and gonorrhœal rheumatism.

These complications are quickly cured by hypodermic injections of mycolysine.

#### *Soft Chancre and Syphilitic Chancre.*

Soft chancre cicatrizes rapidly after the action of the penetrating heat obtained by electro-coagulation (see Vol. I.).

Electro-coagulation must be applied with great care to avoid passing beyond the infected zone. I have been able to cure in one sitting a case of phagedenic soft chancre ulcerating the prepuce, the scrotum, the upper part of each thigh, and the whole subumbilical portion of the abdomen. There was no recurrence. Thermo-penetration at 58°, using the same method, instantly destroys the spirilla of hard chancre. A specific treatment is instituted for the general infection combined with mycolysine.

#### CHRONIC INFLAMMATORY LESIONS.

Chronic blenorhagic urethritis is generally localized in the small glands close to a stricture or in the posterior urethra. Same treatment as in the acute period. Two to four lavages are performed in the twenty-four hours, and the maximum dose is reached as soon as possible.

#### TUBERCULOUS ULCERATIONS.

Tuberculous ulceration of the prepuce is rare. It requires treatment by means of phymalose, curetting, and aërocatherization.



**Congenital and Acquired Malformations.**

**CONGENITAL MALFORMATIONS.**

*Preputial Adhesions.*

Adhesion of the prepuce is almost the rule in the newborn. All that is required is to draw the prepuce backwards, remove with a compress the caseous epithelial débris in the balanic groove, and apply zinc ointment.

Should this precaution be neglected, and if the prepuce is much developed, the infant suffers from constant pricking and irritation. A seropurulent oozing supervenes, and the preputial orifice becomes narrow. This condition requires circumcision. Chronic balano-posthitis may cause total adherence or symphysis of the prepuce and glans, which must be shaped later when circumcision is performed.

*Phimosis.*

The prepuce, in the adult, may be highly developed without any adhesions. This is complicated generally by an exaggerated development of the frænum.

The adhesions between glans and prepuce are inflammatory in origin; they may acquire a fibro-cartilaginous consistence.

**Circumcision.**

**A. IN THE NEWBORN.**

*First Stage.*—The prepuce is drawn backwards in order to expose the glans, and to allow the epidermal débris to be cleared away. If the orifice is too narrow it is dilated by divulsion, using a Champonnière's artery forceps.

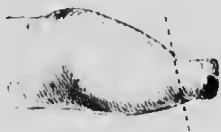


FIG. 508. —PHIMOSIS IN THE NEWBORN.  
The dotted line indicates the section of the exuberant portion.



FIG. 509. —THE SAME.  
First Stage: Withdrawal of the prepuce

*Second Stage.*—The prepuce is drawn forwards. A flat aluminium instrument shaped as in Fig. 511 is introduced into its orifice in order to push back the glans. The metallic plate interposed between the mucous surfaces prevents their cohesion under the action of the éraseur.

*Third Stage.*—Crushing of the prepuce with small model *écraseur*, which is left in position for two minutes.



FIG. 510. THE SAME.  
Section of the penis showing where the section of the prepuce is made.



FIG. 511. INTRODUCTION OF THE ALUMINIUM INSTRUMENT.

*Fourth Stage.*—The *écraseur* is removed; section is made 2 millimetres from the upper limit of the groove, and the integuments are gently drawn behind the glans. Care is taken not to break the epidermic union produced by the action of the *écraseur*.

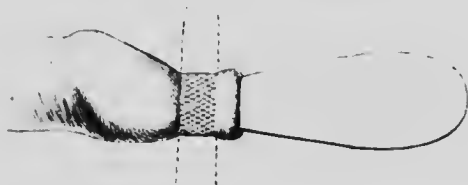


FIG. 512. ASPECT OF THE PREPUCE AFTER APPLICATION OF THE ÉCRASEUR.



FIG. 513. THE CIRCUMCISION IS FINISHED.  
Section of the penis showing what remains of the prepuce.

#### B. IN THE ADOLESCENT.

The same operation can be performed. The prepuce is longer, and the glans more voluminous than in the newborn. It is therefore easy to place a forceps transversely on the extremity of the prepuce in order to limit the field of action of the *écraseur*. The aluminium instrument is introduced between the mucous surfaces to prevent their adhesion. The mucocutaneous fold is then reduced beyond the corona.

#### C. IN THE ADULT.

##### 1. Operation by Crushing.

The prepuce is crushed exactly on the median dorsal surface in a longitudinal sense.

The *écraseur* is left in position for two minutes, and section is made in the centre of the groove. It is then easy to crush successively from before backwards the right half and then the left half, and by a fourth application of the instrument from right to left the *frænum* is divided (Figs., 515 and 516).

**Operation.**—General anæsthesia, using ethyl chloride.

*First Stage.*—Dorso-median crushing of the prepuce from its orifice as far as the corona. The instrument is compressed to its full extent, and is left in position for two minutes.



FIG. 514. ASPECT OF THE GLANS EXPOSED IN A CASE OF BALANO-POSTHITIS BY A DORSAL INCISION. OLD METHOD.



FIG. 515. DOYEN'S OPERATION FOR CIRCUMCISION BY CRUSHING.

First application of the écraseur. The second and third applications are indicated.

*Second Stage.*—Longitudinal section along the groove formed by the écraseur.

*Third Stage.*—Crushing of the left half of the prepuce from before backwards, followed by crushing of the right half: section in the groove formed by the écraseur.

*Fourth Stage.*—Transverse crushing of the frænum and section. No blood is lost.



FIG. 516. CRUSHING THE REGION OF THE FRÆNUM. The lateral epidermic union is seen.

*2. Circumcision with Complete Extirpation of the Mucous Membrane.*

It is often useful to remove the preputial mucous membrane as far as within 2 or 3 millimetres of the corona. In this operation the cutting

instrument must be used, and care must be taken to spare as much as possible of the skin in order to replace the mucous membrane.

**Operation—First Stage.**—Oblique section of the skin of the dorsal region towards the frænum with scissors, taking care not to draw the prepuce forwards. This section is made 6 or 7 millimetres from the corona of the glans. The small subcutaneous vessels are avoided.

**Second Stage.**—The skin of the prepuce is drawn forwards, detached from that of the penis, and the preputial skin and mucous membranes are incised on the median dorsal line as far as the corona.

**Third Stage.**—The entire glans is exposed and the mucous membrane is incised circularly 2 or 3 millimetres from its insertion to corona of the glans. The muco-cutaneous flap is then torn away, which manœuvre causes no loss of blood. It is rarely necessary to crush the small artery of the frænum.

**Fourth Stage.**—A circular suture composed of three sutures, using No. 1 silk, each taking a third of the circumference of the glans. The ends of the sutures are not knotted, which allows of their easy removal. The application of these three separate sutures prevents all danger of strangulation of the base of the glans—an accident which can happen if a single circular suture be employed.

#### HYPOSPADIS.

##### *A. Balanic Hypospadias.*

The abnormal opening of the urethra on the inferior aspect of the glans where the preputial frænum should exist is not infrequent. This deformity can be easily cured by elongation of the urethra, which is very elastic.



FIG. 517. CIRCUMCISION WITH ALMOST COMPLETE EXTIRPATION OF THE MUCOUS MEMBRANE. INCISIONS OF THE SKIN AND MUCOUS MEMBRANES.

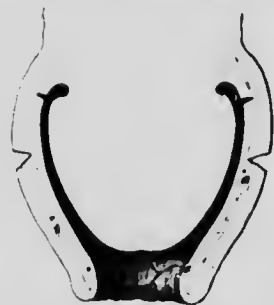


FIG. 518. THE SAME. FRONTAL SECTION PASSING IN FRONT OF THE URETHRA.

It can be seen that the skin is preserved, whilst almost the whole of the mucous membrane should be removed.

**Operation—First Stage.**—Circular dissection of the abnormal meatus and longitudinal incision of the skin of the penis in such a way as to expose the spongy urethra for its anterior half.



FIG. 519. —THE SAME.

Third Stage: Tearing of the mucocutaneous flap. The vessels retract and do not bleed.



FIG. 520. —THE SAME.

Fourth Stage: Suture of the mucous membrane to the skin by three continuous sutures, whose ends are not tied.

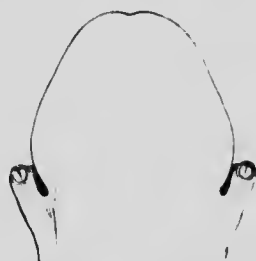


FIG. 521. —ASPECT OF THE UNION OF MUCOUS MEMBRANE AND SKIN SHOWN IN FRONTAL SECTION PASSING IN FRONT OF THE URETHRA.

The glans is completely exposed.



FIG. 522. THE DRESSING FOR A CIRCUMCISION.

A piece of sterilized muslin is used pierced with a hole for the passage of the glans.



FIG. 523. —LATERAL VIEW IN A CASE OF BALANIC HYPOSPADIAS.

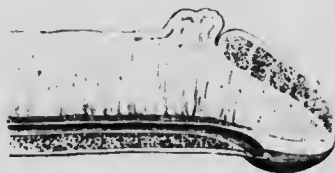


FIG. 524. —THE SAME. SAGITTAL SECTION.

*Second Stage.*—A catheter is introduced into the meatus and the spongy portion of the urethra is detached for a distance of 5 or 6 centimetres.

*Third Stage.*—Perforation of the glans by a narrow bistoury.



FIG. 525. THE SAME. PLAN OF THE RAGLET SHAPED INCISION FOR DISSECTION OF THE URETHRA AND VIVIFICATION OF THE SUB-BULBAR GROOVE.

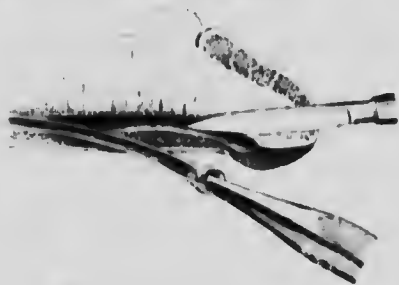


FIG. 526. THE SAME. THE URETHRA HAS BEEN DISSECTED. PERFORATION OF THE GLANS.

*Fourth Stage.*—The urethra is drawn through this new-formed canal, and the urethral meatus is sutured to the circumference of the small central wound in the glans by means of fine arteriorrhaphy needles.



FIG. 527. THE SAME. THE OPERATION IS FINISHED. PLAN OF THE SUTURES.

*Fifth Stage.*—The sub-bulbar groove is treated by V-shaped vivification. The two preputial valves are united with two planes of suture. Longitudinal remotion of the skin of the penis with very fine silk, employing an interrupted suture. The catheter is removed, as its presence is unnecessary.

#### *B. Scrotal Hypospadias.*

Scrotal hypospadias is much more difficult to repair. If the spongy portion of the urethra is completely absent a similar technique is employed to that described later for the repair of longitudinal penile fistula of accidental origin.

#### *C. Total Hypospadias.*

Autoplasty is performed in several stages. The penile urethra is first reconstructed, then the perineal urethra. The intermediary position is repaired at a third operation by the technique described later (see longitudinal fistula of the penile urethra).



FIG. 528. THE SAME.

First Stage: Incision *en raquette* and dissection of the extremity of the urethra.



FIG. 529.— THE SAME.

Second Stage: The insertion of an elastic catheter into the urethra facilitates its dissection as far as the centre of the penis.



FIG. 530.—THE SAME.

Third Stage: The glans is perforated and the urethra is about to be drawn through the canal cut in the glans. The laxity of the spongy tissue surrounding the mucous membrane permits in considerable extension.



FIG. 531.—THE SAME.

Fourth Stage: The same. The urethra appears at the end of the glans, where it will be fixed by five or eight fine silk interrupted sutures.





FIG. 532.—THE SAME.

Fifth Stage: The same. Suture of the peri-urethral cellular tissue with fine silk, using an arteriorrhaphy needle. Suture of the preputial valves follows using No. VI silk.



FIG. 533.—THE SAME.

The operation is completed. Aspect of the superficial sutures. The sound has been left in order to mark the situation of the new meatus.

## EPISPADIAS.

Penile epispadias is rare. Where it is close to the glans it can be repaired by the operation already described for hypospadias. The urethra is dissected up from its abnormal orifice as far as its spongy and subcavernous portion. The fibro-mucous canal thus isolated is drawn through a per-



FIG. 534. PENILE EPISPADIAS.

Total epispadias occurs in ectropion of the bladder. The operation will be described in the section dealing with malformations of the bladder.

formation of the glans, and the meatus is sutured to the circumference of the small orifice. If the meatus is situated close to the root of the penis, autoplasty is performed by means of an analogous technique to that described for penile fistula and total hypospadias.

## ACQUIRED MALFORMATIONS.

*Transverse Fistula of the Penile Urethra.*

The author has seen a fistula of this nature in a patient forty years old. The fistula dated from infancy, and was produced by a ligature placed in play. A circular cutaneous cicatrix prolonged the commissures of the fistula on to the dorsum of the penis. This cicatrix was the indelible trace of a deep ulceration of the skin produced by the circular ligature. Repair is easy; it is carried out in the same manner as the operation described for longitudinal fistula.



FIG. 535. THE SAME. OPERATION COMPLETED. ASPECT OF THE SUTURE.



FIG. 536. LONGITUDINAL FISTULA OF THE PENILE URETHRA.

*Longitudinal Fistula of the Penile Urethra.*

This deformity is very exceptional. It is shown in Fig. 536. In this subject the fistula affected only the lower wall of the urethra. The skin and mucous membrane were united by a supple and resistant cicatricial zone, and an oval window existed, through which the mucous membrane of the superior wall was seen to be intact. The nodular retraction had given to the circumference of the orifice the appearance of a diaphragm with sharp edges, which became effaced on erection or on stretching the skin of the dorsal region. The functional disabilities in such a case are the same as those which are observed in penile or scrotal hypospadias, urine and spermatozoa being totally evacuated by the fistulous orifice.



FIG. 537. RESHAPING OF THE EDGES OF THE FISTULA BY DOUBLING.

The operative technique for the treatment of extensive longitudinal fistula is also the best for the cure of penile or scrotal hypospadias.

The line of the cutaneous incision and the method of liberation of the flaps are the same. The suture is also identical. The operation for penile fistula differs only from that for hypospadias in the persistence of a certain length of the spongy portion of the urethra beyond the accidental meatus. The result is that in the case of a penile fistula the fistula is less extensive than in hypospadias, but it is necessary to obtain union of the two com-

missures, the anterior and posterior, while in hypospadias the posterior commissure alone exists. The method of union of these commissures constitutes the whole difficulty in the cure of longitudinal penile fistulas. This operation comprises the following stages:

1. Oval incision of the skin and shaping of the mucous and cutaneous flaps by doubling.
2. Reconstruction of the urethral wall by suture of the two mucous flaps, which are brought back to back by their surfaces.
3. Application of a second plane of buried sutures (strengthening sutures).
4. Union of the skin.



FIG. 538. THE SAME. THE URETHRAL SUTURE IS FINISHED.

The guiding principle in this autoplasmic procedure, which differs little from my method for repair of complete rupture of the recto-vaginal septum and vesical and recto-vaginal fistula (see Gynaecology), is to sacrifice no particle of tissue except those which are unnecessary for the union. This procedure is also of the same nature as the operation I have devised for congenital harelip, in which operation I double over the surfaces which are

to be united and apply two planes of interrupted suture, one mucous and one cutaneous, which gives a thick line of union and is perfect from the plastic point of view.

Hypospadias and epispadias considered in their anatomical and surgical sense are analogous deformities to harelip.

Figs. 536 shows the fistula before operation. Figs. 537-539 illustrate the operation.



FIG. 539. THE SAME. THE SKIN SUTURE IS FINISHED.

**Operation.**—A large gum elastic sound (No. 24 or No. 28) is introduced as far as the bladder.

*First Stage.*—Oval incision of the skin around the fistula and shaping of the internal and external flaps on each side. The surgeon carefully examines the extent of destruction of the urethral wall and estimates from the disposition of the fistula the dimension which must be given to each lateral flap. The incision must be made freely with a light hand, and in two stages, first on the right side and then on the left. The incision is 3 or 4 millimetres from the sharp edge, uniting the urethral mucous membrane

and the skin. The skin is stretched on the fingers of the left hand in order that it may be divided completely with one stroke. The edges of the incision spring apart at once (Fig. 537; also Fig. 540). The bistoury is again passed in each incision, especially in the region of the commissures, in such a way as to completely free the muco-cutaneous collar, which is to serve for the construction of the urethral wall. On the union of this collar depends the success of the operation.



FIG. 540.—LATERAL INCISION FOR VIVIFICATION BY DOUBLING WHERE THE MUCCOUS MEMBRANE IS INSUFFICIENT.

A small cutaneous flap is spared, which is turned down towards the urethra.

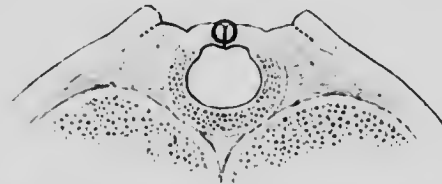


FIG. 541.—THE SAME. REDUCTION OF THE SMALL DEEP FLAPS WHOSE SUTURE CONSTITUTES THE ANTERIOR WALL OF THE URETHRA.



FIG. 542.—THE SAME. UNION OF SKIN.

The right and left flaps, which constitute the internal lips of the incision, become oval in shape, owing to the retraction of the tissues. These are mobilized in order to enable the surgeon to turn them towards the interior of the urethra.

*Second Stage.*—Reconstruction of the urethral wall by the suture and invagination of the two internal flaps, which are brought face to face by their cut surfaces.

The suture of the two inner or muco-cutaneous flaps is the most delicate stage of the operation. The small muco-cutaneous flap forming the posterior commissure of the fistula is turned down upon the sound, and the continuous

suture is begun 6 or 8 millimetres higher on the freshened surface, invaginating the commissure of the fistula against the sound. The mucocutaneous tongue is thus pushed into the calibre of the urethra, and the continuous suture is applied along the whole length of the fistula, bringing face to face the small lateral cutaneous flaps on their freshened surfaces. Union must be perfect, as the suture must come into contact with the urine. The suture, therefore, must be made with round curved needles, generally employed in gastro-intestinal surgery. No. 1 or No. 2 silk is used. The needle should penetrate the freshened surface on the surgeon's right 3 millimetres from the epidermic edge, and emerge about  $\frac{1}{2}$  millimetre from the same edge. It is then engaged in the left flap, following a symmetrical course (Fig. 543).



FIG. 543.—SCHEME OF THE RECONSTRUCTION OF THE URETHRAL WALL. FIG. 544.—SCHEMATIC SECTION OF THE FINISHED SUTURE.

The spirals of the suture are about 2 millimetres apart, and are threaded with the same care as in a gastro-enterostomy. The suture placed as described above is absolutely extra-urethral, and should it have been applied with all the requisite care the epidermic edges of the flaps are exactly approximated, and a perfect union results, the suture being free from contact with the urine. The deep suture should be finished in the same manner in which it was begun—that is, the small terminal cutaneous flap which is left at the level of the anterior commissure of the fistulous orifice is turned into the calibre of the urethra (Figs. 538 and 544).

The deep suture is thus extra-urethral, and it begins and ends 4 or 5 millimetres beyond the fistulous orifice, which it obliterates.

Fig. 541 shows the coaptation of the two inner flaps about the middle of the fistula. Fig. 543 shows the two posterior commissural cutaneous tongues pushed by the suture into the calibre of the urethra.



*Third Stage.*—Arrangement of a buried reinforcing suture. It is a useful step to place a reinforcing suture, which will strengthen the coaptation of the internal flaps and assure their union. This reinforcing suture unites above the deep suture the cellular subcutaneous tissue on either side. It has not been shown in the figures, to give greater clarity to the diagrams. I consider that this suture should be placed always when the fistula is extensive.

This suture is made with the same round needles and fine silk. It unites the freshened subcutaneous tissues throughout the whole length of the wound.

*Fourth Stage.*—Suture of the skin. Suture of the skin is made interrupted, with fine silk. The integuments in this region are of minimum thickness, and must be united with the greatest care. Union of the skin must be by first intention, in order to obtain a satisfactory result. The penetration of the least quantity of urine between two points of suture can cause the total failure of the operation.

*Fifth Stage.*—The sound is removed. Aseptic dressing. The operation here described has given remarkable results in every case in which I have employed it. Immediate union was always obtained.

The sound is indispensable during the operation, in order to appreciate the extent which it is necessary to give to the cutaneous flaps, and to avoid all danger of a narrowing of the calibre of the urethra while the deep suture is being applied. The suture should be made on the sound in such a way that there be no tension of the tissues. This is easily realized if the inner flaps are of sufficient extent—that is to say, if the two lateral skin incisions are made at a sufficient distance from the lips of the fistula. As soon as the operation is finished the sound is removed. Micturition is carried out as in a normal urethra, and does not compromise the union, which is complete in ten to twelve days.

*Application of this Technique to the Operation for Hypospadias and Epispadias.*

*1. Penile and Scrotal Hypospadias.*

The autoplasmic procedure which has just been described can be employed even in the gravest cases of hypospadias. I have employed it successfully in several cases. In one case of subscrotal hypospadias I was enabled to reconstruct the whole of the spongy urethra.

When the integuments are supple and the penis is well developed, the operation can be attempted in a single stage. Success depends chiefly on the proper application of the deep continuous suture and the good union of the posterior commissure of the new urethra, which is always the weak point of the suture. When the operation is on a very young subject (five or six years), it is preferable to perform the operation in two stages. In the first operation the penile and balanic urethra are reconstructed, including the prepuce. The autoplasty is begun at the distance of a centimetre from the abnormal orifice. The urine continues to flow by this orifice, and does not

come into contact with the sutures of the new penile urethra. Reconstruction of the balanic urethra is easy if the shape of the two lateral flaps is continued as far as the glans and the prepuce. The two small inner flaps are carefully brought into contact by their freshened surfaces. The glans is incised deeply in the median line, for this section of the spongiosum tends to reunite partially. The second operation consists in closing the interval which has been left between the scrotal or penile orifice and the posterior orifice of the penile urethra, which has been reconstructed in the first operation.

### 2. *Epispadias.*

The technique just described can but create a cutaneous urethra, which is situated at the upper part of the corpus cavernosum. It might be advantageous in certain cases to incise deeply the intercavernous space or even to perforate completely the penis in the region of the pubis, in order to give the new urethra a direction beneath the corpus cavernosum, thus restoring it to its normal anatomical relations.

## Tumours.

### BENIGN TUMOURS.

Small or recurrent papillomata are preferably removed by the thermocautery, local anaesthesia being employed.

### MALIGNANT TUMOURS.

#### *Epithelioma.*

Epithelial cancer of the glans is not infrequent. It is treated by amputation or, preferably, by electro-coagulation. The following is the technique for the amputation of the penis.

*First Stage.*—Circular section of the skin above the tumour.



FIG. 545.—AMPUTATION OF THE PENIS. PLAN OF THE SURFACE OF SECTION.



FIG. 546.—SUTURE OF THE CORPUS CAVERNOSUM.



FIG. 547.—SUTURE OF THE SKIN AND ASPECT OF THE NEW MEATUS.

*Second Stage.*—Transverse section of the penis with bistoury or scissors and ligation of bleeding arteries.

*Third Stage.*—Transverse suture of the fibrous sheath of the corpora cavernosa and union of the new urethral meatus to a small perforation of the skin.

*Fourth Stage.*—Transverse suture of the skin.

*Electro-coagulation.*—Electro-coagulation is preferable to amputation,

for it is always followed by complete cure if performed in time, and if profound enough to destroy all the cancer cells.

**Operation—First Stage.**—Complete curetting of the tumour, fragments being set aside for histological examination.



FIG. 548. SAGITTAL SECTION SHOWING THE RESECTED PORTION AND THE DIFFERENT PLANES OF SUTURE. CORPUS CAVERNOSUM, SKIN, AND NEW MEATUS.

**Second Stage.**—Electro-coagulation as far as the extreme limits of the neoplasm. The wound is allowed to cicatrize after elimination of the scar.

It is easy to judge after three or four weeks if the cicatrization is satisfactory. Any suspicious tissue appearing in the wound is immediately destroyed.

**Autoplasty.**—Autoplasty of the cicatrix can be undertaken if necessary after six or eight months, when all further risk of recurrence is passed.

#### *Inguinal Adenopathy.*

If the adenopathy be small, vaccination with cytolase and leucolase can be employed. If not, the glands are removed and their cellular sheath is treated with the thermo-electric bath.

The autoplasmic vaccination is continued for six months. The patient is kept under observation for a further period of ten or twelve months.

## SCROTUM TESTICLES.

### SPERMATIC CORD.

#### **Traumatic Lesions.**

Wounds of the scrotum require no special mention. They are treated by suture or by plugging according to circumstances. If the cord or the testicles are injured an attempt is made to treat the wound by suturing.

### ACUTE INFLAMMATORY LESIONS.

#### **Inflammatory Lesions.**

##### *Boils and carbuncles.*

These lesions are not rare. They are speedily cured by the use of mycolysine. A curette may be employed to remove the core if already formed, using ethyl chloride as a local anæsthetic.

*Circumscribed Phlegmon.*

If pus collects it is incised and drained or plugged antiseptically.

*Urinary Abscess.*

(a) **Circumscribed Urinary Abscess.** Incision, plugging, and internal treatment by means of mycolysine by the mouth and by podermic injections.

(b) **Infiltration of Urine.** Infiltration of urine, a serious accident, should be diagnosed very early and freely incised. The action of mycolysine is here very valuable to prevent infection.

Should the suppuration extend widely all the cavities are opened and drained.

## CHURCH'S INFLAMMATORY LESIONS.

Tuberculosis of the epididymis, by no means a rare infection, has a tendency to become fistulous. This condition was treated by castration. This operation was generally useless, since deep lesions existed in the region of the prostate and the bladder.

The great success which has attended the use of phymlose, together with local ennetting, since 1907 has led me to advise this mixed method as the preferable procedure for the treatment of tuberculosis of the epididymis.

**Congenital and Acquired Malformations.**

## CONGENITAL MALFORMATIONS.

*Undescended Testis.*

Undescended testis is not of rare occurrence. Operation should be performed before the age of twelve. I devised the following technique in 1898:

**Operation -First Stage.**—Oblique incision as for the operation for the cure of an inguinal hernia.

**Second Stage.**—Incision of the common fibrous tissue which closes the external inguinal orifice, and exposure of the testicle.

(a) **There is a Congenital Hernia.** The sac is opened and the testicle is drawn out. It is easy to bring it out with the cord, by freeing the fibrous adhesions around. Sufficient traction is performed on the testicle to lengthen the spermatic cord.

(b) **No Hernia is Present.** There should be no hesitation in opening the serous fold, which is drawn out with the testicle. It is the only means of freeing the cord to a sufficient length to allow the testicle to be brought to the bottom of the scrotum.

**Third Stage.**—The internal inguinal ring is first reconstructed (see p. 57-58). The most convenient point of the fibro-cellular tissue of the spermatic cord is then sutured to the pectineal ridge, and to the fibrous tissue in the

neighbourhood of the pubic spine. This suture of the fibrous tissue of the central part of the spermatic cord to the fibrous tissues of the external orifice



FIG. 549. EXPOSURE OF TESTIS. EXPOSURE OF TESTICLE AND LENGTHENING OF THE CORD.



FIG. 550. THE SAME. SUTURE OF THE FIBROUS COVERING OF THE CORD TO THE FIBROUS TISSUE CLOSE TO THE PUBIC SPINE.

of the inguinal canal is the only means by which the testicle can be prevented from rising. In fact, the testicle remains hung on to the portion of the

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cord below this suture, and the fixation of the cord to the external ring will prevent it from ever becoming shorter.

*Fourth Stage.*—As soon as the cord is solidly fixed to the periosteum



FIG. 551. THE SAME. DISTENSION OF THE SCROTUM AND FORMATION OF THE COMPARTMENT TO RECEIVE THE TESTICLE.

at the external inguinal orifice the upper portion of the inguinal ring is closed as in the radical cure of an inguinal hernia (p. 6, Fig. 71). The cavity of the scrotum is then dilated on the index finger. The testicle

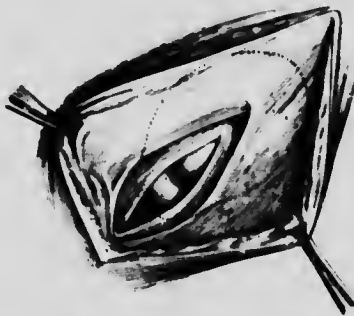


FIG. 552. THE SAME. INCISION OF THE INGUINAL CANAL AND EXPOSURE OF THE TESTICLE (DIAGRAM).

is fixed in position by a small loop of silk, which is tied externally to the skin. This suture is removed after eight to ten days.

*Fifth Stage.*—Closure of the inguinal wound.

This procedure gives excellent results if practised before the age of twelve. If operation be performed later there is a risk that the testicle



FIG. 553. THE SAME. RECONSTRUCTION OF THE INGUINAL RING BY SUTURE OF THE CONJOINT TENDON TO THE DEEP EXTERNAL PILLAR.



FIG. 554. THE SAME. SUTURE OF THE FIBROUS SHEATH OF THE CORD TO DEEP AND SUPERFICIAL LAYERS.

remains atrophied. It should not be forgotten that an undescended testicle has a tendency to become the seat of malignant growth. The following case is an illustration:

*Pseudohermaphroditism; Cryptorchid and Perineal Hypospadias; Cancer of the Testicle.*—M. X., born in 1872. Father and mother living, normal in constitution and enjoying good health. On the mother's side two uncles suffered from unilateral cryptorchid and hypospadias. One of these was operated on in 1870, and had since married, having two normal children. The other, also operated upon, had married and emigrated, and had become untraceable by his family. Three sisters, all well-formed, the eldest of whom was the mother of four normal boys. M. X. was born with complete absence of testicles, a rudimentary penis without a meatus, which had a perineal groove at its base, at the lower end of which opened the urethral orifice. Towards the age of sixteen the breasts commenced to develop, and after several years they became female in dimension. Palpation at this epoch revealed the presence of testicles in the inguinal canals. In



FIG. 555.—THE SAME. RECONSTRUCTION OF THE ANTERIOR WALL OF THE INGUINAL CANAL AND EXTERNAL RING.

1913 M. X. had a bicycle accident, causing a violent shock in the right inguinal region. The testicle was bruised. A short while afterwards he noticed a small tumour in the inguinal tract, which caused no apprehension, since the testicular sensation was normal. Five months later he received a second blow. This traumatism caused the tumour to grow rapidly, reaching the size of a fist in a month. He came to consult me, and I found the following condition:

M. X. is 1.67 metres in height; weight 70 kilogrammes. The general contour of the body is that of a woman (Fig. 556), and the physiognomy is distinctly feminine. The chest and the thighs are much developed, the breasts are remarkably developed, the glands having the aspect of a woman who had nursed for a long period. The left breast is more developed than the right. The skin is white and has no hairs. The limbs are rounded, but the muscles are well developed—since the patient has been an ardent follower of various sports. The hands are small and well made, with long fingers—the hands of a woman. The gestures are feminine. Sex is represented





FIG. 556. PSEUDOMAPHRODISM. CANCER OF UNDESCENDED RIGHT TESTIS.



FIG. 557. THE SAME. ASPECT OF THE RUDIMENTARY PENIS AND PERINEAL MEATUS.

by a penis from 2 to 2½ centimetres in length, the glans being half exposed and having no meatus. The meatus opens in the perineum at the bottom



FIG. 558. THE SAME. THE CANCEROUS TESTICLE HAS BEEN REMOVED. OPERATION FOR LEFT UNDESCENDED TESTICLE.



FIG. 559. VARICOCELE. ISOLATION AND LIGATION OF THE PRINCIPAL GROUPS OF VARICOSE VEINS.

of a groove, which extends from the penis to the upper part of the pubic arch (Fig. 557).

The tumour which brought the patient under my notice was in the right inguinal region, and was about the size of the closed fist. It was oval in shape, with its long axis parallel to the groove between the thigh and the



FIG. 560. —THE SAME. RESECTION OF THE SKIN OF THE SCROTUM.



FIG. 561. —THE SAME.

abdomen. It extended beyond the inguinal orifice, and here pushed the penis to the left of the middle line. The skin was stretched and vascular. The patient was operated on on September 9, and the tumour removed.

Histological examination revealed that it was a malignant tumour, being an epithelioma of the seminiferous tubules.

An inguinal incision revealed the second testicle, which was treated by the procedure already mentioned. No trace of a prostate could be discovered.

The immediate results of the operation were simple, but the patient died a year afterwards from generalization in the peritoneum and lungs.

The interest in this case lies in the striking opposition of sex in the same individual, if we compare the external strictly female aspect of the subject and the real determination of sex by the rudimentary sexual organs. The external aspect of the patient was that of a woman, while he possessed the corpora cavernosa of a child of eight and two undescended testicles.

### Acquired Malformations.

#### CYSTS OF THE CORD.

Cysts of the cord can be removed by a small cutaneous incision. They are as a rule spermatic cysts. The cyst is removed, care being taken to spare the essential elements of the cord.

#### VARICOCELE.

Varicocele, or varicose veins of the spermatic cord, may attain a considerable size.

**Operation—First Stage.**—Oblique cutaneous incision in front of the external orifice of the inguinal canal.

**Second Stage.**—Incision of the common fibrous sheath. The testicle is brought outside with the whole of the cord.

**Third Stage.**—Each of the three chief groups of dilated and varicose veins is verified carefully. The diseased veins are resected between two ligatures of No. 2 silk or fine catgut. Two or three veins should be spared to assure the circulation. The two arteries and the vas deferens are carefully avoided. If the cord be very long, it is made to assume its normal length by uniting the ends of the sectioned veins, using fine silk sutures. The fibrous tissue of the lower third of the cord may also be sutured to the fibrous tissue of the external orifice of the inguinal canal.

**Fourth Stage.**—Suture of the skin.

#### COMPLEMENTARY RESECTION OF THE SCROTUM.

When the skin of the scrotum is too redundant the portion which requires removal is circumscribed by two strong curved forceps. The skin is resected 10 millimetres from the forceps and united by clips.

HYDROCELE.

*Radical Cure by Inversion of the Tunica Vaginalis.*

In 1898 the following operation was described for the radical cure of hydrocele:

The liquid is evacuated by a small incision and the tunica vaginalis is then inverted.



FIG. 562.—INVERSION OF THE TUNICA VAGINALIS.  
The testicle appears outside.



FIG. 563.—THE SAME.

**Operation--First Stage.**—The skin is distended over the hydrocele, whose transparence has been verified by means of an endoscope in the dark room. An incision 3 centimetres in length is made; the tunica vaginalis is exposed and seized in two Doyen's ringed forceps.



FIG. 564 THE INVERTED SEROUS COAT IS LINED BY TWO SUTURES.



FIG. 565 HEMATOCELL OF THE TUNICA VAGINALIS WITH THICKENING OF THE SEROUS ENVELOPE. DECORTEICATION OF THE TUNICA VAGINALIS.

**Second Stage.**—Puncture of the tunica vaginalis and evacuation of the fluid. The testicle is immediately drawn outside with its serous envelope, and liberated from surrounding cellular connections.

## OPERATIONS ON THE GENITO-URINARY ORGANS OF MAN 453

*Third Stage.*—The orifice in the tunica vaginalis is enlarged by division, and the serous membrane is turned completely inside out. It is fixed in this position by several fine silk sutures placed above the testicle.

*Fourth Stage.*—Reduction of the testicle, which remains outside the serous coat. Suture of the skin with clips. This operation occupies four to five minutes.

### HEMATOCELE.

In the case of hematocoele of the tunica vaginalis the considerable thickening of the serous envelope necessitates its resection. This operation requires, as a rule, an elaborate hemostasis.

One or more continuous sutures of fine silk may be used to obtain hemostasis.

### Tumours.

#### BENIGN TUMOURS.

##### *Benign Fungus.*

Benign fungus of the testicle is a rare affection. The exuberant tissues are resected by the thermo-cautery. In case of recurrence the testicle must be removed.

#### MALIGNANT TUMOURS.

##### *Cancer of the Testicle.*

Cancer of the testicle, in the majority of cases, is an epithelioma of the seminal cells. These tumours are very grave, since metastasis occurs very rapidly in the lumbar glands and in the lymphatic glands at the origin of the renal veins.



FIG. 566. CASTRATION. CRUSHING THE SPERMATIC CORD.  
The large model is used.

**Castration (using the Ecraseur).**—The operation for the removal of the testicle is very simple when the method of crushing by the écraseur is employed.

Figs. 567 and 568 show the wound and the suture of the first case of cancer which was treated by cytotoxic.



FIG. 567. WOUND CAUSED BY THE REMOVAL OF A LARGE TESTICULAR TUMOR WITH RECURRENCE AS FAR AS THE INGUINAL CANAL.



FIG. 568. THE SAME REVISION OF THE CUTANEOUS WOUND (1904). A sixth recurrence appeared in the lower third of the wound.

The tumour was the size of an adult head. This patient had a sixth recurrence in February, 1913. I operated, since I had treated him with anti-cancerous vaccine, and (1910) he is still in perfect health.



**Operation—First Stage.**—Incision of the skin which is stretched over the tumour. The diseased testicle is exposed, covered by the tunica vaginalis.

**Second Stage.**—The tumour is brought outside the wound and the cord is brought out in its turn.

**Third Stage.**—Crushing the cord as high as possible with the large model *écraseur*, which is left in position for two minutes screwed as tight possible. Ligature in the groove formed by the *écraseur* with catgut No. 3. Section of the cord below the ligature and a safety ligature placed in the groove formed by the *écraseur*.



FIG. 569. REMOVAL OF THE CANCEROUS PENIS AND INGUINAL GLANDS ON EITHER SIDE IN A CASE WHO HAD ASKED TO HAVE HIS TESTICLES PRESERVED.

**Fourth Stage.**—Reduction of the ligature. Skin suture.

**Total Resection of the External Genital Apparatus.**—This is a rare operation and requires no special description. The technique depends on the extent of the disease, which is generally too far advanced to permit a lasting cure.

I prefer to total resection, which can only be proposed in cases of extensive cancer, electro-coagulation followed by an antoplasty.

### Perineum and Membranous Urethra.

#### TRAUMATIC LESIONS.

##### *Wounds by Stabbing or Cutting Instruments.*

Wounds by stabbing or cutting instruments and gunshot wounds are rare. Treatment is dictated by the peculiar indications in each case.

##### *Contused Wounds.*

I have seen a perforating wound of the perineum caused by a vine-prop in a young man of thirty-two, who had fallen from a tree in a vineyard



close to Reims. The wooden pole, 25 millimetres in diameter, had perforated the perineum between the urethra and the ischium, and had penetrated the bladder laterally. The fragment of wood remained in the depths

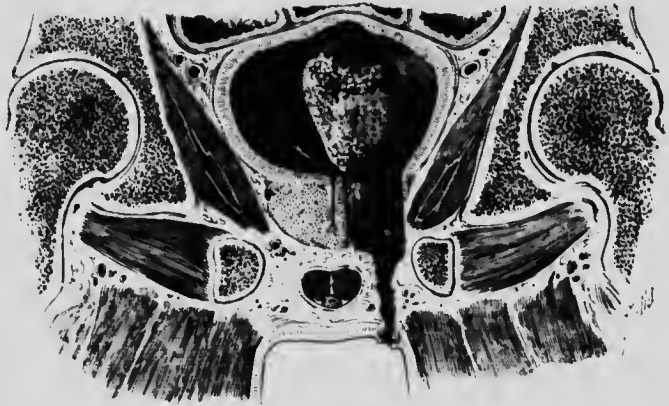


FIG. 570. PERFORATING WOUND OF THE PERINEUM AND BLADDER BY A VINE POLE.

Showing the relations of the foreign body, the calculus formed around it, and the fistulous tract.

of the wound for fifteen months, and the patient voided his urine by the resulting fistula. A calculus formed around the intravesical portion of the foreign body. I extracted this by a hypogastric cystotomy. This patient recovered without a fistula (see Fig. 570).

#### *Rupture of the Membranous Portion of the Urethra.*

Traumatic rupture of the membranous urethra can occur when (to give an example) a man falls astride a tree-trunk. This accident is usually followed by an infiltration of urine, which occurs when the patient first tries to pass water. If the urine be septic a perineal oedema can be observed which is acute and precedes the onset of infectious symptoms.

#### *Aseptic Infiltration of Urine.*

**Operation—First Stage.**—Perineal incision 6 to 8 centimetres long in the middle line.

**Second Stage.**—A search is made for the urethral wound, a metallic sound being introduced into the urethra as a guide.

**Third Stage.**—As soon as the urethral wound is exposed a large catheter is introduced into the bladder.

**Fourth Stage.**—Suture of the urethra in two layers, using very fine silk. Either a continuous or separate suture may be employed. Very fine arteriorrhaphy needles should be used.

*Fifth Stage.*—Toilet of the wound; aseptic plugging; partial suture of the skin.

I do not leave a catheter tied in position. Immediate union ought to be obtained without fistula. The superficial wound occupied by the aseptic plug heals by secondary union.

### Inflammatory Lesions.

#### ACUTE INFLAMMATORY LESIONS.

##### *Abscess of Cowper's Glands.*

The small focus close to the middle line can be perceived quite easily. If the administration of mycolysine does not cause resolution it can be incised by the perineum.

**Operation**—*First Stage.*—Cutaneous incision.

*Second Stage.*—Perforation of the focus with a blunt instrument, and enlargement of the wound by divulsion.

*Third Stage.*—Curetting and draining.

##### *Urinary Abscess.*

This name is given to small purulent collections of the perineum, close to the urethra, when localized. The term "circumscribed urinary abscess" or "diffuse urinary phlegmon" is given to extensive and diffuse suppurations complicating the infiltration of urine infected by micro-organisms from the urethra or the bladder.

Urinary abscess is a localized abscess of small volume.

**Operation**—*First Stage.*—Longitudinal median incision.

*Second Stage.*—Curetting the focus.

*Third Stage.*—The condition of the urethra is examined.

*Fourth Stage.*—If there be a stricture below the origin of the abscess a catheter is tied in position. Aseptic plugging.

It must not be forgotten that a urinary abscess often forms above an old stricture. The stricture must be cured in order that the perineal infection shall be cured. If not, it may become fistulous (see later).

##### *Circumscribed or Diffuse Urinary Phlegmon.*

Acute urinary phlegmon is caused by an infiltration of the perineum by septic urine. An interstitial injection of unsterilized fluid may also cause the same accident. If there be rupture of the urethra the phlegmon advances very rapidly; the suppuration extends in a few hours to the scrotum and as far as the ischial region. This accident very often happens by a false passage in catheterizing a patient suffering from infectious cystitis.

I have seen a diffuse and gangrenous perineo-pelvic phlegmon after a perineal injection of unsterilized mercurial oil without rupture of the urethra.

The inflammation may develop with extraordinary swiftness. The

perineum becomes red, distended, œdematous, and violet in colour; superficial phlyctenules are seen and gangrenous patches. The tongue becomes dry and furred, and the general condition very disquieting. Intervention must take place as soon as the symptoms appear, since death may supervene very rapidly.

**Operation—First Stage.**—Longitudinal incision of the perineum.

**Second Stage.**—A curved forceps is used to search out all the ramifications, which are freely opened by division.

**Third Stage.**—Acro-cauterization of all the exposed surfaces.

**Fourth Stage.**—Antiseptic plugging, using a 5 per cent. solution of Labarraque's fluid mixed with an equal quantity of peroxide of hydrogen (12 vols.).

#### AFTER-CARE.

If the infiltration of urine is very extensive, secondary stripping up of the tissues may occur as far as the central aponeurosis of the perineum, the cavity of Retzius, and the latero-vesical cellular spaces. Persistence of the symptoms of infection requires incision and antiseptic plugging of these deeper collections, which often have to be approached by the iliac route by incisions above the crural arch.

Stenosis of the urethra is treated temporarily, should this condition exist, and complete cure of the purulent foci must be attended before any radical cure is attempted.

#### CHRONIC INFLAMMATORY LESIONS.

##### *Repeated Urinary Abscess.*

Some small urinary abscesses, once evacuated, have a tendency to recur. Pus is discharged, the small cutaneous wound heals, and the symptoms recommence intermittently. These cases can only be cured by a radical cure of the stricture, situated below the ulcerated point, which is the origin of these repeating abscesses.

##### *Tuberculous Abscess.*

Tuberculous abscess may occur in the perineum in relation with tuberculosis of the perineal cellular tissue.

This condition is treated by curetting combined with acro-cauterization.

The administration of phymalose combined with mycolysine is also indicated.

#### Congenital and Acquired Malformations.

##### CONGENITAL MALFORMATIONS.

##### *Perineal Meatus.*

Supplementary perineal opening of the urethra is rare. More frequently a perineo-scrotal pseudohermaphroditism is observed, characterized by the opening in the perineum of the membranous urethra, bifid scrotum and atrophy of the penis.

Radical cure is possible if the malformation be not too accentuated. In case of perineo-serotal pseudohermaphroditism the deformity is incurable. An imperforate membranous urethra or even the opening of the rectum into the urethra has been observed.

ACQUIRED MALFORMATIONS.

*Urinary Fistula.*

Urinary fistula is single or multiple.

The tract can easily be discerned by the characteristic induration of the walls.

Cure of these fistulae necessitates complete removal of the pathological tissues and radical cure of the urethral stricture which causes them.

**Operation**—*First Stage*.—Oval incision with its long axis antero-posterior circumscribing the fistula.

*Second Stage*.—Total resection of the fistulous tract. A metal sound introduced into the urethra is used as a guide.

*Third Stage*.—A catheter is tied in position. Aseptic plugging. If a perineal fistula persist the urethra is repaired later (see below).

PROSTATE AND SEMINAL VESICLES.

**Traumatic Lesions.**

These are rare owing to the depth of these organs.

**Inflammatory Lesions.**

ACUTE INFLAMMATORY LESIONS.

*Prostatic Abscess.*

Abscess of the prostate is a complication either of gonorrhœa or of catheterism. It is not unfrequently observed in men suffering from gonorrhœa. If the action of mycolysine is not sufficient to cause resolution the focus is incised either by the rectum after dilatation of the sphincter or by the perineum.

1. **BY THE RECTUM**.—The anus is dilated and the fluctuating point is found.

*First Stage*.—Puncture of the abscess, which is brought into evidence by a retractor or short speculum.

*Second Stage*.—Widening of the orifice by divulsion. The cavity is plugged with a gauze mesh saturated with Labarraque's fluid (3 per cent.).

2. **PERINEAL OPERATION**.—The perineal operation is the better if the collection of pus points in this direction and does not bulge into the rectum.

**Operation**—*First Stage*.—Transverse incision of the perineum.

*Second Stage*.—Deep prerectal incision. The method of divulsion is

now employed, pushing the rectum backwards, and the deep structures are reached. A finger placed in the rectum to avoid wounding this organ and a catheter in the urethra serve as guides.



FIG. 671.—PROSTATIC ABSCESS BULGING INTO THE RECTUM.  
The arrow indicates the direction of access by the rectum.

*Third Stage.*—Puncture of the abscess and widening of the orifice by divulsion.

*Fourth Stage.*—Antiseptic plugging.

#### *Suppuration of the Vesiculæ Seminales.*

This is rare and causes practically the same symptoms as a suppurating prostatitis.

**Operation**—*First Stage.*—Transverse incision of the perineum.

*Second Stage.*—Deep prerectal incision. Divulsion is then employed, pushing the rectum backwards to reach the prostate.

*Third Stage.*—Detaching the rectum by divulsion and passing between the prostate and the rectum, the suppurating focus is reached. This is globular and indurated.

*Fourth Stage.*—Perforation and widening of the orifice by divulsion. Antiseptic plugging. General treatment by mycolysine.

#### CHRONIC INFLAMMATORY LESIONS.

##### *Tuberculosis of the Prostate and Vesiculæ Seminales.*

These affections can be cured by curetting associated with specific phagogenic treatment, using phymalose and mycolysine combined.

The focus is incised by the perineum and is curetted, followed by antiseptic plugging. The patient is then treated for as long as may be necessary to the specific treatment by phymalose combined with mycolysine. The

administration of these two remedies is regulated so as to produce no local or general reaction. The treatment should be continued for at least one year after cicatrization of the tuberculous focus. The patient is kept under observation and any relapse is treated immediately.

### Congenital and Acquired Malformations.

#### ACQUIRED MALFORMATIONS.

##### *Hypertrophy of the Prostate.*

This term is inexact, for the prostate is never the seat of a true hypertrophy—that is to say, of a general and regular increase in volume of the whole organ.

The increase in volume of the prostate is caused by the development of true prostatic fibro-adenomata, whose external aspect and hardness recall the small fibromyomata of the uterus. Prostatic fibro-adenomata develop either beneath the mucous membrane of the bladder, where they form a considerable bulge behind the neck of the bladder, or in the lateral lobes of the gland. It is probable that microbial infection of the prostatic glands is influential in the production of these fibro-adenomata.



FIG. 572.—HYPERTROPHY OF THE MIDDLE LOBE OF THE PROSTATE.

In the base of the bladder is a calculus. The urethral orifice is seen.

Total removal of the prostate is not indispensable, all that is necessary is to remove the exuberant adenomata. It is easy to ascertain by exploration if the prostatic fibromata bulge into the bladder, or if they are situated in the lateral lobes of the organ.

In the first case, the suprapubic operation alone is possible. In the second case an attempt can be made to remove the exuberant lobe by the perineal route, or even by the coccyssacral route.

I prefer to total prostatectomy the removal of abnormal prostatic fibromata by the suprapubic route, preserving the rest of the gland and wounding the urethral canal as little as possible.



1. **PERINEAL ROUTE—Preliminary Stage.**—The conducting stem of a Luys cystoscope is introduced into the bladder, the beak is then turned backwards, so as to push the prostate downwards.

*First Stage.*—Median perineal incision and transverse incision in front of the anus (reverse T incision).

*Second Stage.*—Deep transverse incision; dissection of the front wall of the rectum, which is held back by a large retractor. The lower wall of the urethra is followed, using a metal catheter as a guide. Divulsion is used to reach the lower lobe of the prostate.

*Third Stage.*—The prostate is forced downwards by pressing on the base of the bladder with the beak of the Luys cystoscope or an instrument of the same form, and the posterior aspect of the organ is brought into view.

*Fourth Stage.*—The left lobe is incised, followed by the right. Divulsion is used to enlarge the openings, and the adenomata are removed with a small Doyen's gouge forceps.

Care is taken not to open the urethra. If the canal be opened care is taken not to enlarge the orifice and a bladder drain is placed in the perineum.

*Fifth Stage.*—Aseptic plugging of the wound.

2. **THE COCCYSSACRAL OPERATION.**—This operation approaches the prostate openly.

**Operation.**—The patient is placed in the right lateral decubitus as for resection of the rectum.

*Preliminary Stage.*—Forcible dilatation of the anus withusco's speculum and introduction of the conducting stem of a Luys catheter, the beak being turned backwards.

*First Stage.*—Incision 12 centimetres long, commencing 4 centimetres from the anus.

*Second Stage.*—Exposure of the coccyx and the two last sacral vertebrae; section of their lateral fibrous attachments and osseous resection, using Liston's forceps.

*Third Stage.*—Exposure of the left border of the rectal ampulla, which has already been washed out after dilatation of the anus. The rectum is detached, using the fingers of the left hand introduced into the rectum as a guide. The dissection is continued until the postero-inferior surface of the prostate is entirely uncovered.

*Fourth Stage.*—The prostate is pushed down by movement of the catheter and the prostatic compartment is incised. It is now easy to approach and remove successively the lateral and median adenofibromata. The best incision for the prostate is transverse. This incision allows of cuneiform resection of the gland and as perfect a transverse reunion as possible. Any bleeding arteries are ligatured.

*Fifth Stage.*—A vesical drain is placed in position, fixed by a thick silk suture, the ends of which are brought outside. Antiseptic plugging, partial suture. This method avoids destruction of the neck of the bladder.

As soon as the coccy-sacral wound commences to cicatrize a catheter is tied in position and the latero-rectal drain is removed.

The sacral fistula closes generally after four or five weeks.

3. SUPRAPUBIC METHOD.—This method will be described later.

The advantage of this method lies in the fact that it avoids the formation of a temporary urinary fistula. We will see if it is prudent to directly drain the prostatic compartment by the perineal route.

#### *Removal of the Vesiculæ Seminales.*

This operation can be performed by the coccy-sacral route (as above) The rectum must be stripped up as far as the vesiculæ seminales, which may then be enucleated from their cellular compartment. I have also performed this operation by the transectoperineal route.

### Tumours.

#### MALIGNANT TUMOURS.

Malignant tumours of the prostate are generally incurable. If taken in time an attempt should be made by antineoplastic vaccination and electro-coagulation. The cancerous prostate is approached by the coccy-sacral route, using the technique already described.

Drainage of the field of operation is better carried out by the posterior route than if the prostate is approached by the hypogastric route. It is also more easy to destroy the pathological tissues to their full extent by the posterior route. They can be followed with the curette to their extreme limits. Penetrating heat is then used to destroy the whole zone of invasion.

### URETHRA AND BLADDER.

#### Disinfection of the Urethra and Bladder.

Disinfection of the anterior extremity of the urethra when the rest of the urinary passage appears to be healthy, and disinfection of the whole urethra and of the bladder when the urinary passage appears to be infected, should always precede exploration.

#### Lavage of the Anterior Urethra.

If the urinary passage appears to be healthy and the urine is limpid, the anterior portion of the urethra should be disinfected before any instrument is introduced, which may push before it microbes of the navicular fossa.

A rubber syringe is used for this purpose, armed with a red rubber cannula (Fig. 573).

The patient is made to pass water, thus washing the urethra from above downwards. The rubber syringe is then filled with antiseptic fluid and employed to wash out the anterior portion of the urethra.



FIG. 573. -RUBBER SYRINGE WITH RED RUBBER CANNULA.

### Exploration of the Urethra and Bladder.

#### EXPLORATION OF THE URETHRA: CATHETERISM.

Catheterism can be employed at once to empty the bladder when no probable sign of stricture is present.

##### 1. *Catheterism with a Red Rubber Catheter.*

The catheter, sterilized, is anointed with glycerine or sterilized oil, and gently introduced into the disinfected meatus. If the patient be hypersensitive a preliminary intra-urethral injection of a  $\frac{1}{20}$  cocaine solution may be injected.

The catheter (Nos. 18-24) is introduced centimetre by centimetre. The effort necessary to overcome the resistance of the prostate and neck of the bladder is soon perceived.

The urine flows at once. It is collected aseptically for clinical, microscopical, and bacteriological examination.

##### 2. *Catheterism with a Gum-Elastic Catheter with Olive-shaped End or with a Catheter "à béguille."*

In many cases it is more easy to introduce a No. 16, 18, or 20 catheter à béguille. These instruments are more rigid than the red rubber catheter and penetrate the bladder more rapidly.

##### 3. *Catheterism with Metal Catheter or Sound.*

**Rules for Catheterism with the Metal Instrument.**—1. The instrument should be introduced gently and without effort, in such a way that an impression is given that the instrument is sucked in by the urethra.

2. The extremity of the instrument should follow the anterior wall of the urethra, without deviating for a moment from the middle line.

3. The lowering of the instrument should commence at the moment when the nose crosses the central perineal aponeurosis.

**Position of the Patient.**—The patient lies on his back, the thighs semi-flexed and the seat raised on a hard cushion.

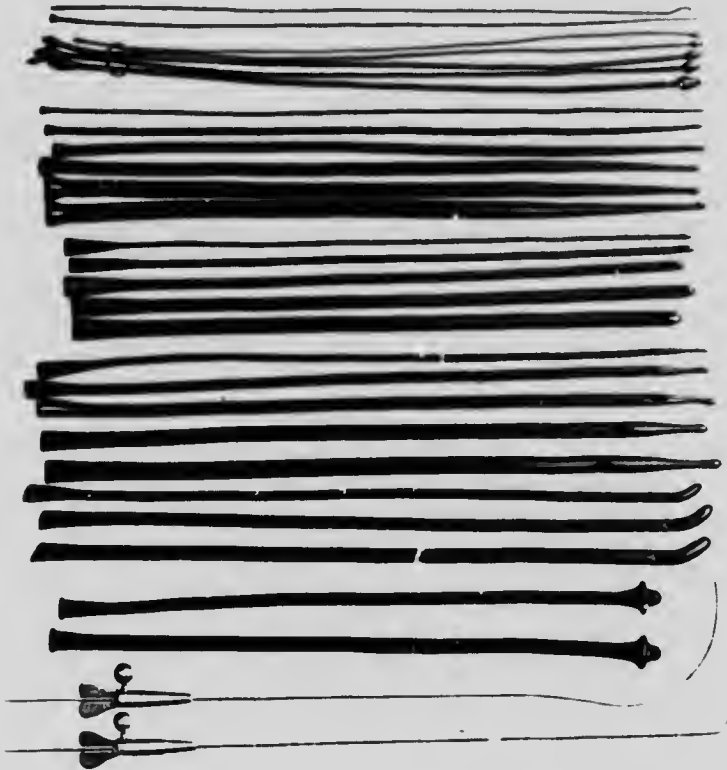


FIG. 574.—INSTRUMENTS FOR EXPLORATION OF THE URETHRA.

From above downwards: Filiform bougies, conical bougies; soft Nèlaton sounds in red rubber; olive-ended sounds, bent sounds; Pezzer's catheters and large curved mandrils for Pezzer's catheters.

It is preferable to employ an operating table which can be tipped, which is indispensable if direct cystoscopy is to be employed.

**Technique of Catheterization.**—The surgeon stands at the left of the patient if he is right-handed, and on the right of the patient if he holds

the instrument in the left hand. It is well to become ambidextrous in this manipulation.

*First Stage.*—Introduction of the catheter as far as the membranous urethra. This stage is easily accomplished. The moment when the end

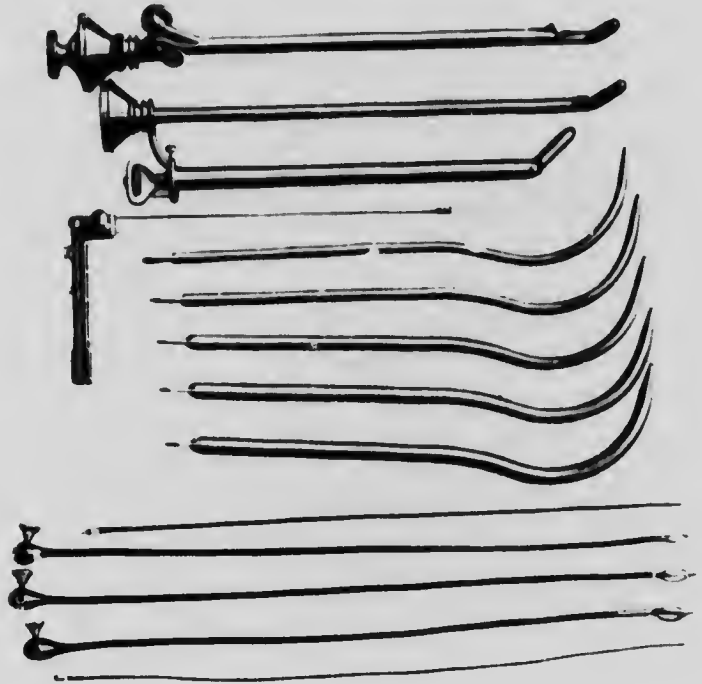


FIG. 575. INSTRUMENTS FOR EXPLORATION OF THE BLADDER AND DILATATION OF THE URETHRA.

From above downwards: Nitz cystoscope for catheterization of the ureters; simple Nitz cystoscope; Lutz' direct-vision cystoscope; lamp carrier; Hoyer's urethral dilators with conductor; Hoyer's electric urethrotomes with four contacts and conductor.

of the instrument reaches the natural narrowing caused by the central perineal aponeurosis is perceived. Below this point many false routes are caused.

*Second Stage.*—The index of the free hand is placed below the scrotum.



FIG. 576.—EXPLORATION OF THE URETHRA WITH A CONICAL INSTRUMENT BEARING AN OLIVE-SHAPED END.



FIG. 577. CATHETERISM OF THE BLADDER WITH A CATHETER "A BÉGUILLE."



FIG. 578. THE SAME.  
The instrument crosses the prostate.

There it guides the end of the instrument, pushing it upwards in contact with the anterior wall of the urethra. The end of the instrument, always kept carefully in the middle line, immediately penetrates the membranous portion of the urethra.



FIG. 579.—CATHETERISM OF THE BLADDER WITH A LARGE CURVED SOUND.

A false passage is caused only when the end of the instrument is directed either downwards or laterally. In such a case a small depression is caused and the urethra is perforated, and at each repetition of the attempt at catheterization the catheter will tend to pass by the false passage.



FIG. 580.—EXPLORATION OF A STRICTURE WITH A BULB-POINTED INSTRUMENT.

*Third Stage.*—As the end of the catheter passes into the membranous portion of the urethra the surgeon lowers the pavilion without pushing, and the instrument passes into the bladder as if inspired.

**EXPLORATION OF THE URETHRA WITH A BULB-ENDED INSTRUMENT.**

If a stricture be considered probable, exploration should be commenced with a bulb-ended instrument. A No. 16 or 18 should be used. If this instrument penetrates without difficulty, it is probable that the urethra is normal.

A No. 22 olive-ended or a large metal catheter can be passed immediately.

Exploration with a bulb-ended bougie reveals strictures of the spongy and membranous portions. If No. 16 is arrested exploration is made with No. 12, 8, 6, or 4; and if no success is obtained with No. 1, a straight filiform or a bougie with twisted end. If filiform bougies do not pass, a bundle of eight or ten is introduced as far as the stricture, and an attempt is made to pass one of these successively.

*Urethroscopy.*

Urethroscopy is performed with a Luys cystoscope, which consists of a tube with a thin wall illuminated by a small electric lamp.

The tube with its guide, whose end is articulated, is introduced. The end is bent. The bent stem is straightened and the guide is removed, and the lamp is placed in position, mounted on a holder of convenient length. The cystoscope penetrates at first as far as the bladder. The neck of the bladder is first examined, then the urethra is explored throughout its entire length from behind forwards, withdrawing the instrument little by little.

Ulcerations of the neck of the bladder are recognized, also of the urethra, as well as small inflamed points. At times a small head of pus is seen to exude from an infected cul-de-sac.

Luys' instrument is easily managed, and all surgeons should be able to use it.

**Exploration of the Bladder.**

**EXPLORATION WITH A BENT CATHETER (CATHETER COUDÉ).**

This exploration at one time was made with Mercier's catheters. Guyon's catheters with small bend, made by Collin, are more easily introduced.

The bladder is evacuated. It is then washed out with tepid boric solution, and 100 to 150 c.c. of tepid boric solution are introduced. Injection must be performed gently, to avoid reflex contractions of the bladder, which are produced when the organ is inflamed and irritable.

The exploring catheter is then introduced, and after the extent of the prostatic urethra is examined the bladder is explored in every direction, particularly at its base, which is the seat of calculi.

Exploration with the catheter can be combined with a rectal examination.

Exploration with the metal catheter is very useful, but at the present time it has lost some of its importance. In fact, it is the rule to complete this examination by a cystoscopy, which gives more precise information.



*Cystoscopy.*

1. *With the Prismatic Instrument.*—The instrument with prisms is the most frequently employed. Nitze's original model has been followed by models which are remarkable for their luminosity and the extent of their optic field.

The bladder is first washed out with sterilized water. 150 c.c. of sterilized warm water are introduced, and the manipulation is proceeded with. Care must be taken not to wound the mucous membrane, as the least trace of blood obscures the field of vision.

The base and the wall of the bladder are examined in turn. Calculus, papilloma, culs-de-sac, and calcareous plaques can be recognized.

The ureters can then be catheterized in order to examine the kidneys, an operation which requires an expert hand.

2. *With the Direct Vision Cystoscope.*—The direct vision cystoscope (Luys' method) requires that the bladder be completely empty. The bladder is washed out in the manner already described, and the cystoscope, with its guide, is introduced. The guide is removed and the bladder is allowed to empty itself. The operating table is then tipped, allowing the bladder to fill itself with air by aspiration. The electric lamp is introduced and the cystoscopy is proceeded with. Luys' instrument is more useful for localizing a lesion than the prismatic instrument. An aspirator is used in connection with the instrument. This connects with an evacuating pump, which gets rid of the urine as it arrives.

## TRAUMATIC AND INFLAMMATORY LESIONS OF THE URETHRA.

These injuries are described, with their treatment, in the section dealing with the Surgery of the Penis.

## CONGENITAL AND ACQUIRED MALFORMATIONS.

**Congenital Malformations.**

The operations for the relief of phimosis, hypospadias, and epispadias have been described under Surgery of the Penis. Figs. 581, 582, 583, and 584, show several varieties of this malformation.

## ABNORMAL OPENING OF THE RECTUM IN THE URETHRA.

The anus must be first re-established in its normal relations. The supplementary fistulae must then be removed and their orifices obliterated by one of the methods already described.

**Acquired Malformations.**

The operations called for to cure accidental fistula of the urethra have been described under Surgery of the Penis.

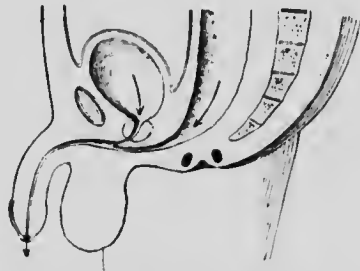


FIG. 581.—IMPERFORATE ANUS.

The rectum opens into the membranous portion of the urethra.

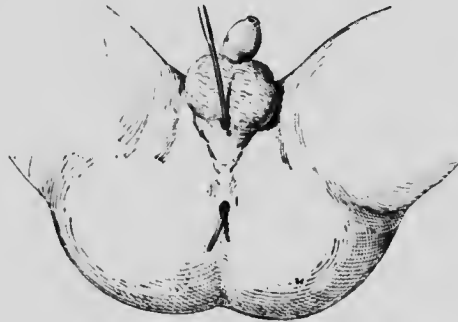


FIG. 582.—THE SAME.

Complicated by a double perineal fistula.

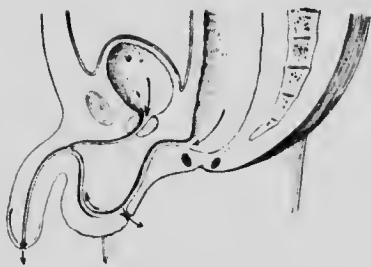


FIG. 583.—IMPERFORATE ANUS.

The rectum opens in the scrotal region and into the urethra.



FIG. 584.—THE SAME.

Introduction of a grooved sound in the scrotal fistula to reconstruct the normal anus.

## STRUCTURE OF THE URETHRA.

Inflammatory strictures of the urethra are often multiple. They often occupy the spongy portion and follow gonorrhœal urethritis. Cicatricial strictures occupy the perineal or membranous urethra. Inflammatory strictures may be very accentuated. They may be 10 to 15 millimetres in length and their wall become fibrous. The walls of cicatricial strictures are more resistant. Fig. 585 represents a cicatricial Y-shaped stricture in the midst of a mass of cicatricial tissue nearly 2 centimetres long. Stricture of the urethra can be treated by dilatation or electrolysis, or when fibrous by resection of the segment.

*Progressive Dilatation.*

1. *With Olive-ended Bongies.*—If the stricture be single and slight simple olive-ended bongies may be employed. The urethra is washed out and two or three bongies are passed of gradually increasing size. The dilatation is repeated two or three times per week.



FIG. 585. DILATATION OF A STRICTURE WITH DOYEN'S CONICAL SOUND AND CONDUCTOR.

2. *With Metal Conical Sounds and Conductor.*—A more rapid result can be obtained by using Doyen's metal conical sounds and conductor. The first to be introduced is the smallest which can pass the stricture, whose diameter is found by exploration with a bulb-ended sound. The sound is mounted on a filiform bongie. The sound is removed and a higher number sound is attached. These sounds increase in size by  $\frac{1}{16}$  millimetre. I rarely use this dilatation except to complete an electrolysis.

*Electrolysis.*

This is the preferable method, however simple the case may be. It is always to be preferred to progressive dilatation, since a result can be obtained in one sitting.

**Operation.**—A special conducting urethrotome is introduced. This instrument consists of four diverging, then converging, metal arcs, which constitute as many points of contact. Three or four of these urethrotomes should be at hand of different sizes.



FIG. 586.—ELECTROLYSIS OF A URETHRAL STRICTURE WITH DOYEN'S ELECTROLYZER

The instrument is introduced until the extremity is in contact with the stricture and the conducting wire is attached. The other wire is attached to a metal plate, padded and soaked with salt solution, which is placed in contact with the abdomen above the pubis. A current of twenty to thirty milliampères is passed, the negative pole being in the urethra. The current is commenced very gently and the rheostat is pushed until a burning sensation is produced. During this time the surgeon presses gently on the end of the urethrotome, which passes through the stricture in about thirty seconds. The rheostat is brought to zero and the urethrotome is removed. A large-diameter sound can be immediately passed. Every week for four or five weeks a large sound is passed to prevent the recurrence of the stricture.

*Internal Urethrotomy of Maisonneuve.*

This operation is now only of historic interest. Its results are much inferior to those of electrolysis.

*Partial Resection of the Urethra.*

This operation is often performed to cure cicatricial strictures of the perineal or membranous urethra. The stricture may be impassable, the trajet being too winding to allow a filiform bougie to pass. In such a case the urine passes drop by drop.

**Operation—Preliminary Stage.**—A metal sound is introduced into the spongy portion of the urethra.

*First Stage.*—Median perineal incision.

*Second Stage.*—The end of the sound which bulges is exposed and the cord uniting the spongy urethra to the membranous urethra is identified as far as the transverse aponeurosis of the perineum.



FIG. 587.—RESECTION OF A FIBROUS STRICTURE OF THE URETHRA. TRANSVERSE SECTION OF THE URETHRA ON THE EXTREMITY OF THE SOUND.

*Third Stage.*—Transverse section of the urethra on the end of the sound. The fibrous cord is removed, segment by segment, until the healthy portion is reached. The upper end of the urethra is quickly found, retrograde catheterization being seldom necessary. A large catheter is introduced and the bladder is emptied.



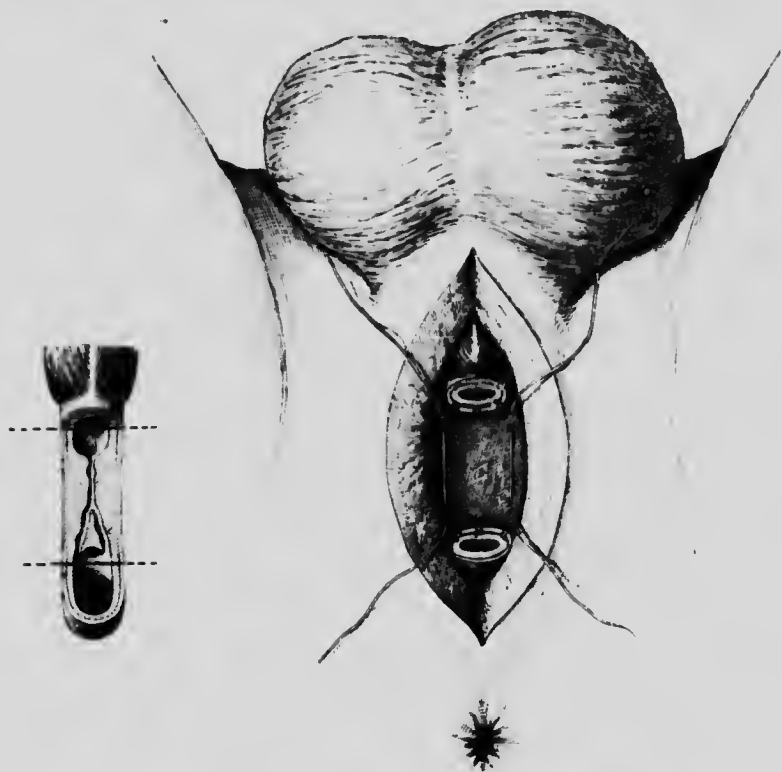
FIG. 588.—THE SAME. CATHETERIZATION OF THE LOWER END OF THE URETHRA.



FIG. 589.—THE SAME.

The operation is completed and the sound is removed.

*Fourth Stage—Reunion of the Urethra.*—The two posterior halves of the two ends of the urethra are united by suture to the retro-urethral cellular tissue. The two orifices are then united by two strong lateral sutures, using No. 3 silk. The posterior halves of the two ends of the urethra are then united by No. 2 silk (two suture points). A large catheter is then placed in position and tied in. The mucous membrane in front of this sound is united by four or five separate fine silk sutures. Fine arteriorrhaphy needles can be used to make a completely watertight suture.



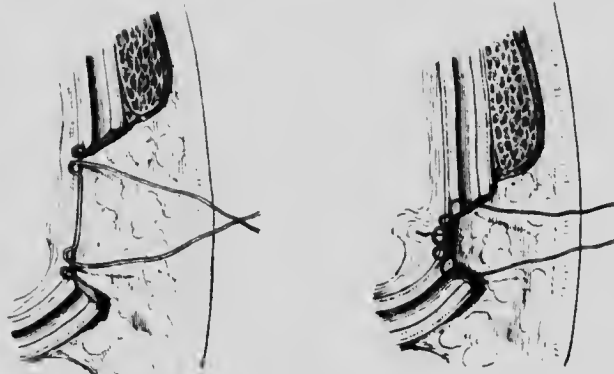
FIGS. 590 AND 591.—DIAGRAM AND RESECTION OF A Y-SHAPED STRICTURE.

*Fifth Stage.*—A second layer of fine sutures is made, uniting the fibro-cellular wall of the urethra. Reinforcing peripheral sutures are also placed, using No. 2 silk.

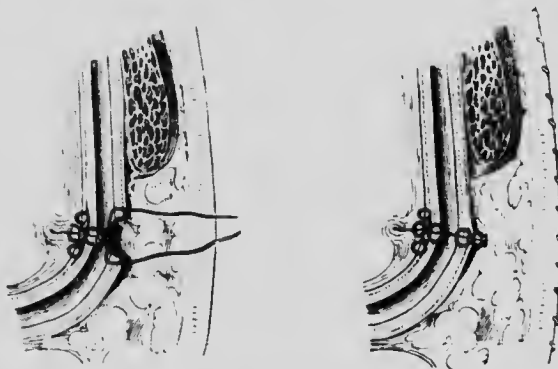
*Sixth Stage.*—Aseptic plugging. Partial closure of the skin. This operation is followed by a rapid union if the suture is well made. It is not advisable to leave a catheter tied in position, since its contact may cause suppuration at the line of union. This will cause the sutures to be eliminated and a perineal fistula will result.



FIGS. 592, 593, AND 594.—THE SAME. REFINION OF THE URETHRA.



FIGS. 595 AND 596.—THE SAME. • SAGITTAL SECTIONS CORRESPONDING TO FIGS. 591 AND 592.



FIGS. 597 AND 598.—THE SAME. SAGITTAL SECTIONS CORRESPONDING TO FIGS. 593 AND 594.



OPERATIONS ON THE BLADDER AND THE PELVIC  
PORTION OF THE URETER.

**Traumatic Lesions.**

WOUNDS CAUSED BY STABBING OR CUTTING INSTRUMENTS.

Wounds of the bladder are not rare. If the bladder be full of urine urinary infiltration is immediate. Extraperitoneal wounds of the bladder are not very serious when the instrument has not wounded the posterior wall of the organ. I have already mentioned, in dealing with wounds of the perineum, a case of penetrating wound of the bladder with a foreign body left in the bladder covered by a calculous deposit.

Intervention must take place as soon as is possible. The operative indications are subordinate to the peculiarities of each case.

GUNSHOT WOUNDS.

Gunshot wounds of the bladder are very grave, since the bullet perforates the organ. The vesical wound is thus complicated by a perforating wound of the peritoneum and often of the intestine. Intervention must take place as soon as is possible.

A suprapubic section is made and the injured part is treated by antiseptic drainage and plugging. If peritoneal or intestinal lesions be discovered a laparotomy is immediately performed.

**Inflammatory Lesions.**

ACUTE INFLAMMATORY LESIONS.

*Perivesical Abscess.*

Phlegmon of the cavity of Retzius causes red and painful swelling in the suprapubic region.

**Operation—First Stage.**—Suprapubic median incision 5 to 6 centimetres in length.

*Second Stage.*—Incision of the linea alba and pyramidal muscles.

*Third Stage.*—Perforation of the abscess with blunt scissors and enlargement of the orifice by divulsion.

*Fourth Stage.*—Drainage and plugging.

*Purulent Cystitis.*

Cystitis is at times localized (cystitis of the neck); at others it is general.

Ammoniacal fermentation of the urine causes phosphatic deposits or veritable calculi. I have seen the whole of the vesical mucous membrane encrusted by calcareous deposit in a case of chronic cystitis.

*A. Cystitis of the Neck.*—Cystitis of the neck is generally of gonorrhoeal origin. It is treated by antiseptic washings, using liqueur Labarraque 1 in 300 to 1 in 100 (see p. 421).

In obstinate cases direct cystoscopy with the Luys instrument is employed and small ulcerations are sought in the urethral mucus or in the neck of the bladder. These are treated by cauterizing with nitrate of silver. The antiseptic washings are continued for several weeks.

*B. Total Cystitis.*—When no foreign body is present total cystitis can be rapidly cured by discontinuous antiseptic irrigation. This has already been described. When one or more foreign bodies are present they must be removed.

#### CHRONIC INFLAMMATORY LESIONS.

##### *Local Ulcerations.*

In certain chronic cases of cystitis localized ulcerations are found occasionally. They must be cauterized, either using Luys' cystoscope or by the operation of suprapubic cystotomy. If the bladder is encrusted with calcareous plaques curetting must be employed, to be repeated if necessary.

An intensive treatment by mycolysine (injectable and by the month) improves cases of this kind very rapidly.

##### *Tuberculous Cystitis.*

This disease, in the majority of cases, attacks the base of the bladder. It is a very obstinate affection, and is best treated by a combination of phymalose and mycolysine, as already described.

##### *Foreign Bodies in the Bladder.*

*Vesical Calculus.*—A great variety of foreign bodies has been discovered in the bladder. My professor, Dr. Gailliet of Reims, in 1878 removed a large phosphatic calculus in the centre of which was a bean which a young man had pushed into the meatus in order to pass a stalk of straw into the bladder.

Vesical foreign bodies produce a local irritation followed by a microbial cystitis, and the foreign body becomes covered by stratified alkaline deposits.

Uric acid and oxalic calculi, on the other hand, are formed by simple crystallization, and do not require microbial fermentation of the urine for their formation. These calculi are formed by one or two small concretions which are arrested in the bladder, and may acquire a considerable volume. At times they are multiple; occasionally there may be but one. Uric acid and oxalic calculi augment in size by the superposition of concentric layers, which are identical as long as the bladder remains aseptic. When the bladder becomes invaded by microbes the calculus becomes covered with phosphatic deposit, which is more or less porous.

*Encysted Calculus.*—Calculi of the bladder are found at times in diverticula or vesical compartments, and only appear on the exterior as a more

or less sharply marked bulging (see Fig. 599). Vesical calculus can easily be defined either by exploration with a metal sound, the cystoscope, or by radiography.

Lithotripsy and the various operations on the bladder will be described later.



FIG. 599. ENCYSTED CALCULUS IN A LATERAL COMPARTMENT OF THE BLADDER. This calculus was discovered by the cystoscope, owing to the sharp point bulging from the compartment.

#### CONGENITAL AND ACQUIRED MALFORMATIONS.

##### Congenital Malformations.

##### EXTROVERSION OF THE BLADDER.

Extroversion of the bladder is characterized by the congenital absence of the anterior wall of the bladder and the upper part of the urethra. The vesical mucous membrane forms a hernia above the pubis, appearing as a red and bleeding tumour. The orifices of the ureters can be identified. The corpora cavernosa end in the lower part of this tumour, where they form a rudimentary penis. The rectus muscles are pushed to either side, leaving room for this vesical hernia to protrude. Operative technique for the cure of this condition must vary in detail according to the peculiarities presented by each case. It comprises two stages: (1) Construction of the wall of the bladder, and (2) reconstruction of the urinary meatus.

##### 1. Construction of the Anterior Wall of the Bladder.

*First Stage.*—Dissection of the entire circumference of the vesical tumour. This dissection must be of sufficient extent to allow of the reconstruction of the bladder after it has been invaginated with the exception of its neck.



FIG. 600. -EXTROVERSION OF THE BLADDER.

The two urethral orifices can be distinguished. The corpora cavernosa are well developed.



FIG. 601. THE SAME.

The periphery of the vesical hernia is detached from the skin. Longitudinal suture of the mucous membrane.



FIG. 602.—THE SAME.

The bladder is constructed. Disinsertion of the lower attachments of the rectus abdominis on either side, which will be united to one another and to the pubis below.



FIG. 603.

ANOTHER CASE. RUDIMENTARY CORPORA CAVERNOSA.



FIG. 604.—THE SAME. RECONSTRUCTION OF THE ANTERIOR VESICAL WALL. PLAN OF THE INCISIONS.

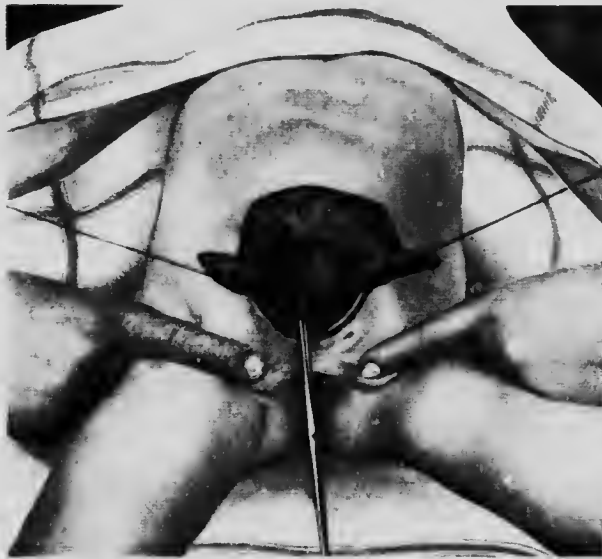


FIG. 605.—THE SAME.

The anterior bladder wall is reconstructed. Mobilization of two lateral skin flaps and perforation of the skin at the point destined to receive the urinary meatus.

*Second Stage.*—Longitudinal reunion of the bladder in two layers of continuous suture, using fine silk, thus constructing the urinary reservoir.

*Third Stage.*—Disinsertion of the lower attachments of the two abdominal rectus muscles, which are transplanted to the neighbourhood of the pubis in order to fortify the anterior wall of the reconstructed bladder. Longitudinal suture of the upper portion of the skin wound.



FIG. 606. — THE SAME.

The cutaneous suture is finished. Suture of the rudimentary penis to the cutaneous orifice, which has been prepared to receive it.

*2nd Procedure.*

When the tumour formed by the vesical tumour is not of considerable size, a large cutaneous flap in the subumbilical region must be shaped.

This flap can be brought downwards in order that it may form the anterior wall of the urinary reservoir.

*First Stage.*—Shaping of the subumbilical cutaneous flap; two lateral liberating incisions are made.

*Second Stage.*—Liberation of the cutaneous flap, and lateral suture of this flap to the mucous membrane of the bladder, the edges of which have been freshened.

*Third Stage.*—Longitudinal suture of the upper portion of the wound; two lateral cutaneous triangles being cut (Fig. 605).

The reconstruction of the urethra is then proceeded with.

#### *Reconstruction of the Urethra.*

*First Stage.*—Dissection of a transverse subpenile and inter-inguino-femoral flap, in which a small orifice is pierced for implantation of the rudimentary penis.

*Second Stage.*—The transverse cutaneous flap is mobilized and drawn above the penis to form the new anterior wall of the urethra.

*Third Stage.*—The rudimentary penis is freshened and sutured to the orifice, which has been pierced in the centre of the interfemoral cutaneous flap.

*Fourth Stage.*—Reunion of the bleeding surfaces, using separate sutures. The skin should be loose enough to allow of complete closing of the wound.

This operation remedies the primary infirmity and allows the subject to carry a convenient urinal.

### **Acquired Malformations.**

#### **VESICAL FISTULA.**

##### *A. Perineal Fistula.*

True perineal fistula of the bladder is rare. The only case which has come under my notice was cured when the foreign body causing the fistula was removed.

##### *B. Suprapubic Fistula.*

This condition follows suprapubic cystotomy. Often it heals spontaneously. If the fistula persists, it can be treated as in the case of other fistulæ by total excision of the tract and by double suture of the bladder with a purse-string suture, invaginating the mucous membrane inwards.

### **Tumours.**

#### **BENIGN TUMOURS.**

##### *Papilloma.*

Papilloma of the bladder is by no means rare. It is generally multiple and pedunculated. Very often this condition is but the first stage of epithelioma. They must be removed, care being taken to destroy the point of implantation by electro-coagulation.



*Fibroma.*

I have observed a case of fibroma of the anterior wall of the bladder which was removed after subperitoneal decortication of the tumour. The bladder was closed by two superimposed continuous suture layers.

## MALIGNANT TUMOURS.

*Cancer.*

Cancer of the bladder is generally a papillary cancer. Often it develops in the base of the bladder, where it may be mistaken for cancer of the prostate. Cancer of the bladder must be recognized very early if it is to be attacked with any chances of success.

The only efficacious method is electro-coagulation, which is made through a large hypogastric opening. In certain cases the suprapubic cystotomy is first performed and the electro-coagulation is performed at a later date.

The suprapubic opening is left open during several months, in order that the cicatrization can be examined from time to time.

## GENERAL TECHNIQUE OF OPERATIONS ON THE BLADDER.

## Operations using the Natural Openings.

## INTERVENTION USING DIRECT CYSTOSCOPY.

Direct cystoscopy can be utilized for the cauterizations of small ulcerations of the neck, or small accessible portions of the mucous membrane the removal of small polypi, and the removal of small foreign bodies, which can be extracted with a specially designed forceps.

A calculus less than 6 millimetres in diameter can also be removed by the cystoscope.

The cystoscope is thus a means of exploration and a way of access for instruments of small diameter.

## LITHOTRITY.

Lithotrity of vesical calculus, followed by immediate evacuation of the fragments, is a well-known operation. Lithotrity is the method of choice when the topography of the bladder and the resistance of the calculus permits of easy manipulation.

**Operative Indications**—1. *The Urethra.*—This must be wide enough to allow a catheter of 10 millimetres diameter to pass (No. 50).

2. *The Bladder.*—The walls of the bladder must be resistant and sufficiently thick. Thus the operation is dangerous in the child because the walls of the bladder are thin and may become interposed between the calculus and the jaws of the crushing instrument.

Exaggerated depth of the retroprostatic cul-de-sac, and hypertrophy of the middle lobe or diverticula and the bladder are contra-indications to lithotrity, since they interfere with crushing and evacuation.

An intense and painful cystitis with reflex contraction of the vesical musculature is also a contra-indication to lithotrity.

3. *Calculi*.—A very large calculus and its possible excessive hardness are also contra-indications.

4. *Kidneys*.—Interstitial nephritis, very frequent in cases of calculus and microbial invasion of the upper urinary passages, must be taken into consideration, owing to the grave complications which may be caused by these lesions, such as anuria and acute ascending nephritis.

#### *Cases which justify Lithotrity.*

I have practised lithotrity in the case of a child of eight years for a single calculus 2 centimetres in diameter, being able to evacuate the fragments at one sitting. But this operation is of too delicate a nature to be recommended at this tender age. In the adult the operation can be performed when the kidneys are in a satisfactory condition, and when the hardness of the calculus or the presence of vesical diverticula does not prevent either crushing or evacuation.

The calibre of the urethra is verified, an incision being made in the meatus if necessary. The urethra should admit the passage of a catheter 10 millimetres in diameter.

#### *Preliminary Disinfection of the Bladder.*

If the bladder is infected it should be disinfected by repeated washings for several days before the operation. Subcutaneous injections of mycolysine may also be given.

#### *Cystoscopy with the Prismatic Instrument.*

A careful examination is made before the operation with the prismatic cystoscope. The state of the bladder walls is determined, the volume and the number of calculi is appreciated, and vesical pouches or a post-prostatic digression.

**Operation.**—The patient is placed horizontally on the table: the legs are flexed and held slightly apart. The bladder is washed out and 150 grammes of tepid borie solution are injected.

*First Stage.*—Introduction of Collin's fenestrated lithotrite, No. 2 or No. 2½. The teeth of the instrument are opened and turned on to one side to catch the calculus. This can generally be quickly and well caught, either by turning to the right or the left. The most difficult cases are those where the retroprostatic cul-de-sac is deep. In such cases it is necessary to turn the teeth of the instrument backwards in order to seize the calculus, which is lying in the base of the bladder. Lithotrity should not be attempted where the base of the bladder lies very low, since the instrument has great

difficulty in sufficiently crushing the fragments resulting from the first crushing.

When the calculus is well seized the teeth are tightened upon it and it is crushed at once by a rapid and powerful turn of the screw. The stone is felt to burst. The teeth of the instrument are immediately opened and made to lie on the same side as at first. The fragment which presents itself is seized, tightened, and crushed with a single movement. The first fragments must be crushed in this way during six to ten minutes. In a short while only fine sand is felt. Two effective crushings per minute can be made by a surgeon who is familiar with the use of the instrument.

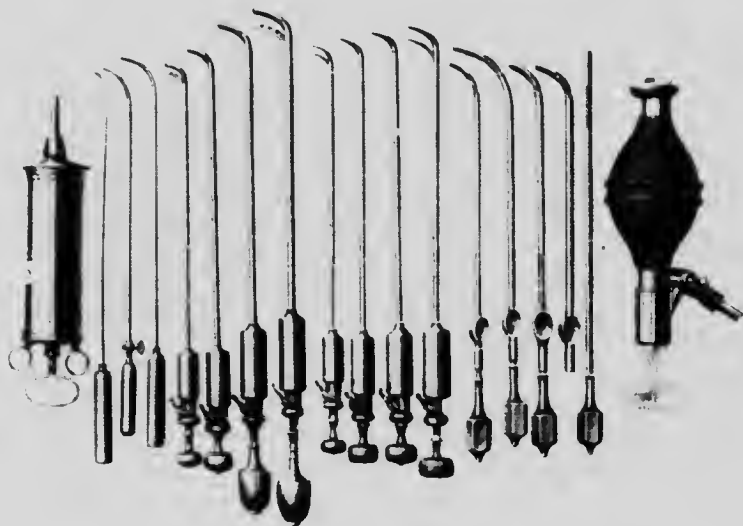


FIG. 607.

INSTRUMENTS FOR LITHOTRITY AND EVACUATION.

*Second Stage.*—Evacuation of the gravel. A large catheter is introduced, and eight to ten times a syringe-ful (150 c.c.) of tepid boric solution are injected. The patient at this moment should not be deeply under the influence of the anæsthetic, in order that the bladder may contract. Each jet of liquid provokes the evacuation of a large amount of gravel.

*Third Stage.*—Aspiration of gravel. 100 c.c. of tepid boric solution are again injected into the bladder, and the aspiration apparatus (Collin's) is attached to the extremity of the catheter. This is held by an assistant (Fig. 611).

The surgeon squeezes the rubber and relaxes it, and the gravel is observed to flow into the glass recipient. The evacuating catheter is turned to the right and to the left. As soon as no more gravel is aspirated the residual fragments are felt to click upon the end of the catheter.

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*Fourth Stage.*—The boric solution is allowed to flow. The catheter is now removed and a fresh injection of 100 c.c. is made. The lithotrite is then



FIG. 608.—INTRODUCTION OF THE LITHOTRITY INSTRUMENT.



FIG. 609.—INTRODUCTION OF THE EVACUATING CATHETER.

reintroduced and the residual fragments are crushed. At times the nucleus of a calculus is so hard that it can only be crushed with the aid of a mallet. The use of a mallet requires a strong manual force and no little dexterity.



FIG. 610.—THE CRUSHING IS AT AN END.

Evacuation of the gravel with the syringe, which projects a strong jet of water into the bladder. The syringe is withdrawn and the gravel is projected with the liquid.



FIG. 611.—LAST STAGE OF EVACUATION OF THE GRAVEL REMAINING IN THE BLADDER.  
Aspiration with Collin's Evacuating Instrument.

If several calculi are present they are seized and crushed in turn.

*Fifth Stage.*—Evacuation of the gravel as above.

*Sixth Stage.*—Examination of the bladder with the cystoscope. The prismatic cystoscope can only be used if the mucus is not bleeding. If blood be present the metal exploration catheter must be used; a final



FIG. 612.—GRAVEL EVACUATED AFTER LITHOTRITY.

Above: Uric acid calculus. Below: phosphatic calculus.

lavage with boric solution is made and the patient is put to bed in warm wraps. An injection of 50 c.c. of mycolysine is made, which is repeated daily for several days.

Operative sequelæ are simple, if no infectious bladder or renal complications supervene. A cystoscopy is made twelve or fifteen days after the operation to ascertain if the gravel has been completely evacuated.

*Accidents attending the Operation of Lithotomy.*

**Rupture of the Bladder.**—If the bladder be very irritable it may rupture by a too violent injection. The liquid does not flow out and a small quantity of blood is passed. A hypogastric incision is made immediately to find the point of rupture, and the wound is treated by antiseptic plugging.

**Wounds of the Mucous Membrane.**—A wound of the mucous membrane between the teeth of the crushing instrument is dangerous if cystitis is present. This accident causes an effusion of blood.



FIG. 613.—PERINEAL LITHOTOMY.

First Stage: Incision of the skin and exposure of the bulb.

Frequent washings of the bladder must be made, using boric solution and Labarraque's fluid.

**Infectious Nephritis.**—These accidents, of very grave import for the affection, are usually bilateral. Injections of mycolysine must be employed.

PERINEAL LITHOTOMY.

This is a very ancient operation. Perineal section gives but a very narrow way of access to the bladder, and calculi larger than 35 millimetres in diameter can hardly be removed by this route.



FIG. 614.—THE SAME.

The lithotome (closed) is introduced into the bladder.

It is an operation which presents no difficulty—above all, in the case of the infant, where the operation takes but a few minutes. In a child calculi of from 15 to 20 millimetres can be removed, but this operation wounds at least one of the ejaculatory ducts.

The instruments used in this operation are illustrated in Fig. 618.

**Operation—Preliminary Stage.**—The bladder is washed out and a grooved sound is introduced.

**First Stage.**—Perineal incision in the middle line ending 3 centimetres in front of the anus.

**Second Stage.**—Section of the perineal raphe. Puncture of the urethra



in the middle line where the bistoury encounters the groove in the catheter and incision of the inferior wall of the membranous urethra.

*Third Stage.*—Introduction of the lithotome closed along the groove of the sound. The extremity of the latter is lowered in order to guide the instrument into the interior of the bladder.

The blade is now made to protrude; its limit of action has been regulated beforehand by a lock-screw. It is directed backwards and outwards and the instrument is brought out, cutting through every obstacle in its path. The urine flows and the grooved sound remains *in situ*.



FIG. 615.—THE SAME.

Introduction of the lithotomy forceps.

*Fourth Stage.*—The index finger is introduced to verify the dimensions of the vesical orifice and to feel for the stone. The lithotomy forceps is introduced, the sound is removed, and the calculus is seized. If there be several, they are removed one by one.

*Fifth Stage.*—Aseptic lavage of the bladder, drainage, and plugging. A tight plugging is generally enough to arrest hemorrhage, which comes from the prostatic plexus.

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When no infection is present of the upper urinary passages perineal lithotomy is followed by no complications of a grave nature. The plug and vesical drain are removed after four or five days, to be replaced by a smaller drain.

The closing of the perineal fistula is all the more rapid if care is taken to puncture the urethra as near as possible to the central perineal aponeurosis. The division of the membranous urethra is thus reduced to the



FIG. 61B. THE SAME.

The perineal wound is plugged. Drainage of the bladder.

strictly necessary limits. It is rare for a fistula not to close after three to four weeks. This may be hastened by tying a Pezzer's catheter in the urethra.

*Inconveniences of the Perineal Operation.*—It has already been mentioned that this operation causes the section of one of the ejaculatory ducts. In double lithotomy with a  $\Lambda$ -shaped incision of the prostate both of these canals are severed. These become obliterated by cicatrization, causing sterility.

*Calculus of the Posterior Urethra.*

I have discovered by catheterization and removed by the perineal route three small uric acid calculi and a large pyriform calculus which, slowly developing, had caused a considerable dilatation of the posterior urethra. The patient recovered without fistula.



FIG. 617. CALCULI FROM THE POSTERIOR URETHRA REMOVED BY THE PERINEAL ROUTE.

## HYPOGASTRIC LITHOTOMY.

This operation has been practised since the Middle Ages. It has become a safe procedure only since the introduction of antiseptic methods.

**Operation (Doyen's Procedure)**—*Position of the Patient.*—The patient lies horizontally on the back, the head being turned towards the light. Trendelenburg's position is only employed in exceptional cases. This position in aged patients is attended with a risk of pulmonary or cerebral congestion.

*Preliminary Stage.*—Antiseptic lavage of the bladder. Evacuation of the fluid and insufflation of air with a large syringe until the bladder is seen to bulge above the pubes.

A large curved and grooved sound is passed (as in the perineal operation). An assistant depresses the extremity, so that its point bulges above the pubes.

*First Stage.*—Suprapubic median cutaneous incision 6 to 8 centimetres in length.

*Second Stage.*—Incision of the linea alba and exposure of the anterior wall of the bladder, which is pushed forwards by the extremity of the catheter.

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*Third Stage.*—A preliminary silk suture is passed through the bladder wall above the bulge formed by the catheter, in order to hold it outside. The vesical wall can also be fixed by seizing it with a Doyen's toothed forceps. The bladder is incised on to the end of the catheter. As soon as the mucous membrane is opened the air contained in the bladder escapes. A closed curved forceps is immediately introduced, the ends of which are opened in order to enlarge the opening by divulsion (Fig. 624).

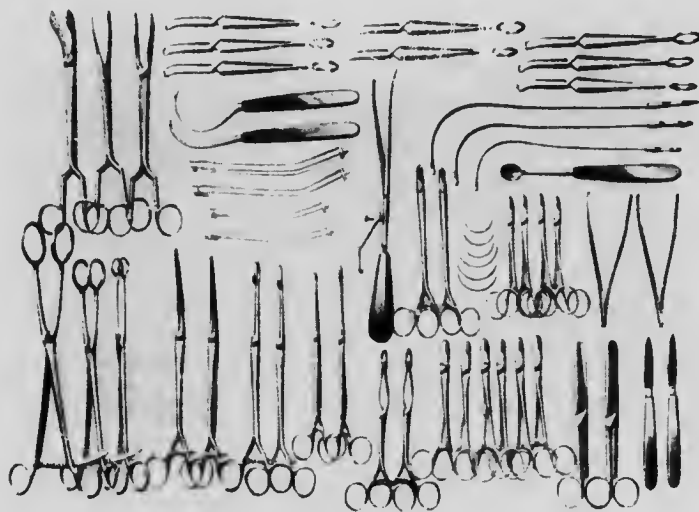


FIG. 618.—INSTRUMENTS FOR PERINEAL AND HYPOGASTRIC LITHOTOMY.

From below upwards and from right to left: Bistouries, scissors; hemostatic forceps, oval-nosed forceps, bullet forceps, Doyen's eccentric forceps, large curved forceps, annular lithotomy forceps (Doyen).

Second row: Toothed dissecting forceps; various needle holders and needles; lithotome with concealed blade; glass drains.

Top row: Churette, grooved sounds; Doyen's hook forceps, Collin's straight and curved lithotomy forceps.

The walls of the bladder wound are caught by forceps and sutured to the musculo-aponeurotic wall by eight or ten separate points of suture.

*Fourth Stage.*—Introduction of a short speculum and exploration of the cavity of the bladder.

### *Vesical Calculus.*

These are extracted, using a lithotomy forceps with ringed ends. The condition of the bladder walls and prostate are verified.

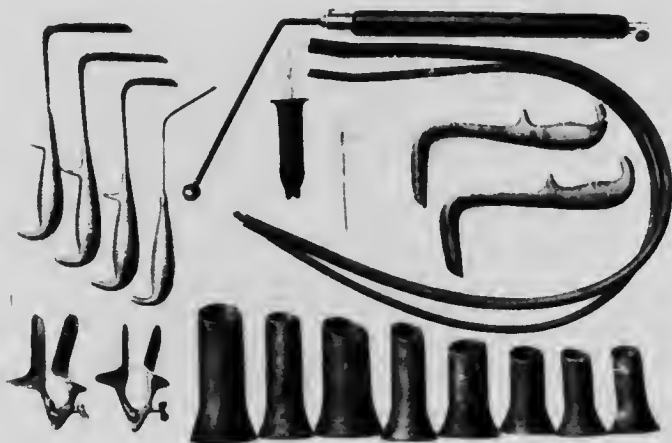


FIG. 619.—DOYEN'S SHORT SPECULUM (VARIOUS SIZES). DOYEN'S METALLIC VALVE DILATORS.

Wooden specula and wooden valves. Electric mounting with hemi-isolated electrode. Centigrade thermometer (see Vol. I, Electro-Coagulation). Apparatus for continuous irrigation of the bladder and aspiration of the urine.



FIG. 620.—HYPOGASTRIC LITHOTOMY.

First stage: Introduction of the grooved sound.

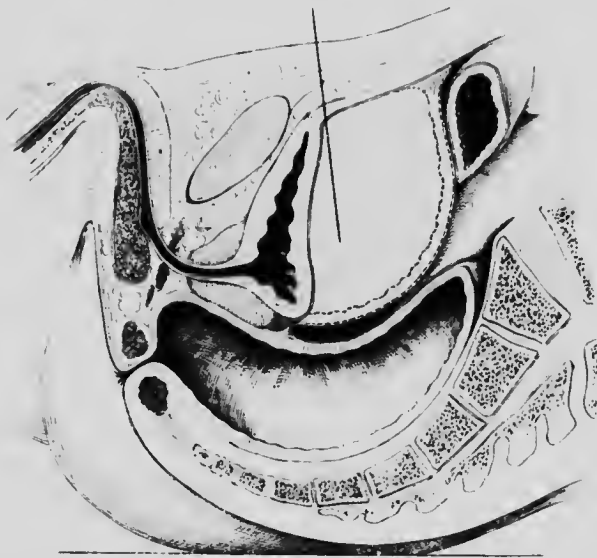


FIG. 621. SAGITTAL PLAN SHOWING THE RELATIONS OF THE EMPTY AND DISTENDED BLADDER.

The black line shows the access to the bladder by suprapubic section.

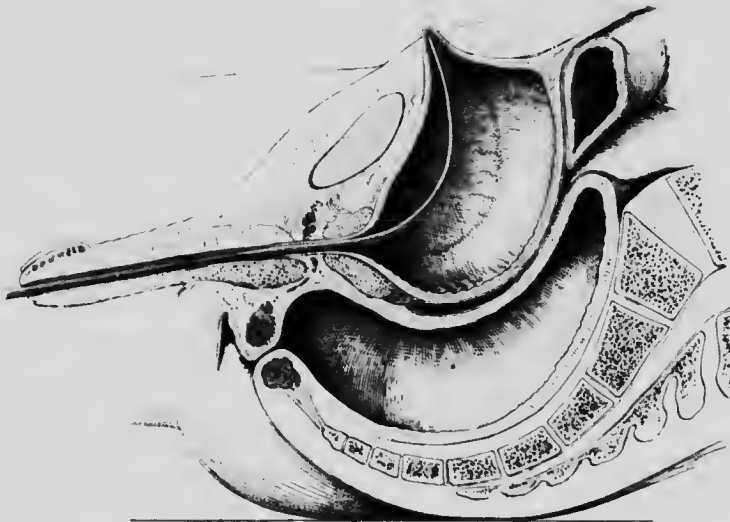


FIG. 622. THE SAME. POSITION OF THE GROOVED SOUND.



FIG. 623. THE SAME. EXPOSURE OF THE BLADDER.



FIG. 624. THE SAME. INCISION OF THE BLADDER WALL, WHICH IS HELD IN POSITION BY FORCEPS. DIVISION OF THE ORIFICE.

*Encysted Calculus.*

If an encysted calculus be found the compartment in which it lodges and its orifice are discovered by means of the speculum. The orifice is dilated by means of divulsion; the calculus is extracted, and a careful toilet is made of the compartment. An attempt may be made to invaginate the ectopia of the mucous membrane, with a view to removal of the diverticulum and to prevent the formation of fresh calculi.



FIG. 625. —THE SAME. EXTRACTION OF A URIC ACID CALCULUS, USING COLLIN'S CURVED LITHOTOMY FORCEPS.

*Polypus of the Bladder.*

A pedunculated polypus is easy to extract by the suprapubic method. If the tumour is benign the surface of implantation can be extirpated by the bistoury; the mucous membrane is then sutured. If the diagnosis be doubtful the points of implantation are cauterized by electro-coagulation.

*Cancer of the Bladder.*

Curetting and partial ablation of vesical cancer, such as are still recommended in certain treatises of surgery, are irrational and illogical operations. If the cancer be still limited an attempt can be made to destroy it in one or several sittings by electro-coagulation.

**Electro-Coagulation of Tumours of the Bladder.**—A cylindrical wooden speculum is introduced, and the tumour is brought to light.

If it should be necessary to place the patient in the Trendelenburg position the table should not be inclined to a greater angle than 20 to 25 degrees, since too great an inclination exposes the patient to the risk of a congestion of brain or lungs.





FIG. 626 —THE SAME. FOREIGN BODY OF THE BLADDER AND VESICAL CALCULI. Fragment of a vine-prop covered with uric acid debris; large calculus with phosphatic surface; three uric acid calculi.



FIG. 627.

Above: two uric acid calculi which resisted the lithotrite (female case).  
Middle and below: various types of calculus.

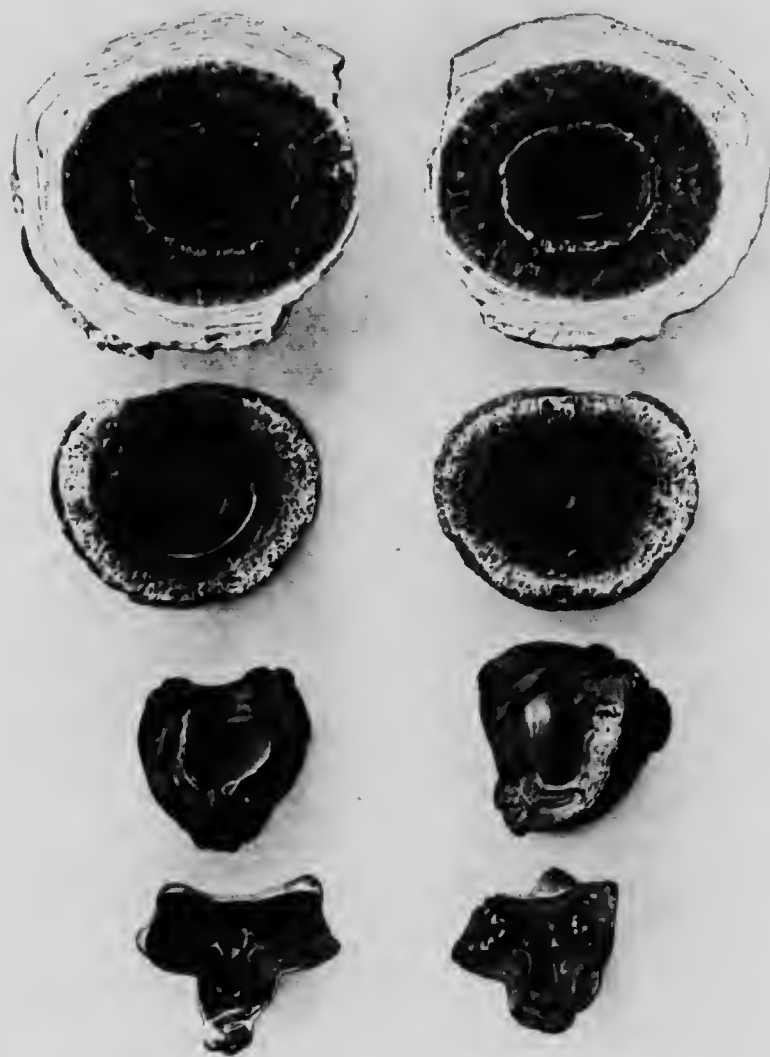


FIG. 628. CERTAIN OF THE PRECEDING CALCULI SHOWN IN SECTION.  
Above represents a section of Fig. 118; below, sections of Fig. 119.

A suitable electrode is introduced, and the tumour is cautiously destroyed following the technique described in Vol. I. The index finger is used to appreciate the thermic effect. Toilet of the bladder.

*Fifth Stage.*—The union of the mucons membrane to the skin is examined, and completed if necessary. A thick rubber tube is placed in position. This is united to a glass double current cannula. The wound is plugged around this tube. This apparatus is used for continuous irrigation of the bladder. Continuous irrigation is installed.

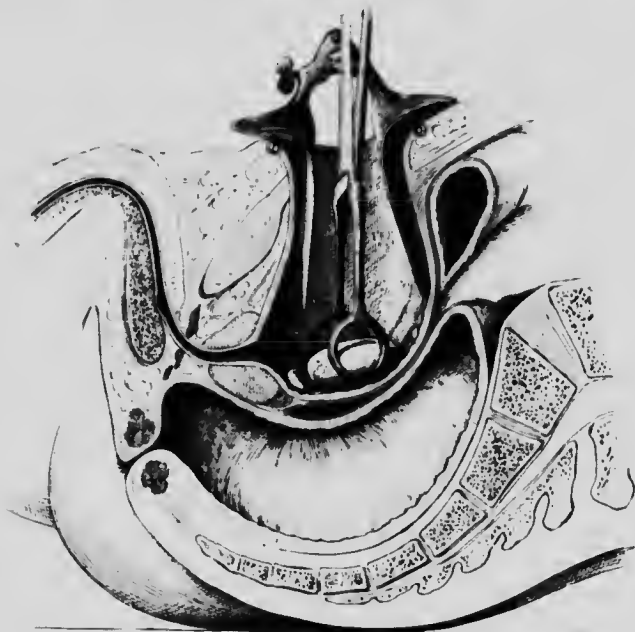


FIG. 629. THE SAME.

Use of Doyen's lithotomy forceps to remove a stone by the suprapubic route.

**Removal of the Prostate.**—Removal of the prostate by the suprapubic method is easy.

*Preliminary Stage.*—A rubber ball blown up with air is placed in the rectum to push upwards the prostate.

*First, Second, and Third Stages.*—As above.

*Fourth Stage.*—The base of the bladder is examined, and the prostatic adenomata are recognized. The mucons membrane is incised circularly behind the neck of the bladder, and the prostate is removed, using divulsion either by the index finger or using the small forceps devised by the author for the purpose. Prostatic adenomata can be easily enucleated once the index finger has penetrated their cellular covering.

*Fifth Stage.*—Continuous irrigation with aspiration is installed. If this cannot be carried out owing to lack of the necessary material, the prostatic cavity can be drained by the transperineal route, using a rubber or glass drain.

**Perineal Drainage of the Bladder.**—A long curved forceps is introduced by the hypogastric wound. This is pushed into the prostatic compartment, and the perineum is perforated as far as the skin in front of the rectum. The position of the forceps is verified by the finger in the rectum. The skin is incised on to the extremity of the forceps, which is pushed out of the

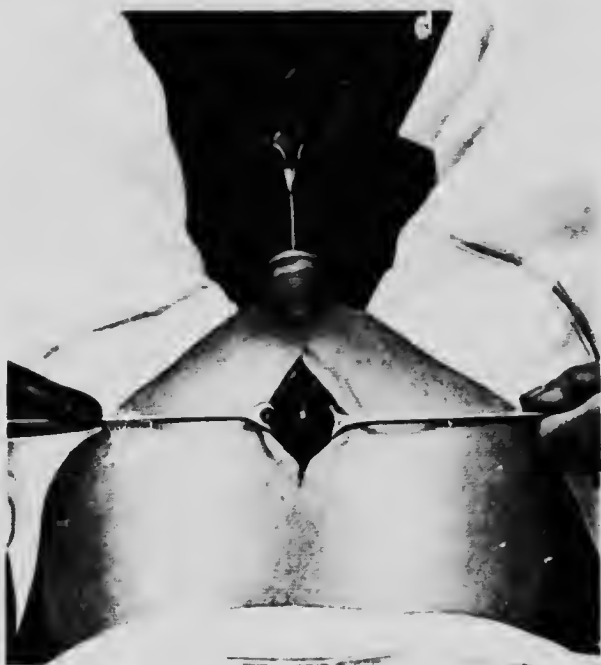


FIG. 630. SUPRAPERINEAL OPENING (TRENDLENBURG'S POSITION) IN A MAN OF THIRTY SUFFERING FROM POLYPI OF THE BLADDER.

wound. The wound in the perineum is enlarged by divulsion. A large No. 10 silk thread is seized in the teeth of the forceps and drawn into the hypogastric wound. One of the ends of this thread is tied to the olive end of a Doyen's glass drain, and this drain is introduced from above downwards in the prostatic compartment, its end appearing in the perineal wound. The collar of the upper end will hold it in the bladder. A large rubber drain can also be used.

**Immediate Suture of the Bladder.**—Perineal drainage of the bladder is indispensable if the bladder is to be closed immediately. This can be

accomplished if the mucous membrane is intact. A double purse-string suture is used when the orifice in the bladder is small. If the orifice be too large a double layer of muco-muscular continuous sutures is used to close it.

**Partial Resection of the Bladder.**—Partial resection of the antero-superior portion of the bladder is possible. It is an operation which can only take place under exceptional circumstances. I have performed it in a case of benign fibromyoma, which developed at the summit of the bladder. In cancer this operation is useless.



FIG. 631. THE SAME.

The linea alba is incised. The bladder wall comes into sight, being pushed into the wound by the end of the sound.

**Terminal Ureterotomy**—(a) *Iliac and Subperitoneal Route.*—An iliac incision parallel to Poupart's ligament, ending at the pubis, allows of approach to the lateral wall of the bladder and to strip up the peritoneum as far as the exposure of the lateral portion of the prostate and the terminal extremity of the pelvic portion of the ureter.

The same technique can be employed to approach the central portion of the ureter. But the incision and stripping of the peritoneum must be carried much farther; they must be continued as far as the lateral vesical cellular space.

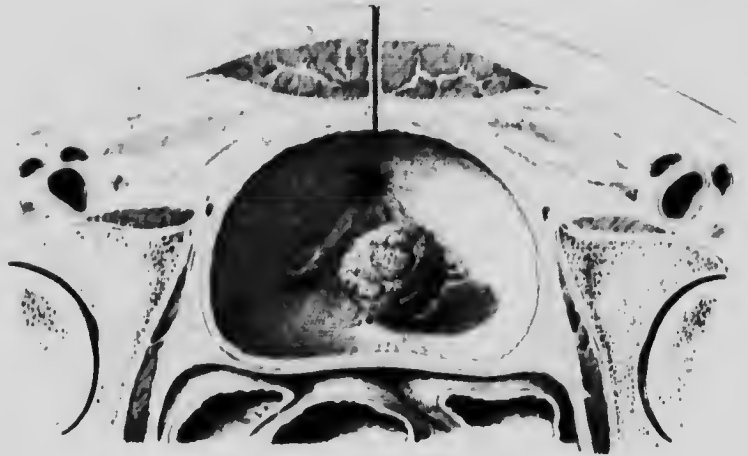


FIG. 632. CALLENDER POLYPIUS OF THE BLADDER.



FIG. 633. THE SAME.

The vesical mucous has been incised and sutured to the skin. Removal of the polyp and its implantation surface.

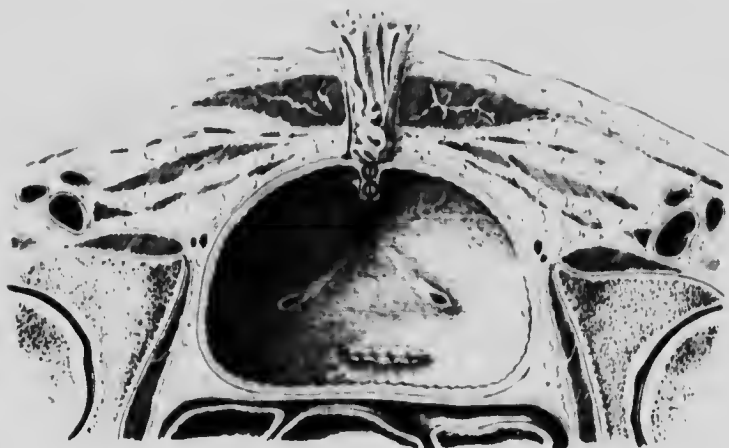


FIG. 634. THE SAME.

The loss of surface of the vesical mucos is closed by a continuous catgut suture.  
Suture of the bladder (purse-string suture).



FIG. 635.—EXTIRPATION OF A PEDUNCULATED VESICAL POLYPUS IN A YOUNG WOMAN.





FIG. 636. THE SAME. SUTURE OF THE SKIN AND TEMPORARY FISTULIZATION OF THE BLADDER.



FIG. 637. THE SAME. SCHEMATIC VIEW.

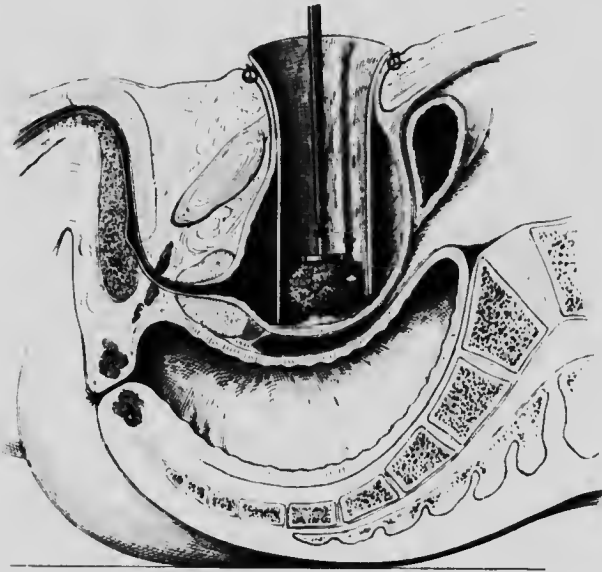


FIG. 638. -ELECTRO-COAGULATION OF A CANCER OF THE BLADDER, USING WOODEN SPECULUM.

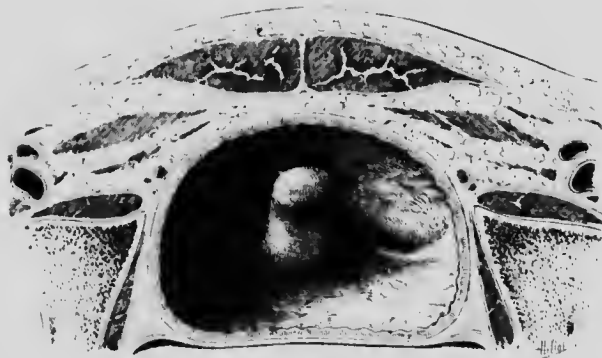


FIG. 639.- HYPERTROPHY OF THE MEDIAN LOBE OF THE PROSTATE.

To remove a calculus impacted in the extremity of the ureter it is necessary, especially in stout cases, to prolong the incision upwards, in order to widen the field of operation and to allow of easier approach to the deeper structures.



FIG. 640.—SUPRABUC PROSTATECTOMY. DRAINAGE BY TRANSPERINEAL ROUTE.



FIG. 641.—THE SAME. PERFORATION OF THE PERINEUM FOR DRAINAGE.

(b) *Transsacral Route.*—Resection of the coccyx and the two last sacral vertebrae, followed by stripping up the rectum, allows of direct approach

to the prostate and vesiculæ seminales. The same technique is suitable in certain cases for the approach to the termination of the ureter, where it enters the bladder.



FIG. 642.—THE SAME. THE DRAIN IS DRAWN FROM ABOVE BY A STRONG SILK THREAD.



FIG. 643.—THE SAME. IMMEDIATE CLOSURE OF THE BLADDER BY A DOUBLE PURSE-STRING SUTURE.

*Pelvic Peritonitis in the Male Subject.*

The pelvic organs in man may be the seat of infectious disorders, which are localized in the pelvic cavity and cause phenomena which are analogous to those of pelvic peritonitis in the female.

Pelvic peritonitis in the male may be caused by the perforation of the small intestine, the sigmoid, or the rectum, by a foreign body such as a fishbone, or by a similar lesion of the bladder. It may also arise from the perforation of the appendix which is in the pelvis, causing an encysted abscess, which may open into the bladder or the rectum.

Pelvic peritonitis has not been described in the male. The following series of observations will show that the inflammatory disorders of the pelvis deserve to be examined as a group in the male, as in the female, since pelvic peritonitis in man is very similar to the same disease in the female. The male pelvic organs may be the originating cause of infective suppurations, as the uterus and its tubes.

**OBSERVATION NO. 1.**—Tuberculosis of left testicle, of the vas deferens, prostate, and vesiculæ seminales. Removal of left testicle. Purulent inguinal fistula. Urethro-rectal fistula. Closure of the inguinal fistula communicating with the sigmoid flexure. Removal of the prostate and vesiculæ seminales. Closure of the rectal fistula. Recovery.

The patient, a youth of twenty, who had already had the tuberculous left testicle removed, suffered from a purulent fistula at the external orifice of the left inguinal canal, and complained that he urinated almost entirely by the rectum.

The urethro-rectal fistula was produced spontaneously. Rectal examination revealed a depression where this fistula opened close to the prostate, which was indurated and covered with bosses. The inguinal tract came from the tuberculous degeneration of the vas deferens and extended towards the prostatic region.

**First Operation.**—A large curved forceps introduced by the inguinal fistula penetrated the pelvic cavity as far as the coccyx.

The sacral route being the more advantageous to reach the lower point of this tract, the patient was turned to his right side and the coccyx and a small part of the sacrum were removed. The end of the forceps which was at the bottom of this wound was exposed by incising layer by layer the tissues covering it.

The bistoury opened the peritoneum and exposed a grayish wall on the end of the instrument. A small incision showed me, to my astonishment, that the forceps had entered the rectum.

The small orifice was immediately closed by a double purse-string suture; the peritoneum was sutured and the wound was plugged.

No gas nor faecal matter had ever been passed by this inguinal fistula, and it was impossible to foresee the existence of a communication between the intrapelvic suppurating focus and the iliac sigmoid. This communica-

tion, which was very narrow, had conducted the exploring instrument to the rectum. The inguinal tract was curetted and plugged.

The urethro-rectal fistula remained to be explored. The rectal orifice was brought to view by a wide-valve speculum introduced into the anus and depressing its inferior commissure.

A catheter was passed into the urethra. A narrow tract of 10 to 12 millimetres existed between the urethra and the rectal orifice. The purulent tract, which commenced above in the right inguinal region, seemed to end below in this focus opening at once into the urethra and the rectum.

The rectal mucous membrane was detached from the circumference of the fistula and treated, after the formation of two lateral flaps, as I have described in the case of vesical and rectovaginal fistulæ (double purse-string suture and union of the flaps by separate sutures).

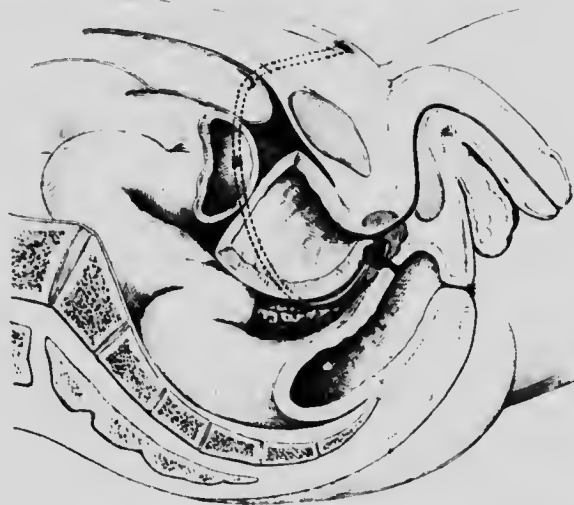


FIG. 644. INGUINAL FISTULA ENDING IN A PERFORATION OF THE SIGMOID, AND, LOWER, IN A FOCUS OF PROSTATIC TUBERCULOSIS AND A FISTULA BETWEEN RECTUM AND URETHRA.

A certain amount of gas escaped by the inguinal fistula. The sacral wound closed rapidly. But the rectal fistula was reproduced after several weeks, and the patient recommenced to pass part of his urine by the rectum.

**Second Operation** (six months later).—At this operation an attempt was made to close at one sitting the fistula of the sigmoid and the urethro-rectal fistula. The following technique was employed:

*First Stage—Laparotomy.*—The inguinal fistula, circumscribed by two curved incisions, was excised as far as the iliac fossa and plugged after curetting its tract, which extended along the sheath of the vas deferens towards the sigmoid and the prostatic region. The peritoneum was widely

opened up. The omentum and sigmoid were adherent to the parietal peritoneum (Fig. 644) over a wide area.

The pelvic cavity and iliac fossa were filled with sterilized compresses, and the intestine was detached together with the omentum, drawn outside, and enveloped in a sterilized compress. The adherent point of the sigmoid was curetted with care; the tract led to the prostatic region. The granulations filling it were scraped away and a long continuous sero-serous suture was arranged to exclude the deep part of the tuberculous tract from the peritoneal cavity.

The omentum was ligatured and reduced, followed by the sigmoid, whose fistula was closed by a double purse-string suture. Examination of the pelvic cavity revealed the appendix, very long and prolapsed into the rectovesical cul-de-sac. It was filled with faecal calculi. The caecum was drawn out, the meso-appendix ligatured and sectioned, and the appendix



FIG. 645. THE SAME. INCISION OF THE ANTERIOR WALL OF THE RECTUM. EXCISION OF PROSTATE AND VESICULAE SEMINALES.



FIG. 646. THE SAME. TRANSVERSE SUTURE OF THE WOUND IN THE BLADDER CAUSED BY ABLATION OF THE PROSTATE. LONGITUDINAL SUTURE OF THE RECTUM.

resected after crushing and ligature of the pedicle. The stump was invaginated in the usual way (thus an appendicectomy was performed through a left iliac incision). The abdomen was closed by layers.

*Second Stage—Perineal Operation*—The patient was then placed in the lithotomy position.

A grooved sound was passed into the urethra and the rectal fistula was exposed by depressing the posterior anal commissure with a wide speculum. A probe in the rectal orifice led into a ramifying focus, and the catheter was found with difficulty. The failure of the first operation showed the necessity of removing all the diseased tissues. I have long established the rule that, in order to close obstinate rectovaginal fistulae, the perineum must be divided from below upwards, together with the rectovaginal septum to a point above the fistula. The diseased tissues must be completely resected. The vagina and rectum are then sutured separately.

Applying, therefore, the experience of gynaecology to the present case, the perineum and the anterior wall of the rectum were incised to a point above the fistulous orifice (Fig. 645).

The prostate, when exposed, was incised and found to be occupied by a large cavity filled with tuberculous granulations.

The entire prostate and vesiculæ seminales were removed by forceps and scissors.

The inferior wall of the urethra was destroyed to a length of 8 to 10 millimetres. This was closed by four sutures fixing it to the tissue surrounding the neck of the bladder (Fig. 646).

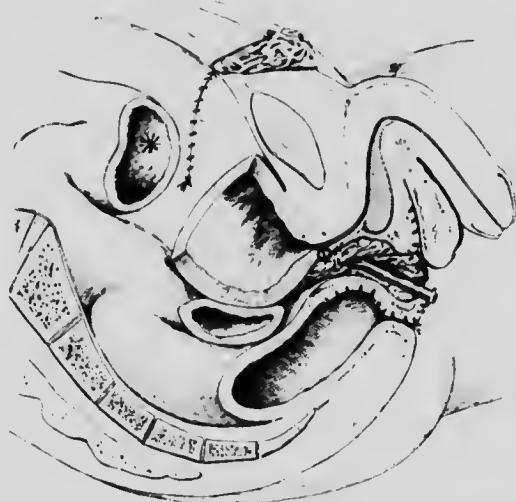


FIG. 647. —THE SAME.

The operation is completed. Union of peritonem and iliac plugging. Suture of sigmoid fistula, urethra, rectum, and perineum.

The field of operation exposed by the incision of the anterior wall of the rectum was remarkably superficial, and the base of the bladder bulged into the wound above the retractor as far as the reflection of the vesico-rectal peritoneum. The rectum was sutured with interrupted sutures, and the vesico-rectal space was plugged and drained to avoid the re-formation of the fistula (Fig. 647). This operation was highly successful, and the patient regained his vigour in the course of a few months.

This case is interesting. It shows that tuberculosis of the vas deferens may start an intrapelvic abscess, which may open in the sigmoid. There is a striking similarity with a salpingitis on the left side which may open into the sigmoid.

The only technical detail on which I would insist is the procedure to extirpate the fistulous tract and to remove at the same time the tuberculous



prostate and vesiculæ seminales. The experiences gained in difficult cases of rectovaginal fistula were of great use here. The best method for closing a rectovaginal fistula with a ramifying tract is the incision of the whole of the rectovaginal septum plus the perineum to a point above the fistula. This is followed by resection of the suppurating tract. The vagina is sutured, then the rectum, followed by the perineal raphe. The urethro-rectal fistula in question was treated by this method. The incision of the perineum and the anterior wall of the rectum gave so wide a field of operation that the removal of the vesiculæ seminales was accomplished with great ease. The whole base of the bladder could be excised by this method.

I repeated this operation a year later on another man of thirty-three suffering from tuberculosis of the prostate and vesiculæ seminales. The testicles and vas deferens were not diseased. The urethra was sutured to the neck of the bladder.

**OBSERVATION No. 2.**—Osteomyelitis of the anterior surface of the sacrum. Opening of abscess into the rectum. Multiple stercorous phlegmons. Creation of iliac anus. Kraske's operation to close the rectal fistula.

*M. X.*, aged thirty-four, presented multiple purulent fistulæ in the sacral region and an iliac anus, whose presence was a source of great discomfort to him. This patient had suffered for seventeen years from a long series of phlegmons in the sacral, gluteal, and femoral regions as a result of an abscess of the anterior surface of the sacrum which had opened into the rectum. The iliac anus, established four years before I saw him in order to cause cicatrization of these interminable abscesses, was followed by an immediate and excellent result.

Exploration of the lower end of the sigmoid revealed the presence of several sharp-angled curves. Instruments introduced by the anus could not be made to come in contact with those pushed to meet them from the iliac anus. The intestine was closely adherent, at several points, to the anterior surface of the sacrum.

**Operation.**—The patient was placed on the side. Resection of the coccyx and part of the sacrum enabled the posterior wall of the rectum to be freed. The orifice of the fistula was thus found. The fistulous tracts were incised and everted, and the whole field of operation was plugged. Cicatrization occupied several weeks. The patient underwent a second intervention at a later date to close the artificial anus and to re-establish the permeability of the sigmoid.

**OBSERVATION No. 3.**—Osteomyelitis of the anterior surface of the sacrum. Purulent inguinal fistula. Cicatrization of the focus after resection of the coccyx and extremity of the sacrum. Recovery.

*M. P.*, twenty-eight years, arrived with a purulent fistula in the left inguinal region, from which the pus flowed intermittently. An attempt had already been made to obtain the cicatrization of the suppurating focus. The patient complained of a deep pain in the sacral region. This pain increased in intensity when the fistula was closed and at such times a painful tumefaction was produced above the crural arch on the opposite

side. Exploration of the fistula with a soft catheter showed its direction towards the concavity of the sacrum.

The fixity of the sacral pain and the symptoms observed in the iliac fossa of the opposite side agreed with the result of the exploration. The disease had started with a subacute onset.

Diagnosis was made of an osteomyelitis of the anterior surface of the sacrum, which had become fistulous in the groin, and was complicated by a vast pelvic detachment reaching the iliac fossa on the opposite side. Resection of the sacrum afforded the most direct access to the principal focus.

**Operation.**—Resection of the coccyx and the two lower sacral vertebrae led directly to a vast bleeding focus, which extended on either side towards the iliac fossæ. This focus, which was widely opened at its lowest point, cicatrized in three months after careful and methodical plugging. No recurrence took place. This observation resembles the preceding. Resection of the sacrum to approach the infectious focus directly is the sole rational method of treatment for parasacral suppurations in the pelvic cavity.

**OBSERVATION No. 4.**—Sacro-iliac tuberculous arthritis. Intrapelvic cold abscess. Tuberculous testicle. Unilateral castration. Sacro-iliac resection and curetting of the pelvic abscess. Recovery.

A boy of fifteen presented himself in 1890 suffering from a tuberculous of the left testicle and a sacro-iliac tuberculous. The prostate and vesiculae seminales were intact. The testicle was removed. The sacro-iliac joint, exposed by a vertical incision, was emptied by gouge and mallet. The sacrum and ileum were resected to a considerable extent. The intrapelvic connective tissue was exposed, and exploration of the pelvic cavity caused the issue of 100 grammes of tuberculous pus. This focus was curetted and the corresponding bony wall was scraped out with care. The wound was plugged. Cicatrization occurred under excellent conditions. No recurrence took place either from the bones or from the urinary organs. This youth is now in *exceptionally vigorous health*.

**OBSERVATION No. 5.**—Hydatid cyst opening into the bladder. Laparotomy. Recovery.

A man of thirty-five was sent to the hospital at Reims. He was very emaciated, having passed hydatids by the urethra. The urine contained a large amount of pus. By abdominal and rectal examination a retro-vesical tumour could be felt, the size of a fist.

I was able to reach the cyst at the bottom of the pelvic cavity by means of a laparotomy. The cyst, isolated by compresses, was incised and emptied. It still contained daughter cysts, and the enveloping membrane was intact. The locality was carefully disinfected, the bladder opening was closed by sutures, and the site was plugged after it had been isolated from the general peritoneal cavity by suture. Recovery took place in several weeks.

**OBSERVATION No. 6.**—Pelvic phlegmon simulating appendicitis. Right iliac incision. Stereoral fistula established. Laparotomy. Discovery and closure of a fistula of the upper part of the rectum. Integrity of the appendix. Recovery.

A youth, twenty-two years of age, was loading a straw waggon with his father, in 1908, when he was seized with a fainting sensation. Placed in bed, he presented subacute peritoneal symptoms during several days, which ended in the formation of a purulent collection in the right iliac fossa. This was incised and drained by my assistant, Dr. Roussel. The general symptoms abated, but after a week the temperature recommenced to rise and the general condition of the patient gave rise to anxiety. The patient had painful micturition. A pelvic focus evidently existed. On the sixteenth day from the first operation the patient had a violent rigor, the temperature rising immediately to 41° C. Dr. Roussel found and opened a vast retrovesical abscess occupying almost the whole of the pelvic cavity. This was plugged.

After several days a stereocoral discharge occurred at the bottom of the wound, and the cavity became shrunken. Dr. Roussel then noticed that the small gauge wick which served to plug the wound was extruded by the anus in three or four hours. Intestinal gas escaped by the wound in an intermittent manner, just as is observed in the case of a rectovaginal fistula. It was then certain that the perforation was quite close to the anus, at the end of the sigmoid or in the first part of the rectum.

A third operation was now performed. I was able to reach the fistula by a wide incision parallel to the crural arch. The opening was discovered in the upper part of the rectum. A loop of small intestine, adherent in the pelvic cavity, was free, and the perforation in the rectum was closed by a double purse-string suture. The appendix was quite intact. It was resected in the usual manner. The abdominal wall was closed in layers. Recovery was uneventful.

This case was interesting owing to an error of diagnosis at the commencement. The evolution of this perirectal abscess closely simulated an appendicitis. The purulent collection was found in the right iliac fossa. The second attack after the treatment of the retrovesical abscess did not exclude an appendicular origin for the symptoms. The fact that the appendix was not found in the purulent focus also did not contraindicate the diagnosis of appendicitis.

The pathogenicity of this phlegmon was very similar to peri-appendicular abscesses. It is certain that the trouble started with a minute perforation of the rectum by a small foreign body—possibly a fishbone. The young man's muscular efforts at the time may be added as a contributory cause. The slow progress of the peritoneal symptoms suggests that the perforation was very small and the suppuration was the better localized since its point of origin was intrapelvic.

OBSERVATION No. 7.—Enterovesical fistula of the sigmoid. Removal of an intestinal segment, which was shrunken and fistulous. Suture of the bladder. Death.

A stout man of fifty-two came to my clinic in Reims in 1897. He complained of passing the majority of his excrement by the urethra.

Laparotomy revealed an indurated mass in relation with the lower portion of the sigmoid and adherent to the bladder. The bladder wall was

isolated and sutured. The indurated segment of the sigmoid was the seat of a considerable cicatricial stricture. Resection of the stenosed segment. Circular enterorrhaphy. The adiposity of the appendices epiploicæ considerably complicated this stage of the operation.

The patient developed signs of perforative peritonitis and died in a few days. The cause of the fistula was never discovered. The extent and hardness of the cicatricial stenosis proved that an intense ulcerating and inflammatory process had been at work. The colo-vesical tract had a length of 2 centimetres and had a very oblique direction.

The non-success of this operation must be attributed to the bad general condition of the patient and the adiposity of the appendices epiploicæ. Again, intestinal, and gastro-intestinal sutures adhere with much more difficulty in patients who are much enfeebled before becoming less stout, than in thin patients where there is no trace of mesenteric fat.

**OBSERVATION No. 8.**—Iliac and retrovesical cold abscess. Incision and plugging. Secondary stereocoral fistula. Ileo-caecal resection. Recovery.

A youth aged sixteen suffered from progressive emaciation since August, 1898. He suffered pain the right groin and walked bent almost double. He remained in bed during a portion of the day and complained of malaise and shivering.

On September 15 a fluctuating swelling appeared in the right iliac fossa. This collection, which resembled a cold abscess, was incised. The abscess contained a small quantity of pus and granulations. It was curetted and plugged. After three weeks, the dressing, by this time almost dry, became suddenly drenched with purulent liquid mixed with faecal matter. This intestinal fistula allowed gas and intestinal matter to pass daily.

On November 19 a wide iliac incision revealed a purulent retrovesical and right lateral collection extending above as far as the space of Retzius. This focus was curetted and plugged.

The peritoneum was widely opened and an intestinal mass consisting of caecum, appendix, and the end of the ileum, was brought outside. The fistula was produced by a tuberculous ulceration of the caecum. The colon was crushed and ligatured and sectioned between the ligature and the caecum. The ileum was treated in the same manner, and the ileo-caecal mass, liberated from its iliac attachments, etc., was entirely detached. Each of the ligatures *en masse* was buried under a double purse-string suture. And the ileum was united to the colon by a lateral anastomosis. Recovery was uneventful.

This observation is remarkable by the coincidence of an iliac cold abscess and ileo-caecal tuberculosis. It shows that some tuberculous purulent collections in the pelvis and iliac fossa may originate in tuberculous infection of the intestine.

**OBSERVATION No. 9.**—Parasacral abscess complicating a non-specific annular stricture of the rectum.

This observation is a new example of the importance to be attached to a close examination of pelvic suppuration in man. This patient suffered

from all the signs of intestinal obstruction. Rectal examination revealed an indurated mass of considerable volume, adherent to the anterior surface of the sacrum, and in the midst of which was a narrow and winding stricture 6 to 8 centimetres in length. The symptoms of obstruction were caused by the development of an adherent parasacral abscess, and they disappeared after evacuation and plugging of the collection.

When I first saw the case in 1910 I found all the signs of an incomplete intestinal obstruction. Rectal examination revealed 6 or 7 centimetres from the anus an annular stricture which admitted the tip of the index finger, above which there was no faecal matter.

Exploring still higher, I was enabled to find an indurated mass in the hollow of the sacrum and adherent to it. This mass, the size of a fist, was very painful. This hard mass was very similar to certain adherent cancers of the upper part of the rectum.

Operation was performed at once to avoid an aggravation of the signs of intestinal obstruction. It was decided, after a careful examination, that the stricture was accessible by the sacral route.

The patient being placed in the right decubitus, the sacrum was exposed, and the coccyx and two lower sacral vertebrae were excised. As the bone was divided a jet of pus was projected from the depths of the wound. It was found that the anterior surface of the sacrum was occupied by a cavity with indurated walls containing 150 to 200 c.c. of pus. The rectal stricture was exactly at this level. This large cavity was disinfected and plugged.

The morning after the operation the patient passed a large quantity of hard and voluminous matter. Cicatrization was complete in six weeks.

The phenomena of obstruction did not recur. Six weeks later, however, defaecation became difficult, and the original annular stricture was found to be the cause. This yielded to forcible dilatation.

This operation is an excellent demonstration of the value of Kraske's method for the exploration of the middle portion of the rectum.

The resection of the sacrum here was made in order to examine directly the indurated mass and stricture. The discovery of the abscess reduced the extent of the operation to this one stage.

If no purulent collection were present, the incision of the posterior wall of the rectum, so easily accessible after the removal of the last sacral vertebrae, would have allowed the exposure of the lower end of the stenosed segment. This could have been explored, and if necessary removed, followed by circular union of the upper and lower ends of the intestine.

Kraske's operation, originally devised for the removal of cancer of the rectum, is, therefore, of even greater value where it is necessary to search and reach in man certain non-cancerous lesions, such as parasacral suppurations, some pelvic cysts, and, particularly, non-cancerous stricture of the rectum situated at a high level.

The etiology of this parasacral abscess is rather obscure. The pus was thick, not fetid, and contained only streptococci.

## CONCLUSIONS.

These observations, to the number of nine, correspond to a variety of pelvic suppurations in the male:

1. Tuberculous ileo-sacral arthritis (Observation No. 4).
2. Suppuration of the anterior sacral region with encysted pelvic focus (Observation No. 9) or with extension towards Poupart's ligament on each side (Observation No. 3), or even opening into the rectum (Observation No. 2).
3. Suppuration of the prostate and tract of the vas deferens (Observation No. 1), with inguinal cutaneous fistula, pelvic fistula of the lower portion of the iliac sigmoid, and transprostatic urethro-rectal fistula.
4. Suppurating pelvic hydatid cyst opening into the bladder (Observation No. 5).
5. Enterovesical fistula between the lower portion of the sigmoid and the bladder, with stricture of the intestine beyond the fistula (Observation No. 7).
6. Pelvic suppuration following an accidental perforation of the rectum (Observation No. 6).
7. Tuberculous pelvic peritonitis (encysted) following ileo-caecal tuberculosis, with secondary caecal fistula (Observation No. 8).

The starting-point of the disease is very varied; the osseous system, genito-urinary organs, the intestines or retroperitoneal regions being implicated; the infecting agents observed were at times Koch's bacillus, or the *Staphylococcus aureus*; at others they were the microbes of urinary infection or contamination from the large intestine.

Whatever were the etiology and variety of pelvic suppuration observed, the suppurating focus may follow the same type of evolution as was observed in the female, before surgical treatment had developed in her case. It may give rise to fistulae, intestinal and cutaneous, to vesical fistulae which may be simple or complicated (antero-vesical or urethro-rectal fistulae).

The prognosis of suppurating pelvic peritonitis is in the male, as in the female, as follows: The lower the starting-point of the inflammation, the less alarming is the outlook.

The course in the male is, as a rule, subacute, and the alarming signs of peritonitis by perforation of the general peritoneal cavity are rarely observed.

Operative indications vary considerably. The observations quoted here show how important to the surgeon is the cure of these complex cases where the operative technique must be subordinate to incidents which may arise in the course of an intervention. Amongst these nine observations we gather the following:

1. A removal of the prostate and vesiculae seminales by quite an original technique, followed by the closure of a urethro-rectal fistula (Observation No. 1).

2. Three cases of suture of intestinal fistula (Observations Nos. 2, 5, and 6).

3. Two resections of the intestine (Observations Nos. 7 and 8) and (Observation No. 7) suture of the bladder.

4. Five cases of sacrocoecal or sacro-iliac resection (Observations Nos. 1, 3, 4, and 9).

My object in grouping these cases was to draw the surgeon's attention to a category of pelvic suppurations, as yet but little known, and which can be grouped neither with appendicitis nor in the category of pelvic suppuration in the woman of genital origin.

We may conclude that in the male, as in the female, pelvic suppuration may have four originating points which are quite distinct: (1) The skeleton; (2) the internal generative organs; (3) retroperitoneal cysts; (4) the end of the sigmoid, the rectum, and at times the caecum. Their origin is very often tuberculous in nature.

Appendicitis must be studied apart, with the lesions of the iliac fossa. It only enters into the category of pelvic suppurations when the suppuration takes a downward direction and exclusively intrapelvic, or, in the woman, when the appendix inflames as a secondary complication by extension of a suppurating salpingitis.

## OPERATIONS ON THE FEMALE GENERATIVE ORGANS.

### Gynæcological Examination.

#### ABDOMINAL PALPATION.

This is carried out with the patient in the dorsal decubitus. The patient is instructed to breathe freely; the arms rest beside the body. It is not necessary to flex the legs or the thighs. Abdominal palpation must be carried out with extreme gentleness, and the patient should experience no pain caused by the pressure of the fingers. A brusque palpation will provoke reflex contractions of the abdominal wall. Patients justly fear a hard-handed surgeon who hurts them.

#### Vaginal Examination.

A rubber glove is generally worn. The legs and thighs are in semiflexion, and the heels are separated to a distance of about 20 centimetres. The vulva is first examined. Where direct light is insufficient, an electric lamp and reflector is placed in front of the vulva.

The external surfaces are examined, where often various lesions, such as redness, ulceration, cysts, may be found. Vaginal examination should be carried out, with every precaution to avoid unnecessary pain where the mucous membrane is sensitive.

When the index finger has explored the ends-de-sac and the neck of the uterus, the examination is concluded by bimanual palpation.

## BIMANUAL PALPATION.

The abdominal palpation is performed by the left hand, while the right index finger completes the vaginal exploration.

Bimanual exploration allows a very precise diagnosis to be given. For instance, a pelvic dermoid cyst can be recognized by its special consistence and by the imprint made by the finger into its caseous mass.

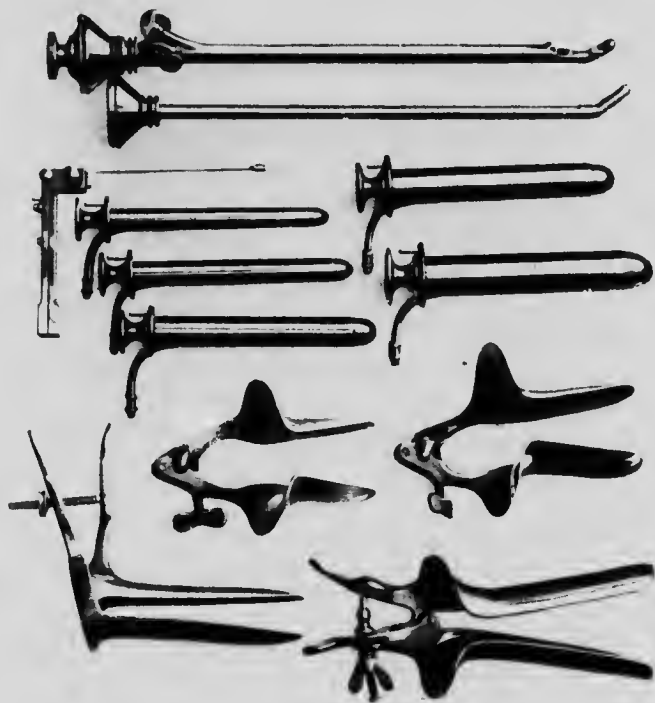


FIG. 648.

Nitz's cystoscope (simple model and model for catheterization of the ureters).

Guy's direct vision gynaecological cystoscope and lamp holder.

Two dozen short specula.

Cusco's speculum.

Doyen's long speculum for hemorrhage of the uterine artery.

## Rectal Examination.

I have never obtained, in gynaecological diagnosis, more precise information by rectal examination than those given by vaginal examination.

Rectal examination is generally useless when the rectum is healthy. It is, however, indispensable should a rectal fistula be suspected, or a cancer of the rectum.



## EXAMINATION WITH SPECULUM.

Cusco's speculum is the most practical instrument, with fixed or pliable blades.

When it is necessary to apply a tent or a compress which must be held in position while the speculum is removed, Collin's model with a single articulation should be used. Collin has made several models of this instrument for me with short valves allowing the neck to be pushed down.

For peritoneal toilet after vaginal hysterectomy Doyen's speculum with single articulation should be used (Vol. I., Figs. 222a and 222b), as this gives much more light than Collin's model, without further distending the vulva. This speculum is particularly useful for making direct compression of a vaginal or uterine artery when the scars of vaginal hysterectomy commence to be eliminated (See also Fig. 648).

*Position of the Patient.*

Examination by speculum can be made on a horizontal table, and in the same position as for manual examination. A reflecting lamp is placed on the table between the patient's legs. The surgeon, standing on the right side, has everything at hand for the examination of the neck and the cul-de-sac, to explore the uterine cavity, etc. This examination can be just as well made on an ordinary bed.

**Dilatation of the Cervix.**

## UTERINE ENDOSCOPY.

Dilatation of the cervix is performed preferably on a gynæcological table or operating table arranged for vaginal hysterectomy.

In order to dilate the uterine canal the cervix is seized on either side with a pair of forceps, and graduated Hégar's dilators are successively introduced. General anæsthesia with ethyl chloride is employed. After a few minutes a bougie of 25 to 30 millimetres diameter can be introduced. It is then easy to make a digital examination or endoscopy. Uterine endoscopy is performed with a straight tube with a glass opening at the end. The same lamps are used as for direct œsophagoscopy.

## RECTOSCOPY.

If there exist a painful fissure of the anus, rectoscopy is performed using ethyl chloride, the anus being forcibly dilated with Cusco's speculum.

## CYSTOSCOPY.

Cystoscopy must be used in every case where a lesion is suspected of the urinary organs.

*Indirect Cystoscopy.*

For the use of Nitz's instrument the patient is placed in a special chair. The bladder is evacuated with a catheter; it is then washed with warm

sterilized water and 100 cubic centimetres of the same fluid are injected. The liquid remaining in the bladder must be limpid. Indirect cystoscopy is very easy in the female. The whole of the walls and the trigone can be examined. Catheterization of the ureters may be performed if necessary. But before this be done the bladder must be carefully disinfected in order to avoid inflecting the ureters.

In order to compare the function of the two kidneys 2 centimetres of indigo carmine are injected subcutaneously a quarter of an hour before the cystoscopy.

#### *Direct Cystoscopy.*

The field of vision given by Luys' tubes is restricted. In order to have a wide field of vision the patient must be anaesthetized in order that the urethra may be dilated to take a tube of 15 to 20 millimetres in diameter.

Direct cystoscopy must be made on a table which can be tipped up. The bladder is emptied and washed with the patient in the horizontal position. It is then completely emptied. The table is then tipped to an angle of 20 to 25 degrees. The cystoscope tube is provided with an aspirator connecting with an air-pump. In this position the air distends the bladder and exploration is easy. The aspirator removes the few drops of urine which arrive in the bladder and come in contact with the cystoscope. Direct catheterization of the ureters can be accomplished. The instrument is withdrawn by slow degrees and the mucous membrane of the neck of the bladder, where small ulcerations often exist, and the urethral mucous membrane are examined.

#### **Disinfection of Vulva and Vagina.**

The vulva is shaved, the patient takes a bath. Vaginal injections are then given of liqueur Labarraque 1 in 200 or bichloride of mercury 1 in 5,000.

#### OPERATIONS ON THE VULVA.

##### **Traumatic Lesions.**

##### **WOUNDS.**

Repair of wounds from stabbing or cutting instruments call for no particular consideration. Suture is made with Florentine hair or silk. If sphacelation occur, the wound is kept under observation and autoplasty is performed after cicatrization.

##### **Inflammatory Lesions.**

##### **ABSCESS OF THE LABIA.**

Abscess of the labia and canal of Nuck cause considerable inflammatory tumefaction. Mycolysine (by the mouth and subcutaneously) should be administered with the earliest symptoms. Resolution is frequent. If pus collects, it is evacuated by a small incision followed by drainage.

## SUPPURATIVE BARTHOLINITIS.

Mycolysine often causes resolution in suppurative Bartholinitis. If pus collects, the most accessible point is incised. The concomitant vulvo-vaginitis is treated with frequent warm irrigations, using Labarraque's fluid 1 in 200 to 1 in 50.

**Congenital and Acquired Malformations.**

## CONGENITAL MALFORMATIONS.

*Congenital Imperforation of the Vulva.*

This is not a rare malformation. Diagnosis is generally made at puberty. When an imperforate vulva coincides with a normal development of vagina and internal generative organs, the blood from the first periods distends the uterus, since it accumulates in the uterine cavity and vagina. The vulva presents a soft fluctuating bulge, which is violet to transparent light.

Abdominal palpation reveals a voluminous tumour, compression of which increases the bulging of the vulva.

In two of these cases I performed circular excision of the hymen for a diameter of 4 centimetres, reuniting the vulva and vaginal mucous membrane by a fine silk suture. An intra-uterine antiseptic irrigation was also given. The patients were kept in bed for ten days and received six antiseptic injections per twenty-four hours. The administration internally of ergot is excellent to hasten the involution of the uterus. If the inferior part of the vagina is missing it is sought for by dissection of the vaginal cul-de-sac. The index finger placed in the anus serves as a guide. The same technique is observed as for imperforate anus.

Where all perineal intervention is impracticable a laparotomy is performed, followed by removal of the uterus and its adnexa.

## ACQUIRED MALFORMATIONS.

*Cicatricial Bands.*

These malformations generally follow burns. The cicatricial tissues must be totally removed both in surface and in depth. For repair the general principles of antoplasty described in Vol. I. are followed.

**Tumours.**

## BENIGN TUMOURS

*Vegetations.*

Vegetations of small volume, if they resist applications of salicylate of collodion (Crequy), are treated by excision under local anaesthesia.

Each vegetation is seized in forceps and excised with strong scissors.



FIG. 649. —CYST OF LABIA ARISING FROM THE CANAL OF NECK. EXPOSURE OF THE CYST.



FIG. 650. THE SAME. ENUCLEATION OF THE CYST.

Small cutaneous wounds result, which are closed with Florentine hair sutures.

The removal of widespread vegetations causes a gaping wound, which must be clamped by an immediate antoplasty.

*Cyst of the Labia.*

These cysts may be met with occasionally. Figs. 649 and 650 represent one of these cysts in elongated form, which had developed in the vestiges of the peritoneal canal of Nuck.

MALIGNANT TUMOURS

*Cancroid*

Cancroid of the vulva affects at times a vegetating, at others an ulcerous, form. It may involve the whole periphery of the vulva, notably the clitoris. The vegetating form may be mistaken for other affections, especially with condylomata or flat papillomata, which in some individuals attain considerable dimensions.

Vegetations of the vulva in some cases may be mistaken for an epithelioma, being accompanied, as in the latter disease, with a sanious



FIG. 651. —CANCROID OF THE VULVA.

and foetid discharge. The surface is lobulated in the form of a cauliflower and contains deep fissures. A doubt is even more admissible in long-standing cases, since papilloma in this region, as in others, may degenerate into epithelioma.

Where diagnosis is uncertain it can be confirmed by histological examination of a small fragment of the tumour, taken from a suspicious point, preferably the invading zone. This fragment should comprise also a small portion of the skin and subcutaneous tissues.

Histological examination is particularly useful if the inguinal glands are indurated or inflamed. Simple vegetations may be accompanied by



FIG. 652.—THE SAME. PLAN OF INCISIONS TO REMOVE THE TUMOUR.

subacute inflammatory adenopathy, which are not painful, just as ulcerated canceroid may cause acute phlegmon in the neighbouring lymphatic glands.

The ulcerating form may also be confounded with tuberculous or venerian ulcer. But diagnosis offers little difficulty to the experienced eye.



FIG. 653.—THE SAME. ASPECT OF THE SUTURED WOUND.

#### Operation.

The diseased area, washed several times with soap and water, is disinfected with a sublimate solution of 2 per 1,000, followed by formol 2 per cent. in alcohol.

#### CLASSICAL PROCEDURE.

The growth is carefully examined in order to determine its limits. The excision must be much more profound if it be a canceroid than if it be simple vegetations.

*First Stage.*—The tumour is circumscribed by several curved incisions, at a distance of 12-15 millimetres from the invading zone. The bistoury is carried into the subcutaneous layer. If the periphery of the growth is irregular, two V-shaped incisions are added, as in Fig. 655.

*Second Stage.*—The upper angle of the growth is caught in a pair of toothed pressure forceps, and the growth is detached from the deeper structures, the dissection proceeding to as great a distance as may appear necessary. At times a small artery may need ligature.

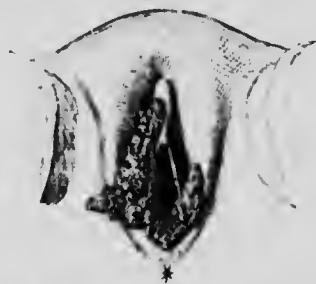


FIG. 654. CANCROID OF THE VULVA WITH IRREGULAR OUTLINE.



FIG. 655. SCHEME OF CUTANEOUS INCISIONS.



FIG. 656. THE SAME. SUTURED WOUND.

*Third Stage.*—Toilet of the wound and suture. The laxity and easy slipping of the skin of the labia and vaginal mucous membrane always enable a satisfactory reunion to take place. Sutures must be superficial and the skin and mucous membrane must be united in a perfect manner without any puckering. Compressive dressing.

#### *Removal of the Sutures.*

The sutures are removed between the fourth and the tenth day. If certain of the points seem to irritate the skin they must be removed on the third day.

The commissural sutures should be removed before the sutures of the central portion, which should be left as long as possible.

#### *Inguinal Adenopathy.*

Should enlarged glands be present in the inguinal or crural region, they must be removed at the same time.

*Treatment by Electrocoagulation.*

Since 1907, in common with all superficial cancers, I prefer electrocoagulation to the cutting instrument for the treatment of this condition. It is quite certain that caneroid of the vulva, when limited in extent and not complicated with glandular invasion, can be cured by a wide extirpation, and I have successfully treated many by this method. But, unfortunately, recurrence is almost always the rule, and if the operation is extensive the cancer cells become reinoculated in the wound. Electrocoagulation, however, is a sure method if employed in time—i.e., when we can operate soon enough to destroy the pathological tissues to their utmost limits.

The general technique of this operation is described in Vol. I., p. 439.

Destruction of caneroid of the vulva by penetrating heat produced by high-frequency currents of low tension is easy, for the lesion is superficial.

The intensity of the current is regulated in order to obtain a result proportionate to the extent and depth of the lesion. A small fragment is removed for microscopical examination, and the rest is scraped away by the curette, as far as the subjacent fibrous tissue. The current is then applied, and the electrode is moved over the whole surface of the wound. The implantation surface becomes blackened very rapidly. The scars are eliminated in two or three weeks. Any remaining disease is immediately recognized. The aspect of cancerous granulations is quite characteristic. An autoplasty may be performed later if it should be necessary.

*Inguinal Glands.*

These are removed at the same operation, and the thermo-electric bath is employed to treat the wound. The temperature employed (60° C.) does not hinder skin union. If this temperature be exceeded a flat dressing must be applied, since there will be partial elimination of the walls of the wound.

## OPERATIONS ON THE URETHRA.

**Traumatic Lesions.**

Wounds of the urethra are easily repaired. Foreign bodies present no difficulties, thanks to modernized methods of exploration such as Luys' Direct Cystoscope, which allows of their removal without difficulty.

**Inflammatory Lesions.**

## GONORRHOEAL URETHRITIS.

The commonest form is acute urethritis. This complaint is often very obstinate. It is treated by discontinuous antiseptic irrigation (see Gonorrhœa in the Male, p. 421). If the infection does not yield after several days of this treatment the urethroscope is employed to discover if small ulcerations are present, which may be cauterized by nitrate of silver or galvano-cautery.



**Congenital and Acquired Malformations.**

**CONGENITAL MALFORMATIONS.**

*Atresia of the Meatus.*

Congenital atresia of the meatus requires spreading and eversion of the mucous membrane, which is sutured to the edges of the vulvar wound.



FIG. 657.—TRANSVERSE INCISION FOR NARROWING THE URINARY MEATUS.



FIG. 658.—THE SAME. LONGITUDINAL SUTURE OF THE INCISION.

**ACQUIRED MALFORMATIONS.**

*Dilated Meatus.*

The female urethra may be so wide as to admit the little finger or even the index finger. This condition may result from a forcible dilatation such as direct cystoscopy. As a rule the urethra shrinks rapidly to its normal calibre after forcible dilatation.



FIG. 659.—PARTIAL RESECTION OF THE MEATUS.

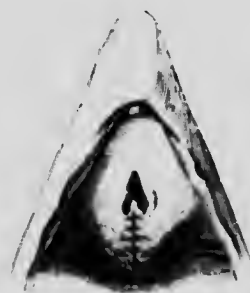


FIG. 660.—LONGITUDINAL SUTURE OF THE WOUND.

**Operation.**

**FIRST METHOD.**

*First Stage.*—A transverse or slightly curved incision is made, 12 to 15 millimetres in length and 2 centimetres in depth below the urethra in the

thickness of the anterior column of the vagina. The urethral wall is detached to a certain height (Fig. 657).

*Second Stage.*—This incision is united by a vertical interrupted suture (Fig. 658).

SECOND METHOD.

*First Stage.*—An elliptical incision is traced either with bistoury or scissors. The long diameter of the incision is antero-posterior, and it comprises the posterior commissure of the urethra and as much as is necessary of the anterior column of the vagina. Hæmostasis (Fig. 659).



FIG. 661.—POLYPUS OF THE URETHRA.



FIG. 662.—THE SAME. TRANSVERSE SUTURE OF THE WOUND OF EXCISION.

*Second Stage.*—Longitudinal reunion of the urethral mucous membrane, using fine catgut. Reunion of the mucous membrane of the vulva with fine silk (Fig. 660).

Tumours.

BENIGN TUMOURS.

*Polypus of the Urethra.*

Polypus of the orifice of the urethra is frequently found in the female. If pedunculated it can be removed by the thermo-cautery. If sessile it must be removed with scissors, and the wound is repaired with fine catgut.

## MALIGNANT TUMOR.

*Epithelioma.*

*Electrocoagulation.*—The sole method of preventing a recurrence is electrocoagulation. The operative details are subordinate to the topography of the lesion. If very extensive a catheter is tied in. When destruction of the growth causes damage which calls for a secondary autoplasty, this autoplasty must be performed six or eight months later, when all chance of recurrence is past.

## OPERATIONS ON THE PERINEUM AND VAGINA.

## TRAUMATIC LESIONS.

*Accidental Wounds.*

These are rare, and may be produced by foreign bodies. They are remedied in the usual way, chiefly by suture.

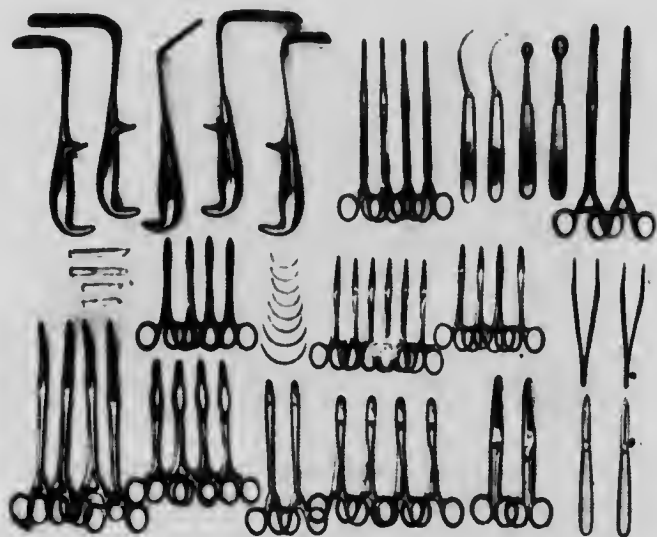


FIG. 661.—INSTRUMENTS FOR OPERATIONS ON THE PERINEUM, ORIFICE, AND WALLS OF THE VAGINA.

- From below upwards and from right to left: 2 bistouries, 2 pairs of strong scissors, 4 Doyen's artery forceps; 2 excentric needle holders (Doyen); 4 ring forceps, 4 long curved forceps.
- 2 dissecting forceps, 4 Champonnière's hæmostatic forceps, 6 oblique-toothed Doyen forceps; 8 open-eyed needles; 4 small forceps (needle holders); 4 glass tube drains.
- 2 long forceps with excentric ringed ends (Doyen's); 2 emettes; 2 Doyen's curved needles (mounted); 4 bullet forceps; 4 Doyen's retractors and 1 (oblique) Collin's retractor.

*Tears of the Perineum.*

Tear of the perineum is a frequent complication of parturition in the primipara. It may occur in the passage of the head or the shoulder. I have frequently seen the perineum torn after difficult vaginal hysterectomies for the removal of large fibromata. The tear should be immediately sutured.

**Operation.**—Toilet of the wound with a non-irritating antiseptic.

*First Stage.*—Suture of the vaginal fissure from behind forwards. This may be continuous, of catgut or interrupted with silk or Florentine hair.



FIG. 664. TEAR OF THE PERINEUM.  
Sagittal section showing the left half of the bleeding surface.



FIG. 665.—THE SAME.  
Showing vaginal and skin sutures.

*Second Stage.*—Suture of the fourchette of perineum. The skin of the fourchette is united with interrupted sutures. The skin of the perineum is then united.

When silkworm gut or Florentine hair are used for the intravaginal sutures the ends are united in a bundle and tied together outside the vulva. The perineal threads are cut short.

Aseptic dressing, vaginal douches. The sutures are removed on the tenth day.

Later perineorrhaphy will be described under acquired malformations.

## INFLAMMATORY LESIONS.

*Vaginitis.*

Acute and chronic vaginitis are treated with hot irrigations, using Labarraque's fluid 1 in 200 to 1 in 50, followed, if there be abundant secretion, by plugging with tarlatan steeped in the same solution.

An examination must be made to ascertain if the inflammation be caused by an infection of the uterine cavity, which should be treated by tincture of iodine, nitrate of silver, Labarraque's fluid, or penetrating heat at 60°. For the latter, a small cylindro-spherical electrode is used which is rapidly brought into contact with the whole of the mucous surface by a to and fro movement.

### Congenital and Acquired Malformations.

#### CONGENITAL MALFORMATIONS.

##### *Vaginismus.*

Vaginismus is a painful and involuntary contraction of the vaginal sphincter.

This symptom is analogous to symptoms of fissure of the anus. Vaginismus is a distressing malady for young women, and often gives rise to hypochondriacal manifestations.

The spasmodic contraction of the sphincter is often most obstinate, and is unrelieved by forcible dilatation, a procedure which is the sovereign remedy for anal fissure.



FIG. 666. VAGINISMUS.  
T-shaped incision to widen the  
fourchette.



FIG. 667. THE SAME.  
Stripping the vaginal mucous and division  
of the vaginal sphincter.

The number of different surgical treatments proposed for the cure of this condition is a witness of their inefficiency—excision of the hymen and the carunculae myrtiformes; section of the internal pudic nerve, subcutaneous section of the vaginal sphincter, etc.

Since no one of these procedures gave any certain hope of a cure with a satisfactory plastic result, I devised the following operation in 1895

The vulva is shaved and disinfected. The left index and the medius are inserted into the rectum and the fourchette is incised transversely for a width of 30 to 40 millimetres.

This incision is made always with one stroke of the bistoury or with several cuts by straight scissors. The anterior edge of the wound is then seized in the teeth of a ring forceps, and the subjacent tissues are stripped up to a depth of about 30 millimetres. This lays bare the sphincter. From the base of this gaping wound the skin of the perineal raphe and the subjacent muscle are freely incised. The right index placed in the wound is used to ascertain if the division of the sphincterian fibres be sufficient, and it completes their rupture if necessary by energetic pressure.

Rennion is made transversely with interrupted stitches. The stripping of the mucous membrane of the posterior column of the vagina allows the centre of the small median flap to be sutured to the most dependent part of



FIG. 668.—THE SAME.

Transverse union of the wound.

the cutaneous vertical incision, whose two lateral borders contribute to the enlargement of the vulvar orifice. Cicatrization is obtained in eight to ten days. The plastic result is most satisfactory, as is shown in Fig. 160, and ectropion of the vaginal mucous membrane never occurs.

**Operation—First Stage.**—Transverse section of the fourchette, encroaching 2 to 3 millimetres on to the skin of the perineum.

**Second Stage.**—The vaginal mucous membrane is seized in a pair of ring forceps and stripped up to a depth of 30 to 40 millimetres.

**Third Stage.**—Vertical section of the skin of the perineum and subjacent muscles to a depth of 10 to 12 millimetres.

**Fourth Stage.**—Transverse suture of the vaginal flap of skin. The small perineal gap is made to disappear. This widens the vaginal orifice.

This operation, performed in a few minutes, cures in a few days the most inveterate cases of vaginismus. It also prepares the vulva for the work of parturition, which is often retarded in primipara by the resistance of the perineum.

#### *Double Vagina.*

When two vaginæ and two cervixes uteri end, either in two uterine bodies or in one bifid uterine body, it is rare that one of the vaginal conduits should not be much more developed than the other.

If atresia of both conduits demands an autoplasty, this operation will consist in transverse section of the median compartment, followed by bilateral union and longitudinal union of the two anterior and posterior mucous membranes, using catgut or No. 2 silk.

#### *Congenital Stenosis of the Vagina.*

When the vagina is reduced to a long and narrow canal, an artificial vagina may have to be formed. Operative technique varies with the case.

#### *Absence of the Vagina.*

Absence of the vagina coincides with atrophy of the uterus, which is reduced to a small muscular cylinder 10 to 12 millimetres in diameter, with a rudimentary cavity.

#### *Creation of an Artificial Vagina.*

1. *Perineal Graft of a Loop of the Small Intestine.*—It is possible that a surgeon be required to create a vagina in a woman suffering from this malformation. A perineal graft of a loop of the small intestine may be attempted in such a case.

This operation may also be attempted in the case of a rudimentary vagina. The new vagina is created in front of the rudimentary vagina, and the operation can be completed later by the operation for double vagina. A laparotomy is first performed and a loop of intestine is sought in the neighbourhood of the ileum, whose mesentery is long enough to allow of its being brought into the pouch of Douglas without dragging. A segment of this loop, 20 centimetres long, is isolated, after double closure of the upper and lower end, above and below by purse-string suture, and the circulation in the intestine is re-established by a lateral anastomosis.

The excluded segment will serve to form a vagina. The vulva is incised and the lower extremity of this segment, ligatured, is drawn down. The ligature is removed and the mucous membrane is sewn to the orifice of the vulva; the segment retains its mesenteric circulation.

**Operation—First Stage.** Longitudinal incision of the vulvar region at the precise point where the orifice of the vagina should exist. At this point there is generally a depression.

**Second Stage.**—Divulsion of the connective tissue of the perineo-rectal space where the new vagina is to be created. If a rudimentary vagina

exist the canal is incised at its lower part and through its entire length, and the tract of the new vagina is prepared by divulsion of strong forceps or hysterectomy scissors.

*Third Stage: Median Laparotomy.*—The loop of the ileum with the longest mesentery is chosen, and a portion 20 centimetres in length is excluded. The *écraseur* is applied above: a ligature is applied in the groove formed by the *écraseur*; a second ligature is applied in the same way 10 millimetres higher. The same manoeuvre is carried out 20 centimetres below. Section is made between each double ligature, care being taken to preserve the integrity of the mesentery. The upper end of the ileum is closed by a double purse-string suture, the lower end also, then the extremity of the intermediary segment, the lower end being ligatured with care to avoid any contamination of the peritoneum. The small inferior stump is burnt with the thermo-cautery.

*Fourth Stage.*—Lateral anastomosis of the two ends of the ileum in order to re-establish the intestinal circulation, and minute repair of the mesenteric breaches.

*Fifth Stage.*—Perforation of the peritoneum in the rectovesical space. The extremity of the intestinal segment is drawn down to the vulva. What appears to be exuberant is resected and the intestinal mucous membrane is sutured to the skin of the vulva.

*Sixth Stage.*—Toilet of the abdomen. Closure of the wound.

2. *Compartmenting the Rectum.*—When the rectum is wide an attempt can be made to detach the whole of its anterior wall to construct a vagina.

The rectal ampulla is often very dilated in the woman, and its circumference may attain 20 to 25 centimetres. This operation requires the longitudinal section of the whole of the rectovaginal septum, including the perineum.

**Operation—Preliminary Stage.**—The rectum is dilated during several days by the repeated application of an oval rubber bag which is filled with air.

*First Stage.*—Division of the rectovaginal septum, including the perineum.

*Second Stage.*—An oval flap is shaped from the anterior wall of the rectum, extensive enough to form the new vagina.

*Third Stage.*—Closure of the new vaginal cul-de-sac and longitudinal union from behind forwards of the mucous segment which will form the vagina.

*Fourth Stage.*—Longitudinal suture from behind forwards of the wound in the anterior wall of the rectum.

*Fifth Stage.*—Reconstruction of the fourchette and repair of the perineum. Drainage of the rectovaginal space.



## ACQUIRED MALFORMATIONS.

*Tear of the Perineum. Perineorrhaphy.*

On several occasions I have united deep tears of the perineum immediately after delivery. The vagina is first sutured, then the skin. Immediate union is the result.

When the tear of the perineum is not immediately united the wound suppurates, and a later antiplastic operation is undertaken.

*First Case: The Tear is Two to Three Weeks Old.*—The wound is granulating or is hardly cicatrized. In this case the whole thickness of the inflamed tissues is resected. The union is then proceeded with as described below.



FIG. 669. OLD TEAR OF THE PERINEUM. OUTLINE OF INCISIONS FOR EXTERPATION OF THE CICATRICAL TISSUE.



FIG. 670. THE VAGINAL SUTURE IS NEARLY FINISHED.

*Second Case: The Wound is Cicatrized.*—Whether the cicatrix is recent or old, it must be totally removed in order to obtain a good union.

The technique, therefore, is the same in the two cases. The whole cicatrix must be removed in order to re-establish the wound as it existed at the moment of the accident. The suture is then applied as in an immediate perineorrhaphy.

**Operation.**—The granulating surface or the cicatrix is circumscribed on the vaginal side by two longitudinal incisions in **A** shape, and on the perineal side by two incisions which start at the inferior extremity of the preceding to unite in **V** in front of the anus.

With forceps and bistoury, or scissors, the whole thickness of the inflamed or cicatricial tissues are removed. The section of the vaginal mucous membrane and of the skin must be very clean.

*Second Stage : Suture of the Vagina.*—The vagina is reduced from behind forward either with interrupted sutures of silk or Florentine hair or a continuous line of No. 2 catgut.

I prefer the catgut suture. The lowest extremity of the continuous suture marks the front of the vaginal commissure.

*Third Stage : Suture of the Fourchette and Perineum.*—The fourchette is united with interrupted silk or hair sutures.



FIG. 671. ASPECT OF THE VAGINAL SUTURES (SUTURES UNITED IN A BUNDLE) AND CUTANEOUS SUTURES.

When the tear is very deep and extensive, and there is much oozing, a glass drain is placed in the perineum, fixed to the skin with a silk thread.

The drain is removed on the fifth, and the sutures after the tenth, day.

#### *Distension and Prolapse of the Vaginal Mucous Membrane.*

Permanent distension and relaxation of the vulvar orifice and vaginal mucous membrane require plastic operation, as in the case of perineal rupture.

This condition of relaxation of the vulvar orifice is manifested at times by prolapse of the bladder, at others by a rectocele, and is often complicated by a considerable descent of the cervix.

We discuss here the repair of the vulva in the case of considerable relaxation of the vaginal orifice, with simple cystocele and rectocele.

The more advanced degrees of genital prolapse, complete or incomplete uterine prolapse, with or without hypertrophy of the cervix, will be studied in the section dealing with operations on the uterus.

The condition of the vaginal mucous membrane in cases of cystocele or rectocele is quite peculiar, and generally there is a notable increase in surface of the vaginal canal.



FIG. 672. ANTERIOR COLPORRHAPHY OF CYSTOCELE AND DISSECTION OF VESICAL FLAPS.



FIG. 673. THE SAME. DIAGRAM SHOWING THE FOLDING OF THE VESICAL MUCOSA AND THE VAGINAL SUTURE.



FIG. 674. THE SAME. SUTURE OF THE VAGINAL MUCOSA WITH CATGUT.

The mucous membrane, which during parturition has been greatly stretched, has lost all its elasticity. It is thick, fibrous in structure, and if it has been exposed on the exterior for a long time, it has a cutaneous aspect. At times in long-standing cases it becomes the seat of callous nodules. Reconstruction of the vagina requires suppression of the exuberant mucous membrane. The outline of the flap to be resected must correspond to the whole extent of the vesical or rectal hernia.

#### *Cystocele. Anterior Colporrhaphy.*

The cystocele sometimes occupies the lowest position of the anterior column of the vagina, which is hypertrophied and bulges outside the vulva; at others the true prolapse of the vesico-vaginal wall is observed.

**Operation** *Preliminary Stage.*—The cervix, which can be easily lowered, since there is always a certain degree of prolapse, is seized by its anterior lip and drawn into the vulva.

*First Stage.*—A  $\nabla$  shaped incision, the point of the  $\nabla$  being forwards, is made, ending in front in the neighbourhood of the urinary meatus; it

circumscribes laterally the extreme limits of the surface to be removed. This incision is traced out with the bistoury.

*Second Stage.*—As soon as the extent of the necessary loss of substance has been marked out, the exuberant mucous membrane is resected. The median and anterior angle of the V is seized in a pair of toothed forceps, and it is detached with the bistoury from the perimetrium tissues, to which it adheres closely.



FIG. 675. ANTERIOR COLPORRHAPHY. RESECTION OF THE MUCOUS FLAP.

The detachment is prolonged on the right and left as far as the vesico-vaginal septum. The flap is then seized in a ring forceps and detached in a few moments from the bladder with the help of the index and middle, covered with a compress—the anterior wall of the vagina as far as the cervix. The vaginal mucous membrane is then detached on the right and

left to the limits of the part which it is intended to remove. The two lateral incisions are then prolonged from before backwards as far as the cervix, care being taken to only cut the mucous membrane to within 5 or 6 millimetres of the angle formed by the vesico-vaginal septum. Two veritable



FIG. 676.—THE SAME. UNION OF THE VAGINAL MUCO'S MEMBRANE BY A CONTINUOUS CATGUT SUTURE.

vaginal flaps are thus obtained, which allow of the application of a solid suture. This solid suture pushes the bladder back towards the pelvic cavity.

*Third Stage.*—Union is made with a continuous suture of No. 2 catgut. Five or six irrigations are given a day, using 1 in 5,000 sublimate until cicatrization is complete.

*Rectocele. Colpoperineorrhaphy.*

The continuation of posterior colporrhaphy with perineorrhaphy is suitable where the perineum, distended in a permanent manner, is slackened, without any true tearing. The exaggerated widening of the vulva takes place at the expense of the perineal fascia, and the reconstruction of the latter is indispensable.

The vulva may be so relaxed that it may be possible to push the whole fist into it, under chloroform, without an effort.

This condition of the vulva is accompanied usually by a certain degree of uterine prolapse, with rectocele and cystocele.



FIG. 677. COLPOPERINEORRHAPHY, COMPLEMENTING AN ANTERIOR COLPORRHAPHY WHERE THE SUTURE IS MADE WITH FLORENTINE HAIR. REMOVAL OF EXCESSIVE MEMBRANE.

The fingers of the left hand gauge the thickness of the rectovaginal wall, which might otherwise be perforated by accident.

The fourchette is situated quite close to the anus. Local examination enables us to ascertain if the teguments are intact, or if they have traces of old cicatrization. It is often advisable to perform anterior colporrhaphy and a colpoperineorrhaphy at the same sitting.

**Operation.**—The left index and medius, covered with a rubber glove, are introduced into the rectum, in order to bulge the fourchette and to stretch the lax teguments (Fig. 677)

**First Stage.**—The fourchette is incised transversely with a bistoury at the junction of the mucous membrane and the skin. This incision must be

prolonged forwards on either side of the vulva in the form of a horseshoe and as high as appears to be necessary in order to obtain a normal vulval orifice.



FIG. 678. THE SAME.  
Showing the vaginal flaps and loss  
of substance.



FIG. 679. END OF THE VAGINAL  
MUCOUS MEMBRANE, HAVING A CURVED  
CONTINUOUS SUTURE.

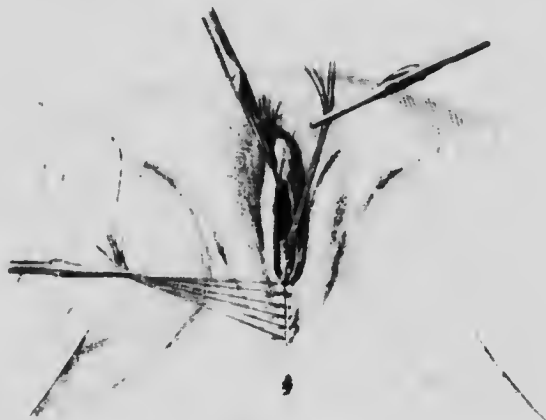


FIG. 680. THE SAME.

The operation is finished. The suture is made with Florentine hair. The anterior and posterior and perineal vaginal sutures are tied together in three distinct bundles.

The ultimate result can be immediately appreciated, for the circumference of the vulva will be reduced, at the completion of the operation, to the extent of the tissues which are left intact above the horseshoe incision.



FIG. 681. COLPOPERINEORRHAPHY. SECTION OF THE FOURCHETTE WITH SCISSORS.



FIG. 682. THE SAME. DISSECTION OF VAGINAL FLAP.





The technique of the incision of the fourchette has lately been modified in the following manner:



FIG. 683. THE SAME. CERVILINEAR INCISION OF THE RIGHT SIDE FLAP.



FIG. 684. THE SAME. INCISION ON THE LEFT SIDE.

The extreme point of the horseshoe incision on the surgeon's left is sought for. A small incision is made with scissors, and one of the blades

of the scissors is introduced in order to detach the skin of the fourchette, which is incised as far as a corresponding point on the opposite side of the vulva.

*Second Stage.*—The central part of the vaginal flap, thus traced out, is seized in a pair of ring forceps and held upwards with the left hand whilst the right index finger follows the detachment. It is generally necessary to free the vaginal flap from its muscular connections by several cuts with the scissors.

As soon as the posterior part of the vaginal flap is detached to a depth of 12 to 15 millimetres, the lax tissues of the rectovaginal septum can be detached towards the deeper parts by means of a compress. This detachment is quite easy as soon as the intervaginorectal cellular tissue is reached.



FIG. 685.—THE FIRST VAGINAL STITCH

The detachment should be prolonged in the form of a **V** pointing backwards as far towards the cervix as may seem to be necessary in order to remove a sufficiency of the vaginal mucous membrane.

*Third Stage.*—The mucous triangle is removed with scissors, following two curved incisions, concave outwards, which leave the vulva at the lateral limits of the first section and unite in a **Λ** at the posterior extremity of the detachment.

As in anterior colporrhaphy, resection of the posterior vaginal flap is practised 5 or 6 millimetres from the angle formed by the mucous flap detached from the perineum and rectovaginal septum. This allows a perfect coaptation and solid suture, by the turning in towards the vagina and joining of these small flaps.

*Fourth Stage: Suture.*—The suture is made in two stages, as in perineorrhaphy. For the vagina interrupted silk or continuous suture in catgut, interrupted sutures for the skin. The vaginal suture ends 4 or 5 millimetres from the new commissure, which becomes the fourchette, and at this point the skin suture is commenced. When the union is completed, the whole line of sutures occupies exactly the middle line, as in perineorrhaphy. In exceptional cases I place two or three deep catgut sutures and a glass drain. After-treatment consists of vaginal injections and a compressive antiseptic dressing on the perineum. The stitches are removed on the eighteenth day.

### Tumours.

#### BENIGN TUMOURS. CYSTS. PAPILLOMA.

The removal of submucous cysts of the orifice or vaginal canals presents no difficulty. Papillomata are removed, together with their point of implantation, and the wound in the mucous membrane is sutured. If the papilloma be extensive it is destroyed by electro-coagulation.

#### MALIGNANT TUMOURS.

##### *Epithelioma.*

Epithelioma of the vagina is not rare. The only operative procedure which can be employed is electro-coagulation. An examination in three or four weeks is made to see if the operation is complete, when any suspicious points are immediately destroyed.

This procedure gives remarkable results in numerous cases where surgery has been hitherto impotent, and where removal by the bistoury has often been followed by recurrence. The inguinal glands are treated in the same way as has been described for epithelioma of the vulva.

#### OPERATIONS ON THE RECTOVAGINAL SEPTUM.

##### Congenital and Acquired Malformations.

##### ACQUIRED MALFORMATIONS.

##### *Tear of the Perineum and Rectovaginal Septum.*

*Complete* rupture of the perineum and rectovaginal septum is an accident which is becoming rarer as obstetric practice is improving. An immediate suture should be attempted if the surgeon is called upon to intervene less than two hours after the rupture. If the wound is infected an autoplasty should not be attempted before the third or fourth month.

Complete rupture of the perineum and rectovaginal septum causes complete incontinence of gas and faeces. It produces a *vaginorectal cloaca*, one of the most painful inconveniences which may afflict a woman. At one time extremely difficult to cure, this lesion is now capable of repair.



FIG. 686.—COMPLETE PERINEAL RUPTURE WITH CICATRICIAL BAND, WHICH WILL BE EXCISED.



FIG. 687.—THE SAME. FRESHENING (VIVIFICATION) BY DOYEN'S METHOD.

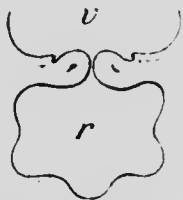


FIG. 688.—SECTION SHOWING THE HERNIA INTO THE VAGINA OF THE RECTAL MUCOUS MEMBRANE.

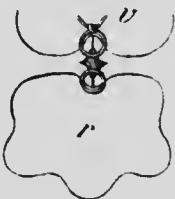


FIG. 689.—SAME SECTION SHOWING SEPARATE SUTURE OF VAGINAL AND RECTAL MUCOUS MEMBRANES.



FIG. 690.—THE RECTUM IS SITUED. SUTURE OF VAGINA AND PERINEUM.

The following description of the operation deals with the most complicated of these cases, represented in Fig. 686.

In this case the tear reached the neighbourhood of the cervix. Irregular cicatrizations are often observed in such cases, also cicatricial bands, which form a bridge between the lateral edges. These bands are formed by contact of the granulating surfaces as the original wound cicatrizes.

**Operation.**—The patient is purged; Constipation is then enforced by the administration of five to ten pills containing 0.01 centigramme of opium, one being administered every hour.

*First Stage.*—The cutaneous cicatrix is circumscribed by two incisions oblique from without inwards, and from before backwards. These incisions start from the region of the labia minora, and end at the anus. They should be made precisely on the line representing the perineal raphe at the moment of rupture. The cicatricial bands have been excised.



FIGS. 691, 692. THE OPERATION IS COMPLETED. FRONTAL AND SAGITTAL SECTION SHOWING SUTURES.

*Second Stage.*—The bimuscular cicatrix is circumscribed by two similar incisions, reaching from the orifice of the vagina to the deep extremity of the tear. The two small triangles thus marked out are cicatricial surfaces. They are removed with scissors and toothed forceps.

*Third Stage.*—The rectovaginal septum is split for the whole length of the loss of tissue, in order to form a mucous flap as full of tissue as possible, which is to form the posterior wall of the vagina; the scissors and toothed dissecting forceps are used for this manœuvre. The mucous membrane of the vagina is then incised as far as 15 or 20 millimetres above the tear in the septum, and the detachment is prolonged to this point, where a good coaptation is necessary. The irregular edges of the rectal fissure are then freshened with two cuts of the scissors, and all is ready for suture.

*Fourth Stage: Suture of the Rectum.*—The mucous membrane of the rectum is united from behind forwards, using No. 3 silk. This silk must be thicker than that which serves for resections of the intestine. This rectal



FIG. 693.—COMPLETE RUPTURE OF THE PERINEUM.



FIG. 694.—THE SAME.

The rectal suture is finished. Placing the first vaginal suture.

continuous suture must be sufficiently tightened to assure a perfect union of the mucous membrane, whose edges are everted towards the rectum.

Below, close to the anus, are placed two or three security sutures of silk (No. 3) or Florentine hair.

The rectum being thus closed, the wound is washed with care and a second cellulo-cellular continuous suture is made, covering the first and excluding it from the field of operation.

*Fifth Stage: Vaginal Suture.*—The vaginal mucous membrane is sutured either in a continuous catgut suture or by interrupted silk or Florentine hair. Care must be taken to bring the lateral mucous surfaces together as widely as possible, especially in the neighbourhood of the cervix. We have already seen that, at the upper part of the tear, the detachment of the recto-vaginal septum has been prolonged to a point 15 or 20 millimetres above the limit of the rectal tear in order to obtain two lateral mucous flaps containing as much tissue as possible. The vaginal suture is made from above downwards.

*Sixth Stage: Suture of the Perineum.*—The perineal raphe is reconstructed in its turn by a series of interrupted sutures.

In this operation interrupted sutures for the vagina are more certain than a continuous suture. As the complete reconstruction of the perineum and recto-vaginal septum is often performed in the case of young women who may have other children, the vulva must be left wide enough. The vaginal sutures may be removed after twelve to fourteen days with the aid of a small oblique retractor.

The rectal suture is left *in situ*. If it be considered advisable to remove this suture it is better to fix the initial thread on a flat button, leaving it long enough to protrude from the anus. About the twentieth day the thread is cut above the button, and the lower end, which has been fixed in the same manner, is drawn upon. It is better to anaesthetize the patient with ethyl chloride for this operation, to avoid unnecessary suffering. Great care must be taken, in removing the rectal thread, not to cause a distension of the line of union, which may rupture by too vigorous manipulation.

The diet during the first eight days following the operation must be as restricted as possible. It is composed exclusively of beef-tea, eggs, white meat, and very small quantities of bread—in a word, of substances easily assimilable, which leave as little residue in the intestine as possible. Should an action of the bowels take place, the lower part of the rectum must be disinfected by irrigations of warm water, to which Labarraque's fluid 1 in 100 is added. Four to six vaginal irrigations are given a day, using Labarraque's fluid at 1 in 100 or perchloride of mercury solution at 1 in 5,000. An antiseptic dressing is applied to the perineum.



## RECTO-VAGINAL FISTULA.

Recto-vaginal fistulæ occur either near the fourchette or near the middle of the vagina; sometimes they are found close to the cervix.

Fistulæ following difficult labour occur the most frequently in the lower two-thirds of the vagina. The aspect varies considerably. Fistulæ near the perineum are usually very narrow, their tract being often 6, 8, and even 15 millimetres in length. They are oblique and irregular.

Fistulæ situated about the middle of the vagina are, on the other hand, wide, and their borders are shaped as if punched out. The recto-vaginal septum is so thin in this region that the circumference of the fistula is reduced to a narrow edge where the vaginal mucous membrane is continuous with that of the rectum. The latter, when the opening is wide, reaching a diameter of 20 millimetres, often bulges into the vagina, giving the appearance of rose-coloured folds radiating from the orifice.

Fistulæ near the uterus are rarely direct fistulæ. They are usually caused by the simultaneous opening into the vagina and rectum of a peri-uterine abscess. The permeability of the intestinal orifice persists, and faecal matter penetrates into the pouch. It is sometimes observed after a hysterectomy.

These fistulæ are rather indirect stercoral fistulæ than true recto-vaginal fistulæ. This distinction is the more exact, as the communication with the intestine, situated very high, rarely permits the same operative procedure as the ordinary recto-vaginal fistula.

It is scarcely necessary to add that the term recto-vaginal fistula applies to a fistula whose surroundings are cicatrized, and which can no longer shrink nor widen. The definition excludes the treatment of recent wounds of the recto-vaginal septum which are not yet cicatrized, as well as cancerous fistulæ which are irreparable, as long as it is impossible to cure the cancer.

1. *Recto-vaginal Fistula close to the Perineum.*

When the fistulous tract is situated near the perineum, it is generally complicated by a more or less extensive tear of the fourchette. However narrow or long it may be, the best method to obtain a cure by operation is to incise it with a cut of the scissors.

The fistula is thus converted into a complete rupture of the perineum and recto-vaginal septum. The wound is treated when the fistulous tract is completely resected by the detachment method just described, followed by suture of the rectum and repair of the vaginal mucous membrane.

**Operation.**—The vivification by detachment, the formation of vaginal flaps, the continuous suture of the rectum, suture of the vagina and perineum, are carried out exactly as has been described in the preceding chapter (complete rupture of the perineum and recto-vaginal septum). This procedure has been successfully employed in several difficult cases.

Cure is all the more rapid since the majority of the sutures unite healthy tissues, section of which has been made during the operation in order to completely remove the walls of the fistulous tract.

2. *Recto-vaginal Fistula about the Centre of the Vagina.*

When the fistula is situated at the thinnest part of the recto-vaginal septum the edges are often very thin, and when the orifice is wide the rectal mucous membrane herniates into the vagina.

The following operation to remedy this infirmity was devised in 1820. The vaginal orifice is circumscribed by a circular incision made in the healthy mucous membrane 1 or 2 millimetres from the edge. Two complementary incisions are then made, longitudinal or transverse, 8 to 10 millimetres in

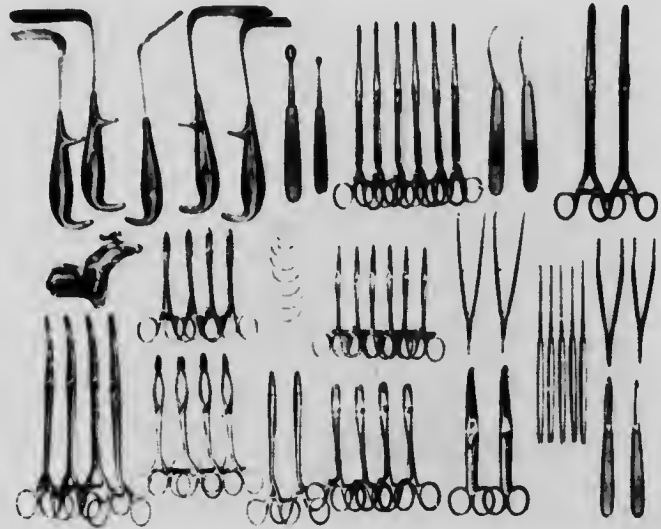


FIG. 695. INSTRUMENTS FOR PLASTIC OPERATIONS ON THE VAGINA AND FOR THE CURE OF VAGINAL FISTULA.

From below upwards and from right to left: 2 bistouries; 2 straight scissors; 4 Doyen's short-nosed forceps; 2 needle-holders; 4 oval-nosed forceps; 4 long curved forceps; 2 dissecting forceps with teeth; 5 angled fistula knives (Doyen); 2 curved dissecting forceps with teeth; 6 Champouinière's forceps; needles; 4 Doyen's needle-holders; Doyen's short speculum.

2 eccentric oval-nosed forceps; 2 mounted needles; 6 bullet forceps; 2 curettes; 4 Doyen's retractors; 1 oblique retractor.

length. These are made to follow the long axis of the fistula if it be oval, or if it be round, in the sense in which the vagina appears to fold best.

The vaginal mucous membrane is detached from the septum, and this detachment is continued, with a flat spatula or curved scissors for the whole circumference of the orifice. This allows two lateral vaginal flaps to be formed, if the incisions are made as in Fig. 697, which are curved in shape and about 6 to 8 millimetres in depth.



FIG. 696. RECTO-VAGINAL FISTULA,  
CENTRE OF VAGINA.



FIG. 697. THE SAME.  
Liberating incision and outline of  
mucous flap.

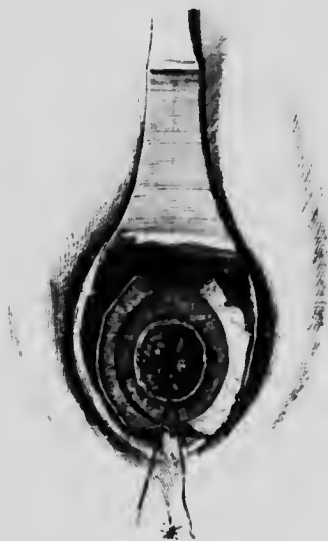


FIG. 698. THE SAME.  
The mucous flaps are dissected. Rectal  
suture (purse-string).



FIG. 699. THE SAME.  
Punctiform closure of the rectum.  
Suture of the vagina.

The orifice in the rectum is then enclosed by a silk suture disposed as a purse-string (Fig. 698); this is drawn tight and knotted in order to close the communication between the vagina and intestine (Fig. 699). The silk suture used for this ligature should be fairly fine (No. 3). The thread must be tightened gradually and with caution in order to assure the contraction of the tissues. The knot must not be tied until the contraction is perfect. A punctiform and hermetic suture is thus obtained. If an attempt be made to tighten and knot the suture in one movement a risk is run of breaking the suture or of obtaining but an incomplete closure of the rectum.

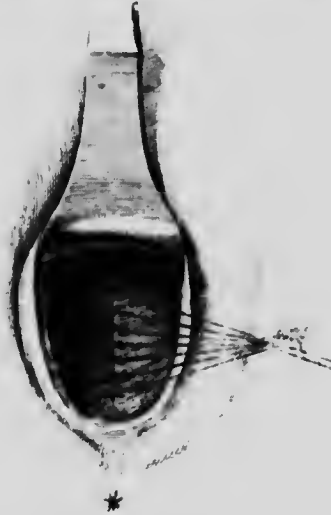


FIG. 700. THE SAME.

The suture is finished. Aspect of the line of union.

The rectal orifice is thus reduced to a simple point, a sort of umbilicus, obliterated by the circular ligature. The first ligature is now excluded by a second purse-string suture which is superimposed on the first and placed on the external wall of the rectum. The wound is washed freely with sterilized water and the small mucous vaginal flaps are sutured, either with interrupted silk or Florentine hair sutures. This is a very sure method, and a rapid cure is the result.

The Florentine hair sutures uniting the vaginal mucous membrane are made to pass in the muscular wall of the rectum should the wound be wide enough. This ensures a more complete coaptation.

The principle of this operation, as shown in Figs. 699 and 700, is (1) to reduce the communication with the rectum to a simple point—i.e., to the possible minimum—in order to minimize, as far as may be, secondary infection of the vaginal suture; and (2) to obtain for the vagina a wide and fresh surface of union.

As we have already seen in Volume I., this procedure is applicable to a large series of analogous cases: vesico-vaginal fistula, uretero-vaginal fistula, intestinal perforation, small umbilical hernie, etc.

**Operator** *—eliminary.*—The patient is purged and is made to take five to ten pills of extract of opium (0.01 centigramme), in order to produce constipation. The anus is forcibly dilated with a Cusco's speculum.

*First Stage.*—Circular incision of the vaginal mucous membrane circumscribing the fistula.

*Second Stage.*—Rectilinear incision, either longitudinal (anterior and posterior) or transverse (left and right), according to whether the approximation of the vaginal walls can be better made from left to right or from before backwards. If the fistula should be elongated in shape, longitudinal incisions are made to the extremities of the large diameter (Fig. 697).

*Third Stage.*—Formation of two mucous vaginal flaps. The detachment should be continued as far as the limit of the liberating incisions (Fig. 698).

*Fourth Stage.*—Double closure of the fistula with a purse-string suture. Care is taken to obtain a perfect closure of the orifice. The second suture must be made with great care in order to fortify without compromising the first suture. The passage of the second suture is easier than that of the first, since the contraction of the rectal wall is already obtained.

*Fifth Stage.*—Linear union of the vaginal mucous membrane with silk or Florentine hair.

After-treatment consists of vaginal injections and opium pills in order to prolong the constipation during several days.

The silk purse-string sutures are left in position. The vaginal sutures are removed about the fifteenth day.

### 3. *Recto-vaginal Fistula in the Neighbourhood of the Uterus.*

Stercoral fistulae whose orifice is situated in the region of the posterior vaginal cul-de-sac are rarely direct fistulae. They nearly always present a more or less winding tract, or they may communicate with the rectum by an adventitious pouch, which represents the remains of a peri-uterine abscess opening into the rectum and, later, into the vagina. The persistence of peri-uterine suppurations opening into the rectum is caused, almost always, by the presence of foreign bodies such as suppurating foetal cyst or dermoid cyst, or by the penetration of faecal matter into the pouch.

The communication may exist in one sense only. If so, the pus flows into the intestine through the intermediary of a very oblique tract, ending in a veritable mucous valve. Spontaneous cure may supervene. But if the communication with the rectum is direct, and the faecal matter penetrates daily, a febrile condition becomes established. In such cases the cavity, being constantly infected, extends over a large part of the pelvic cavity and opens either into the vagina, the bladder, or even on the surface in the neighbourhood of the crural arcade.

Superior recto-vaginal fistulae with a winding tract cause but a small

discharge, often intermittent, of pus and faeces. Gas is better retained than in the case of direct fistula in the middle of the vagina, where they escape entirely by the vulva.

When a pyo-stercoral fistula exists in the posterior cul-de-sac it must be ascertained—

1. If the fistula is direct or indirect, and in the latter case if there is a tract or an intermediary cavity of any importance.
2. If the orifice be in the rectum or at a point higher in the intestine—sigmoid, small intestine, caecum, or appendix.

#### DIRECT FISTULA.

If the fistula be direct, faecal matter escapes, together with gas in variable quantities and little or no pus.

#### INDIRECT FISTULA.

A winding fistula, with a large intermediate pouch, causes a purulent discharge. Faecal matter may be only intermittent in such a case.

Bimanual examination will verify the condition. An indurated mass, which may be of considerable size, can be felt, in a majority of cases, to occupy the region of the fistula. This examination should be repeated under an anaesthetic when the surgeon is about to operate.

#### SITUATION OF THE ORIFICE IN THE INTESTINE.

The frequency or intermittence of the emission of gas by the fistula, the bilious or faecal consistence of the matter which passes, will give some idea of the position of the fistula, whether its position is high or low in the intestinal tube.

The following is the sole infallible test which will determine if the fistula is rectal: The rectum is washed out and a coloured fluid is injected (milk or red wine): at the same time the sigmoid flexure is compressed in the internal iliac fossa. If the liquid appears in the vagina it is certain that the orifice is situated below the sigmoid.

Stercoral fistulae of the posterior vaginal cul-de-sac usually open much too high in the intestine to be reached by the finger, and a rectal examination therefore cannot give any useful indication.

The rectal orifice is sought by direct rectoscopy, which requires a tube 30 to 35 millimetres in diameter.

An examination by radiography may be attempted after injection of milk of bismuth.

**Operative Indications.**—In the case of a fistula of the upper part of the rectum or the lower part of the sigmoid, it is of capital importance to discover if there exist a tract or intermediary pouch. If there be a tract or intermediary pouch, the tract and the intermediary pouch must be removed, and it is quite useless to try to close the vaginal orifice until this extirpation is realized. For cicatrization of the vaginal orifice, if a simple suture be

applied, it will be followed by the formation of a second fistula, following the formation of a new abscess.

The surgeon should be guided by the exigences of each particular case. Two cases will be considered: (1) Where there exists an intermediary tract; (2) where there is a direct fistula.

1. *Where an Intermediary Tract exists.*—The cervix, seized with two-toothed forceps, is drawn down if the posterior adhesions do not prevent this manœuvre. The posterior vaginal cul-de-sac is incised, as described later in the operation of colpotomy. The edges of the fistula are seized in a small-toothed forceps. The mucous membrane around the orifice is incised, the small collar thus prepared is seized anew, and the indurated tissues are removed as completely as possible with scissors.

The removal of the tract and pouch can often be carried out without opening the peritoneum, which is closed above the lesions by numerous adhesions. As soon as this operation is finished the wound is plugged. If the peritoneum be accidentally opened, it must be plugged with care and drained with a wide glass drain. The patient is kept under close observation, and a laparotomy is performed immediately any adverse symptoms appear. Large subcutaneous doses of mycolysine are administered in order to combat infection. In several cases this removal of the suppurating tract and peri-uterine pouch, followed by plugging of the wound, has proved sufficient to close the intestinal orifice. The faecal matter has continued to pass for a while and the wound eventually granulated. In these cases the purulent cavity is the cause of the fistula, and the removal of the indurated tissues is the essential condition for success. It will be noticed that the author does not counsel hysterectomy. The disorders are localized in the pouch of Douglas, and the uterus limits the pyostercoral focus in front. It should, therefore, be left in place, to avoid opening the peritoneum.

The removal of the uterus would expose the patient to the danger of an acute peritonitis, if the perforation of the intestine be extensive, by the opening of the serous membrane in the neighbourhood of the septic focus.

The object of the surgeon is to cure his patient. No unnecessary risk, therefore, must be run and no useless or dangerous manœuvres undertaken.

Our knowledge and experience tells us to operate in two stages, when an operation in two stages is the more sure, and when, as in this case, it suppresses all danger of death.

If a pyostercoral discharge persist after the first operation, the vaginal wound must be carefully examined after several weeks to see if suture is necessary.

The existence of a short tract is of minor importance if the tract is direct and narrow; it will cicatrize, in all probability. If the orifice persist, it is sutured.

2. *The Fistula is Direct.*—This operation is performed by the technique already described for the cure of direct fistula of the central part of the vagina. The liberating incisions made in order to facilitate the detachment of the vaginal flaps are made transversely to the left and right of the orifice. If a

transverse colpotomy has been made beforehand, all that is necessary is to incise the cicatrix on either side to a distance of 12 to 15 millimetres.

The orifice is circumscribed by a circular or oval incision, and, as has already been described in the case of two antero-posterior vaginal flaps, a juxtacervical or even cervical flap is fashioned (Fig. 701). If the fistula be very close to the cervix the whole of its posterior lip is freshened. The detachment of the mucous membrane is continued towards the lateral culs-de-sac, and the posterior flap is fashioned. The fistula is closed either by two purse-string sutures or by a single purse-string suture on which is superimposed a fine silk continuous suture. The cervix is drawn downwards and the two vaginal and vagino-cervical mucous flaps are sutured with interrupted sutures.

#### COMPLEMENTARY VAGINAL HYSTERECTOMY.

The persistence of pelvic pain and peri-uterine pain may call for a later vaginal hysterectomy.

3. *Stercoral Fistulæ of the Vagina after Hysterectomy.*—The presence of a stercoral fistula after hysterectomy may have a double origin: (1) The persistence of an intestinal orifice which communicated before with a peri-uterine encysted abscess, or (2) the wounding or tearing of the intestine during the operation.

(1) A secondary recto-vaginal fistula rarely happens as a result of vaginal hysterectomy for pyosalpinx opening into the rectum or sigmoid if the operation has been properly performed. I have operated on a large number of these cases. If the pouch is detached with care, leaving the intestine, rather than running the risk of tearing the thick and hardened superficial layers of the cavity, cicatrization is rapid.

The obliquity of the passage in the walls of the intestine and its valvular disposition are hardly favourable to the formation of a fistula.

(2) The frequency of tears in the rectum or sigmoid flexure after hysterectomy by removal in morsels is quite sufficient to condemn this method. In Peau and Segond's operation the vagina is encumbered by useless forceps, and the obscurity of the field of operation when the fundus uteri and the adnæxæ are reached exposes the cleverest surgeon to various accidents.

Either the operator leaves the whole or part of the adnæxa in the pelvis, and so fails to obtain a cure, or he complicates his operation by an intestinal tear caused by defective manœuvres, a tear which may cause death by an acute peritonitis.

These tears of the sigmoid in the course of the old operation for the removal of adherent purulent salpingitis, even when not fistulous, were frequent. It is a grave complication if not discovered at the time, for it can cause acute peritonitis. If the intestinal wound is discovered, an immediate laparotomy must be made in order to close the intestinal wound.

**Operation.**—The difficulty of the cure of stercoral fistulæ following total hysterectomy by the vaginal method is caused by the fact that, since



the cervix no longer exists, it is generally impossible to draw the area of operation downwards. The technique is as has been described already.

The outlining and detachment of flaps have to be performed without any support at the summit of the vagina in tissues which give way before the instruments.

The summit of the vagina is stretched as perfectly as possible with two retractors. This allows the two liberating incisions to be made on each side of the fistula. The commissures of these incisions are then seized and drawn downwards by two long-toothed ring forceps; two or more of these forceps are used to seize the mucous folds thus obtained, and a circular incision can then be made round the orifice (Fig. 702). The other stages of the operation—the detachment of the anterior and posterior flaps, the closure of the fistula by purse-string suture, and the suture—have already been described.

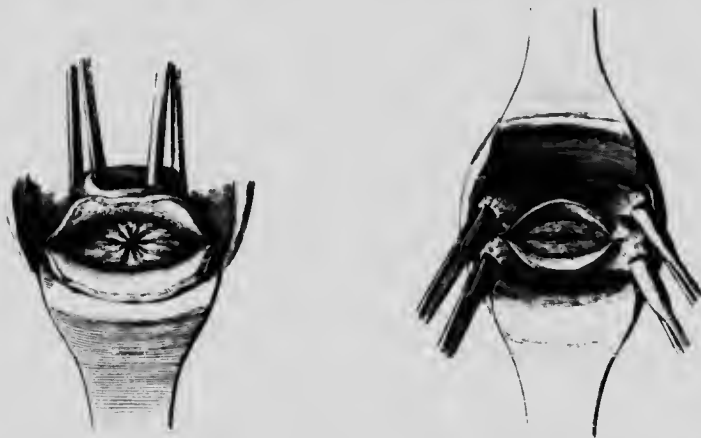


FIG. 701. — Juxtacervical fistula closed by purse-string suture. Outline of the vaginal flaps.

FIG. 702. — The same. Vagino-intestinal fistula following hysterectomy. Outline of flaps.

The application of the suture is very difficult. It can only be achieved by using my model of needle-holder with eccentric grip, which allows the needle to be held in a longitudinal sense.

I have been able to close, not only high recto-vaginal and vagino-sigmoid fistulae by this method, but entero-vaginal narrow and direct fistulae following operations performed by other surgeons.

*Indications for Laparotomy.*—If the operation of a vagino-stercoral fistula should fail, a laparotomy is performed and the intestine is sutured.

As soon as the abdomen is opened the fistulous loop is sought. This stage of the operation may be difficult if there exist numerous pelvic adhesions, and great care must be taken to avoid affecting the peritoneum.

The fistulous loop is detached from its adhesions as far as the perforation. The intestine is then isolated above and below the perforation by Doyen's

elastic intestinal forceps. The contents of the intestine are pressed upwards and downwards from the perforation.

The field of operation is packed with sterilized compresses, and the perforated point is then detached from its adhesions.

The perforated loop, freed from its adhesions, is now drawn outside the abdomen. The surface of the intestine is carefully sponged and washed with Ringer's solution. If the perforation is of small diameter, it is closed by a double purse-string suture. If it be wide, it is closed with a purse-string suture covered by a transverse continuous suture.

Extensive adhesions causing stenosis of the intestine necessitate resection of the involved intestine. The segment which is to be removed is isolated between two elastic forceps.

The resection is made according to the technique already described.

If the bleeding surfaces caused by the tearing of the visceral peritoneum be not very extensive, the segment may be invaginated and an antero-anastomosis is made to re-establish the circulation.

The parieto-vaginal orifice is everted and disinfected. It is then covered in by double sero-serous purse-string suture or a continuous silk suture.

#### CANCER OF THE LOWER PART OF THE RECTUM.

Cancer of the rectal ampulla in the female often invades the recto-vaginal septum.

Removal of the rectum after complete section of the perineum and recto-vaginal septum is invariably followed by a recurrence. These cancers should always be treated by electro-coagulation.

#### *Trans-Perineo-Vaginal Rectotomy.*

Complete section of the perineum and recto-vaginal septum gives a very free and wide access to the rectal ampulla. This operation can be employed to destroy, by electro-coagulation, cancer of the rectal ampulla and recto-vaginal septum. The field of operation is repaired after complete cicatrization and when eight to ten months' observation eliminates any possibility of a recurrence.

#### *Resection of the Upper Segment of the Rectum in the Female.*

This operation was devised and carried out with success in 1897. It was designed to deal with a cancer of the rectum situated at the level of the uterus, and which was felt with great difficulty on rectal examination (p. 703).

The patient was too fat to enable the cancer to be felt by abdominal palpation. No obstruction was present, rendering an artificial anus unnecessary.

The tumour was movable. Ablation of cancerous tumours of the rectum being followed by a long survival in a number of cases led the author to advise removal. The treatment of such tumours by cytolase had not been discovered at this epoch.

**Operation.**—The patient, under anaesthesia, was placed in Trendelenburg's position. The rectum was forcibly dilated.

*First Stage.*—The abdomen was opened, and the small intestine was held back by large sterilized compresses.

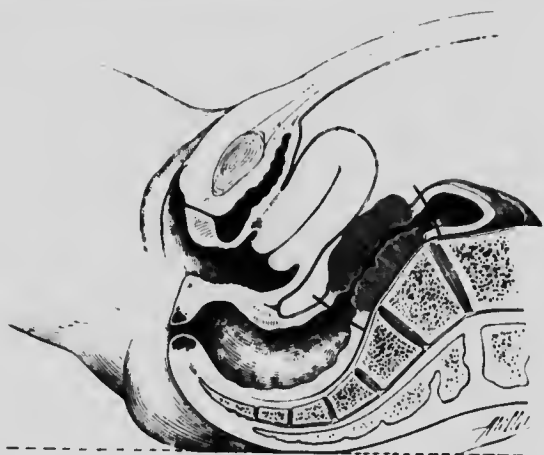


FIG. 703.—CANCER OF THE UPPER PART OF THE RECTUM.

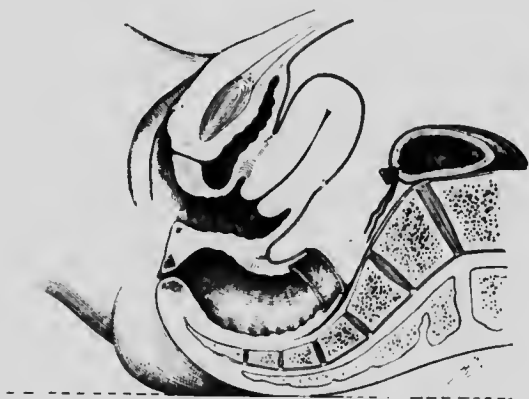


FIG. 704.—THE SAME.

The tumour is removed. Ligature of the sigmoid flexure.

The tumour, which was mobile, extended from the upper part of the rectum to within 2 or 3 centimetres of the pouch of Douglas.

*Second Stage.*—The sigmoid was crushed and ligatured 2 centimetres above the growth, and the rectum was divided below the ligature after

its cavity had been obliterated by a strong curved forceps. The two intestinal extremities were disinfected and wrapped in sterilized compresses. The rectum was then detached from its mesenteric connections and anterior surface of the sacrum, the principal vessels being ligatured separately.

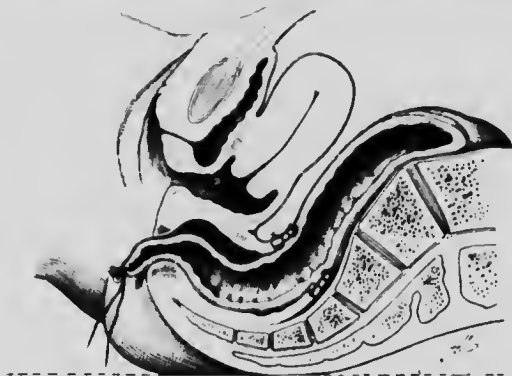


FIG. 705.—THE SAME. SUTURE OF THE SIGMOID FLEXURE TO THE RECTUM.

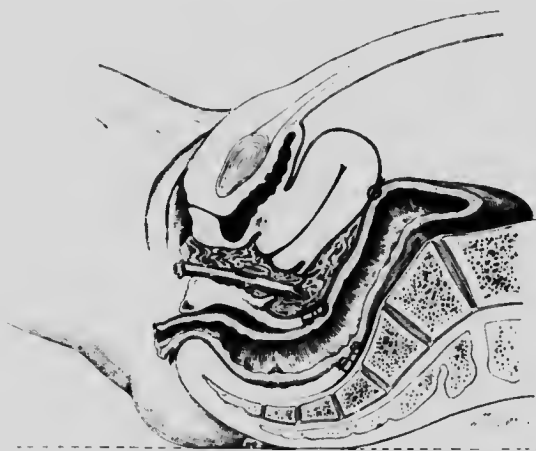


FIG. 706.—CLOSURE OF THE PERITONEUM BEHIND THE UTERUS. PLUGGING DOUGLAS'S POUCH BY THE VAGINA.

The lower end of the rectum was disinfected by antiseptic irrigation by the anus, which had already been forcibly dilated.

The rectum was then divided below the tumour, a strong curved forceps being applied for coprostasis.

*Third Stage.*—After the removal of the tumour it was necessary to unite

the sigmoid to the lower end of the rectum (Fig. 704). The sigmoid was detached from its mesentery for a certain length, and by means of the ligature which closed it was drawn through the lower end of the rectum as far as the anus (Fig. 705). The terminal part of the intestine, deprived of vessels and therefore certain to slough, was thus employed to pass faecal matter for the first few days in order to facilitate the ileo-rectal adhesions.



FIG. 707. UNION OF THE RECTUM TO THE SIGMOID FLEXURE.  
Musculo-serous suture.



FIG. 708.—THE SAME.  
Sero-serous suture.

*Fourth Stage: Enterorrhaphy.*—The rectal mucous membrane was abraded to a height of 2 centimetres, and the muscular wall was united in two layers to the sigmoid, which penetrated the interior of the rectum. The posterior vaginal cul-de-sac was then incised in order to plug the pouch of Douglas.

The operation was completed by the peritonization of the upper outlet, as is practised in the author's operation for panhysterectomy (see below). Recovery was uneventful.

#### OPERATIONS ON THE VESICO-VAGINAL SEPTUM AND ON THE BLADDER.

Operations on the vesico-vaginal septum include operations for stone and closure of urinary fistulæ.

The operation for stone, which is performed by the urethra, is not considered here. It is a defective operation in the sense that it divides the sphincter of the neck of the bladder, and is much more likely to be followed by a durable incontinence than is the incision of the base of the bladder.

Section of the urethra will be specially considered with regard to the removal of calculi at the lower extremity of this canal in the woman.

Cure of vaginal urinary fistulæ includes: (1) Urethro-vaginal fistulæ; (2) vesico-vaginal simple fistula close to the cervix; (3) vesico-uterine fistulæ; (4) vesical and ureteral fistula following vaginal hysterectomy. The vaginal route should be considered to be the best every time it can be adopted.

The lithotomy operation by the hypogastric method is considered as an

exceptional operation, which is to be employed only where a vaginal operation is impracticable.

Disinfection of the bladder is performed several times a day, using warm boric solution, to which Labarraque's fluid (1 in 100) is added (see p. 421).

#### Exploration of the Bladder.

The use of Nitze's prism urethroscope is very easy in the female. Direct cystoscopy can be made with very large tubes—up to 20 millimetres in diameter. The urethra is first dilated under anaesthesia. The patient is placed in the reversed position, and the bladder is examined filled with air.

#### Operations by the Vagina.

##### LITHOTOMY.

Lithotomy by the vagina is very simple.

This operation is applicable to cases of enormous calculi whose consistence is very hard. Cases of this description are occasionally met with where the crushing instrument will hardly dent the surface of the stone. It is also performed in cases of obstinate purulent cystitis when the bladder is totally intolerant.

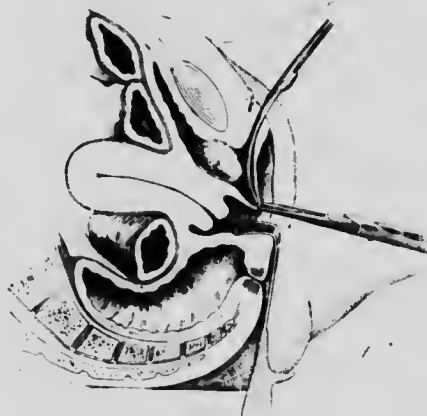


FIG. 709. LITHOTOMY.

The vesico-vaginal septum is pushed to the vulva by a curved forceps.

**Operation—Preliminary Stage.**—The bladder is washed out with boric solution, to which is added 1 in 100 of Labarraque's fluid. Position as for vaginal hysterectomy.

*First Stage.*—A curved forceps is introduced by the urethra.

*Second Stage.*—The nose of the instrument is directed downwards and forwards, and the perineum is depressed by a retractor. By this means

it is easy to cause the portion of the bladder corresponding to the base to present at the vulva (Fig. 709). The branches of the forceps are now separated, and the bladder is incised with bistoury or scissors.

*Third Stage.*—The calculus or calculi are felt for with the index finger, and removed with Doyen's annular forceps.

When this operation is at an end an immediate union can easily be obtained by prolonging on either side the incision. This incision includes the vaginal mucous membrane only. Two antero-posterior mucous flaps can then be detached which are sutured together, the vesical wound being previously closed with a purse-string suture.

#### VAGINAL DRAINAGE OF AN INTOLERANT BLADDER.

In cases of obstinate cystitis, it may become necessary to drain the bladder. A simple puncture of the bladder is made, and a drain is introduced and fixed to the vaginal mucous membrane by Florentine hair. The object of the operation is to assure free evacuation of the bladder for a certain time, and to enable the muscular wall, contracted and in a state of permanent toxicity, to repose and thus to lose its exaggerated sensibility.

*Operation.*—The drain is applied in the following manner: A curved forceps introduced by the urethra is made to bulge the bladder into the vaginal orifice. After incision on the end of the forceps a wide drain pierced with lateral orifices is drawn into the bladder from the vagina: the other end of the drain is held by a hæmostatic forceps. The drain penetrates the bladder, pushing the vesical mucous membrane before it. It is fixed to the vaginal orifice by a suture of Florentine hair. The vaginal end of the drain is furnished with a glass tube to which is fixed a tube conducting the urine into a receptacle, which is placed either in the bed or on the ground, or into a portable receptacle if the patient rises.

The free evacuation of urine immediately abolishes the tenesmus of the bladder and the painful contractions. In ten or fifteen days the tube is removed by cutting the suture, which is easily removed by drawing gently on the end of the drain.

Owing to this method of introducing the rubber drain, which pushes the vesical mucous membrane inwards, the small wound closes spontaneously in a few days, for the mucous membrane plugs the small orifice in the muscular tunic. This simple and harmless intervention has, on several occasions, cured painful, obstinate, and old-standing cases of cystitis.

As soon as the tenesmus has disappeared the bladder should be washed out. These irrigations may be made through a catheter if the patient can use one, or with a simple rubber syringe with a conical cannula of red rubber. The cannula is introduced into the meatus, and the patient fills her bladder with warm boric solution or weak sublimate solution, and evacuates the liquid by micturition. When the bladder is very irritable boric solution alone will be tolerated.

## URETERAL LITHOTOMY.

I have observed several cases of calculi in the lower extremity of the ureter in the woman.

These calculi were removed by the vaginal route. The following description is from personal observation. Two of these cases are remarkable, one for the number, the other for the volume, of the stones removed.

**FIRST OBSERVATION.**—Multiple polyhedral calculi in the right ureter. Vaginal ureterotomy. Recovery.

Madam X., aged twenty-four, complained of acute pain along the tract of the right ureter and at the summit of the vagina. Vaginal examination revealed on the right side a hard cord about the thickness of the little finger. The foreign bodies gave a sensation, which was unmistakable to a surgeon practised in the operation of lithotomy, of calculi of a certain size.

The diagnosis was made quickly, for the calculi were impacted in a cylindrical canal which passed into the upper pelvic outlet and ran towards the hilum of the kidney. Examination of the bladder showed that it contained no foreign body. It was decided to remove the calculi by the vaginal route.

**Operation**—*Preliminary Stage.*—The cervix uteri was seized and drawn downwards with two-toothed forceps.

*First Stage.*—A curved incision was made in the anterior vaginal cul-de-sac. The bladder was pushed as high as possible with the finger, then with a compress.

*Second Stage.*—The index finger explored the region where the calculi had been perceived, and easily reached an unequal cord in which the irregular shape of the calculi could be appreciated.

The ureter was exposed and incised longitudinally at the most accessible point of its prevesical curve. The incision was 10 millimetres in length. By this incision a long curved forceps enabled twenty-four uric acid calculi to be extracted. These calculi were for the most part tetrahedral like biliary calculi (Fig. 710). The forceps had to penetrate to a considerable depth to reach the highest calculus.

The ureter was simply dilated without any trace of microbial infection. No retention of urine had taken place, the irregular shape of the calculi having prevented the obliteration of the vesical orifice of the ureter. The urine was clear, containing neither pus nor mucus.

*Third Stage: Union of the Ureteral Wound.*—The urine was aseptic. Therefore immediate union was indicated.

An instrument was passed through the vaginal wound, and was pushed as far as the bladder in order to dilate the lower orifice of the ureter. A large red-rubber catheter was then passed into the lower segment of the ureter. This was seized in the interior of the bladder by a long forceps, drawn out through the urethra, and fixed to the meatus by a Florentine hair suture. The other end was engaged in the upper extremity of the ureter. A second



catheter was placed in the bladder for purposes of drainage, and fixed beside the first to the meatus with a Florentine hair suture.

The evacuation of the ureter being thus assured, the ureteral wound was closed by a purse-string suture. The two edges of the vaginal wound, which had been strapped up to a certain extent in order to obtain a perfect union, were united with Florentine hair sutures.



FIG. 710.

TWENTY-FOUR POLYHEDRAL CALCULI IN THE RIGHT URETER.

In the centre is shown the large calculus which had formed the urethral suture.

In ten days the patient left the clinique completely cured. A twenty-fifth calculus, which remained in the pelvis of the kidney, was spontaneously evacuated by the meatus several days after the operation. The dilatation of the vesical orifice thus had proved sufficient.

Several months later the patient again came to the clinique complaining

of pain in the bladder. I found a stone occupying the orifice of the ureter which had been operated upon. This was removed by the urethra. The calculus, which was phosphatic, had formed on the ureteral suture. Since this date the patient has remained in perfect health.

**SECOND OBSERVATION.**—Multiple calculi of the pelvis and right ureter. Large pelvic calculus on the left side. Nephrotomy and bilateral vaginal ureterotomy. Recovery.

Madame H. suffered from pyelonephritis and painful cystitis for several years. A small calculus the size of a nut had been evacuated eight years before with renal colic on the left side. Since this the urine became purulent and repeated crises of pyonephrosis occurred, during which the kidney and pelvis formed a voluminous tumour in the left flank. These crises ended in a flow of a large quantity of pus, which was almost pure. In the intervals persistent pain along the tract of the left ureter.



FIG. 711. REMOVAL OF THE LARGE CALCULI FIGURED IN FIG. 710.

On the right side the kidney was voluminous and very sensitive. The patient, emaciated, pale, and feeble, was exceedingly difficult to examine. Examination of the vagina and bladder was, for this reason, negative.

The patient consented to catheterism of the ureters, but the instrument would pass neither on one side nor on the other for more than 10 to 15 millimetres. The cystoscope showed an inflammatory condition of the whole of the base of the bladder.

**Operation—First Stage: Nephrotomy.**—The right kidney was first explored by the lumbar operation.

The pelvis contained a calculus the size of an almond. The kidney was incised on its convex surface, and this calculus was removed. Direct catheterism of the ureter from above downwards. The sound met several calculi, which could also be felt on vaginal examination. The kidney was replaced a compress being placed in the wound on its convex surface to prevent any hemorrhage.

Bimanual examination of the pelvis and exploration of the bladder revealed an enormous calculus on the left side, situated above the lateral vaginal cul-de-sac and evidently in the ureter. On the right side several calculi were also felt.

*Second Stage: Bilateral Vaginal Lithotomy.*—The uterus was detached from the bladder, and the index finger opened up the broad ligament on the



FIG. 712.—LARGE CALCULUS OF THE LOWER EXTREMITY OF THE LEFT URETER  
THREE CALCULI FROM THE RIGHT URETER OF THE SAME PATIENT.

left side. By this means the lower extremity of the calculus was felt very high up. The ureter was exposed and incised longitudinally, and after a small fragment of the lower extremity had been crushed by a first attempt, the whole of the large calculus represented in Fig. 712 was successfully extracted.

No other calculus was found on this side. The right ureter was incised in its turn over the lower calculus; this stone was about the size of a nut.

and was removed by a fine pair of forceps. Several calculi escaped into the depths. As the patient was in a condition of great weakness, the renal and vaginal wounds were then plugged. A smaller calculus was expelled from the right ureter a few days after the operation. Two others were extracted four weeks later from the right ureter during a complementary operation, which was designed to verify the permeability of the two ureters and to suture the right lumbar wound. The renal fistula and the double uretero-vaginal fistula closed spontaneously.

This observation is interesting for the following reasons:

1. The ureter bends in a very obvious manner in the portion which lies in close relation with the uterus when it contains foreign bodies, a fact which renders retrograde catheterization extremely difficult.

2. The flow of urine may remain normal in spite of the existence in the ureter of enormous calculi.

3. If the vesical orifice of the ureter remains freely open longitudinal incisions either on the convex border of the kidney or on the bend of the ureter near the uterus tend to close spontaneously in a short space of time, and call for neither a tied-in catheter nor suture of the canal.

The operative technique for vaginal lithotomy of the ureter to remove calculi at the lower end of the canal can be set forth in the following fashion:

*First Stage.*—Incision of the anterior vaginal cul-de-sac, as in hysterectomy, and detachment of the bladder.

*Second Stage.*—Exploration of the wound. Discovery of the juxta-uterine bend of the ureter.

*Third Stage.*—Longitudinal incision of the ureter on the most accessible calculus, and extraction of the calculi.

It is well to examine at once to see if other calculi exist higher up. For this I have designed a prehensile instrument with a malleable stem, which allows either the renal pelvis to be easily reached from below, or, if the kidney has been incised, to reach and extract calculi from above, even as far as the bladder. A supple probe which can be bent as may be necessary also allows a long bougie to be passed right into the bladder. This can be caught inside the bladder, and serves as a conductor by means of which the vesical orifice of the ureter can be dilated (see Vol. I., p. 196, Fig. 228).

If the vesical orifice be found to be permeable it can be forcibly dilated. The ureteral wound is closed, should it be small, either by a purse-string suture or a fine continuous suture. The suture must not penetrate the interior of the canal of the ureter. In cases such as are under discussion the walls are generally thick, and suture is as easy to perform as an intestinal suture. Closure of the vaginal wound is accomplished either with silk or Florentine hair. If the operation be long and difficult, and if the ureteral wound is difficult of access, the vagina is plugged.

We have seen that vaginal lithotomy can be performed on the two ureters at the same operation, combined with nephrotomy on one side, and without danger. Free flow of urine is the first condition for success in all operations on the urinary apparatus.

Nephrotomy followed by plugging of the renal wound is preferable, for

cleansing the pelvis, to repeated catheterization of the uterus through the bladder. A small catheter can be left in the lumbar wound for two or three weeks, which penetrates the pelvis and which can be used to wash out the ureter twice a day.

#### VAGINAL URINARY FISTULA.

Vaginal urinary fistulæ which require operative treatment are:

1. Fistula following childbirth.
2. Accidental and traumatic fistula such as may be caused by a foreign body.
3. Post-operative fistula.

Cancerous fistula by extension of a neoplasm is generally incurable. The fistula can only be cured after destruction of the pathological tissues by electro-coagulation followed by complete cicatrization.

Progress in the practice of obstetrics has considerably diminished the occurrence of these fistulæ. But gynæcological surgery, and particularly certain defective operative procedures, such as hysterectomy by the piecemeal operation, has created a new category of urinary fistulæ, which may be named post-operative fistulæ. These fistulæ are all the more difficult to cure by a plastic operation, as, the cervix having been removed, the surgeon has lost his chief rallying-point.

The very delicate operation which closes these fistulæ will be described in a special paragraph.

Treatment of vaginal urinary fistula varies according to whether the orifice causes communication with the urether or the bladder, and whether or not the uterus has been removed.

##### 1. *Urethro-vaginal Fistula.*

The internal opening of these fistulæ is situated in front of the neck of the bladder. Urine flows only during micturition.

**Operation.**—The patient is placed in the perineal lithotomy position.

The orifice is circumscribed by a circular incision following the technique already described, and which serves for the closure of all varieties of mucous fistulæ. The two flaps are dissected up either transversely or from before backwards with the object of obtaining the most satisfactory union.

Since these fistulæ are very superficial, the narrow tract may be completely removed before the sutures are placed. The vaginal orifice is then closed with a purse-string suture, and the mucous flaps are closed by interrupted sutures. A cure is obtained the more easily since the flow of urine is intermittent.

A catheter left in position is not indispensable. The patient is catheterized every three or four hours if spontaneous micturition is impossible. Each catheterism must be followed by a free washing with boric solution of the urethra and bladder, followed by complete evacuation of the liquid by means of the catheter.

### 2. Accidental Vesico-vaginal Fistula without Removal of the Uterus.

Two varieties of fistula occur. Either the orifice is close to or far from the cervix uteri.

The distinction between true vesico-vaginal fistula and juxta-cervical fistula is of considerable importance from the operative point of view. Freshening and union are considerably modified in the latter case.

**VESICO-VAGINAL FISTULA FAR FROM THE CERVIX.**—Whether the fistula follows delivery or vaginal lithotomy, the treatment is the same. When the

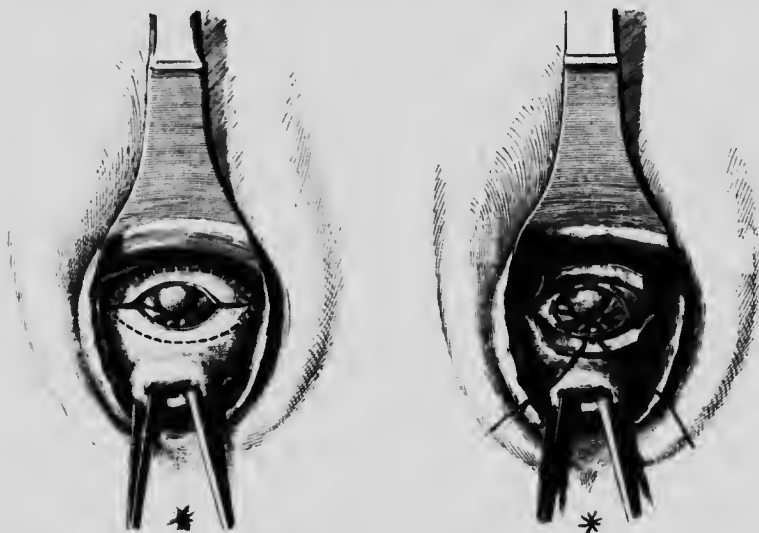


FIG. 713. VESICO-VAGINAL FISTULA. FIG. 714. THE SAME. DISSECTION OF FRESHENING AND LIBERATING INCISIONS. THE FLAPS, AND PURSE-STRING SUTURE.

cervix is normal and separated from the fistula by at least 8 to 10 millimetres of normal mucous membrane, operation offers no difficulty.

**Operation—Preliminary.**—The patient is placed in the lithotomy position.

**First Stage: Freshening and Formation of Mucous Vaginal Flaps.**—The cervix is caught with two-toothed forceps and drawn downwards and backwards. The orifice of the fistula becomes apparent. It is circumscribed using bistoury and dissecting forceps, by a circular or oval incision, which must be made 1 or 2 millimetres from the edge at which the two mucous surfaces join. The two commissures of this first incision are liberated, care being taken to free only the vaginal mucous membrane to a depth of from 8 to 10 millimetres on each side. This double liberating incision is necessary in order to form the mucous flaps (see Fig. 714). The two anterior and posterior vaginal flaps are then detached, either using dissecting forceps and small curved scissors, or with the bistoury, and they are lifted up, one before and one behind the fistulous orifice.

*Second Stage: Purse-String Suture of the Vesico-vaginal Orifice.*—As soon as the two flaps are formed a silk suture is passed around the fistulous

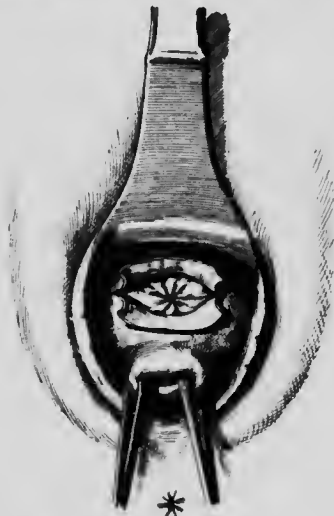


FIG. 715. THE SAME. THE BLADDER IS CLOSED BY THE PURSE-STRING SUTURE.



FIG. 716.—THE SAME. SUTURE OF THE VAGINAL FLAPS.

orifice. This suture must not encroach upon the mucous membrane of the bladder in order to avoid the ulterior formation of a calculus (Fig. 715).

The circumference of the orifice is contracted by progressive traction and the suture is tied. As the first suture may not completely close the



FIG. 717. VESICO-VAGINAL FISTULA CLOSE TO THE CERVIX.



FIG. 718. THE SAME. SAGITTAL SECTION OF THE SAME CASE.

fistula, a second more superficial purse-string suture is applied. A fine silk continuous suture may be substituted. This is left *in situ*.

*Third Stage.*—Suture of the vaginal flaps with interrupted silk or Florentine hair sutures (Fig. 716).

*Duration of the Operation.*—In cases where the cervix is easily drawn down, the author has been able to repair in a quarter of an hour fistulæ of 15 to 20 millimetres in diameter.

A Petzer's catheter is left in position for six to eight days. This is fastened to the meatus by a Florentine hair suture.

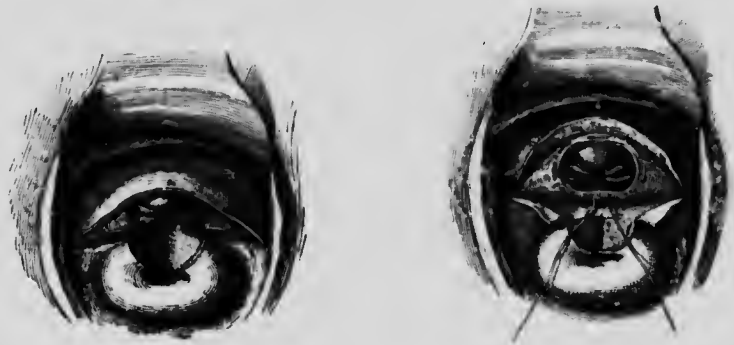


FIG. 719.—FRESHENING OF THE CERVIX AND DETACHMENT OF THE VAGINAL FLAPS.

FIG. 720.—THE SAME. POSITION OF THE FIRST PURSE-STRING SUTURE.

The vaginal sutures are removed on the fifteenth day.

**FISTULA CLOSE TO THE CERVIX.**—Juxtacervical vesico-vaginal fistula nearly always coincides with a tear of the cervix. Every fistula comes into this category when it is close enough to the vaginal insertion of the cervix to call for freshening of the latter.

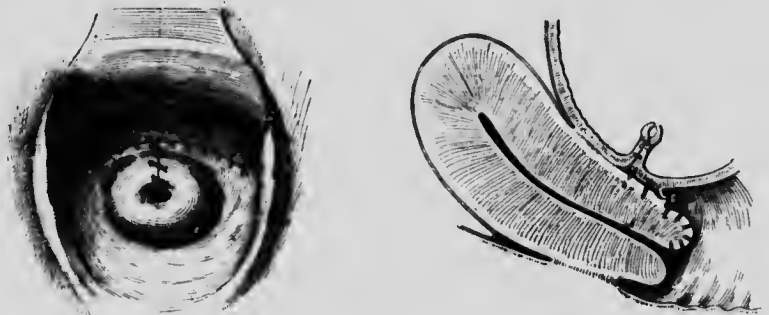


FIG. 721.—THE SAME. SUTURE OF THE CERVIX AND VAGINA.

FIG. 722.—THE SAME. SAGITTAL SECTION, SHOWING SUTURES.

Jobert de Lamballe devised the ingenious method of curing these fistulæ by sliding the cervix which is detached from its vesical connections.

The very extensive local disorders which have caused the fistulæ have often caused at the same time a cicatricial contraction of the vagina, which may render the approach to the orifice very difficult.



It is useful, therefore, in many cases, to prepare for the operation by progressive dilatation of the vagina, which is made during twenty-four to forty-eight hours by an elastic air bladder. The air bladder is stretched with air to the full extent that the patient can bear.

**Operation.**—The operative technique varies according to the shape and relations of the fistula.

*First Stage : Freshening of the Edges and Formation of Flaps.*—Let us take as an example a median juxta-cervical fistula (Fig. 717), complicated by a tear of the cervix. The superior semi-circumference of the fistula is circumscribed by an incision comprising the whole thickness of the vaginal mucous membrane, and this primary incision is prolonged to the right and to the left for a distance of 8 to 10 millimetres on either side. The anterior vaginal flap is then detached.



FIG. 723.—VESICO-UTERINE FISTULA.

The granulating surface of the cervix is then circumscribed by two free incisions which unite behind, and the affected tissues, forming the posterior wall of the fistula, are removed.

*Second Stage : Liberation of the Cervix.*—This is performed as in vaginal hysterectomy by the finger at first on the sides, and then from behind forwards; the bladder is pushed free.

*Third Stage : Closure of the Fistula and Sliding of the Cervix.*—The orifice in the bladder is closed by a double purse-string suture which is reinforced if it be necessary by a continuous suture, and the cervix is drawn downwards and forwards. The wall of the bladder is then fixed to the uterus below the suture of the fistula by one or two separate silk sutures or by a fine silk continuous suture.

*Fourth Stage.*—The vagina is sutured transversely and the cervix is sutured in a longitudinal sense. A vesical Petzer's catheter is tied into the bladder.

### 3. Vesico-uterine Fistula.

If the fistula be situated still higher, and commences directly with the cervical canal of the uterus, the operation is very similar.

The cervix is detached from the bladder to a point beyond the fistula, after transverse incision of the vaginal cul-de-sac.



FIG. 724. VESICO-VAGINAL FISTULA FOLLOWING LITHOTOMY.

Antero-posterior freshening by the author's method. The two anterior and posterior complementary incisions can be distinguished. These serve to form the lateral mucous flaps.



FIG. 725.—THE SAME.

The lateral mucous flaps have been dissected. The bladder is closed by a double purse-string suture.

As soon as the fistula is reached, the anterior peritoneal cul-de-sac is pushed upwards as far as is possible. The circumference of the vesical orifice is then circumscribed, and then closed by a first purse-string suture. A second purse-string suture is superimposed, followed by a continuous fine silk suture if it be judged necessary. The latter suture unites the muscular coats of the bladder.



FIG. 726. THE SAME.

The operation is completed. Union of the vaginal wound with interrupted sutures.

If the peritoneum has been opened, it is closed also by a continuous or purse-string suture. The bladder is then reunited to the uterus and the vaginal wound is closed by a transverse suture.

#### 4. *Post-operative Vesico-vaginal Fistulae.*

Post-operative vesico-vaginal fistulae may occur, as we have already seen, as a result of vaginal lithotomy or of hysterectomy.

Fistulae following vaginal lithotomy are seldom durable and often close spontaneously.

Their disposition is usually a longitudinal crevice or slit. If at the end of three or four weeks a leakage persists, or if there still be an orifice, it can be closed in the same manner as has already been described for fistulae following childbirth.

**FISTULAE FOLLOWING HYSTERECTOMY.**—Operation is more difficult in fistulae following hysterectomy. I may here call attention to the fact that in considerably over a thousand cases of vaginal hysterectomy by the method which the author has devised it has never occurred that either the ureter

or the bladder have been wounded. Many of these cases performed for fibroma or salpingitis were of great difficulty.

In the operation for cancer, however, this accident has sometimes occurred. It is by no means rare to find a cancerous lesion apparently confined to the cervix, and that the anterior vaginal cul-de-sac seems to be free. Under such conditions the detachment of the bladder is commenced under normal conditions. But in pursuing higher the detachment of the bladder towards the anterior peritoneal cul-de-sac, the index finger may suddenly penetrate this organ, whose wall is found to be cancerous.

In cases of this description cancerous degeneration, at first limited to the cervical canal, has deeply invaded the wall of the canal and reached the bladder itself, which, softened and degenerated, yields under the slightest pressure.

The author has always sutured the bladder wound at once in such cases, using silk or Florentine hair. The suture may be left *in situ*. Immediate union was the rule.

In treating of cancer of the cervix, it will be seen that I have abandoned hysterectomy for cancer in favour of thermic electro-coagulation.

To resume the discussion of post-operative fistulæ following hysterectomy for fibromyoma or salpingitis. The same difficulties are met with as in recto-vaginal fistulæ occurring under the same conditions.

The cervix exists no longer, rendering the fistulous orifice very difficult to draw downwards. This difficulty is very often aggravated by the adherence of the cicatrix to the pelvic organs. The cicatrix is also very irregular and is formed of tissues whose exact nature it is impossible to know exactly.

The author has seen a number of these fistulæ following hysterectomy by the piecemeal operation. The operator, who was the victim of a deplorable technique, commenced by removing the cervix. Fragment by fragment he reached the uterine body, perforating the bladder without noticing it. The bladder wall was caught in several forceps, which were left in position. The operation was unfinished. In spite of this mutilation the patient generally survived.

In one case examined about four weeks later an enormous perforation of the bladder was found about the diameter of a five-franc piece. This was divided into two divisions by a transverse band. In front of this band the mucous membrane of the bladder formed a hernia. Behind a hard granular mass represented what had been left of the adnexæ and fundus of the uterus.

The patient demanded relief and was operated on five weeks after the hysterectomy. The vagina was incised transversely on either side of the fistula, as I have described already in discussing stercoral fistulæ following vaginal hysterectomy. The edges of these two sections were caught in long-toothed forceps, and a circular incision was made surrounding the borders of the fistula. The detachment of the anterior and posterior vaginal flaps was a work of extreme delicacy. There was risk of wounding either intestine or the ureters, which were bound up in the cicatricial tissue.

The large orifice was closed with a double purse-string suture, and the anterior and posterior vaginal flaps were united by ten interrupted Florentine hair sutures.

The vaginal suture was nearly 6 centimetres in extent. In spite of the damaged state of the tissues operated upon, which still suppurred at the moment of operation, no leakage of urine occurred until the tenth day, when a dressing applied by a clumsy nurse caused a fresh leakage of urine into the vagina. The catheter was again tied in, and the sutures were removed on the eighteenth day.

The new tract was very narrow. At the end of fifteen days all that remained was a tract about the thickness of a pin, and oblique in direction. This orifice was treated by the author's invariable method. Cure was permanent.

### 5. *Uretero-vaginal Fistula.*

These are hardly ever met with except as a result of vaginal hysterectomy. The operation depends on whether there be a simple wound of the ureter with permeability of the vesical end, or a complete section of the canal which opens directly into the vagina, and has no further relation with the bladder.

1. **LATERAL FISTULA OF THE URETER.**—The peripheral end and the central end of the ureter is catheterized through the vagina. The vesical orifice of the ureter is then dilated to a sufficient extent. A red gum elastic catheter is then introduced into the bladder (as already described in the author's first operation for ureteral lithotomy by the vagina).

This catheter is drawn through the urethra as far as the vulva, and there fixed by a Florentine hair suture. The other end of the catheter, cut to the necessary length, is introduced to a distance of from 10 to 12 centimetres along the central end of the ureter.

The field of operation is then stretched, either by three or four toothed forceps, or by traction on the cervix if it still exists, and two mucous flaps are dissected up. The direction of the incisions for these flaps follows the exigences of each particular case. The further steps are carried out as already described—double deep purse-string suture, reinforcing suture (continuous), and union of the vaginal flaps by interrupted sutures.

2. **URETERO-VAGINAL FISTULA.**—The author has observed a case of complete fistula of the right ureter, following a difficult vaginal hysterectomy for cancer of the body, rendered more difficult by the presence of post-puerperal vaginal bands.

The leakage of urine made its appearance at the end of the first week, when the eschars were separating. It was seen to be intermittent. No trace of coloured injections into the bladder passed into the vagina.

The vaginal cicatrix was so deep and so difficult of access that no operative procedure could be determined beforehand. The introduction of a catheter into the ureteral orifice was impossible even under an anæsthetic unless the wound was opened up. The author decided to refrain from this, and performed the following:

**Operation.**—The patient was anaesthetized and placed in the lithotomy position. The vaginal mucous membrane was stretched by long retractors and forceps. It was incised laterally for a distance of 15 to 20 millimetres on either side of the ureteral orifice.

Mucous flaps were dissected up for a certain distance. A curved forceps was now introduced through the urethra and turned towards the base of the bladder. The external wall of the bladder was then made to bulge facing the ureteral orifice and a wide perforation was made in it. A catheter was then passed through the urethra into the bladder and then into the ureter in order to facilitate the suture.

A purse-string suture arranged to pass around these two orifices enabled their juxtaposition to be perfect. A second, more superficial suture was applied as a measure of security, and the vaginal flaps were united as usual. The vesico-ureteral catheter was then removed. This operation was successful (Fig. 727).

The difficulties experienced in this case seemed to show that the cure of uretero-vaginal fistulae can be obtained almost without exception by the vaginal route.

In this case the uretero-vesicular opening was obtained by the simple juxtaposition of the fistulous ureteral orifice with an artificial orifice in the bladder, and no catheter was left in position.

If a ureteral catheter be left in position to directly empty the renal pelvis, it must be removed after eight to ten days by a brusque traction, the fixing suture to the meatus being previously cut.

#### 6. *Closure of the Vulva in Cases of Incurable Vaginal Urinary Fistula.*

Closure of the vulva has been attempted to cure the incontinence of urine in cases of ureteral or vesico-vaginal fistulae which have resisted other interventions. Closure of the vulva should only be attempted as a last resource.

If the vesico-vaginal orifice is narrow, or if it does not exist, it is a useful preliminary measure to remove the whole of the vesico-vaginal septum, in order that as large a communication as possible be obtained between the bladder and vagina.

As soon as the wound is cicatrized in a satisfactory manner the second operation is proceeded with.

The vulva is obliterated by dissecting the mucous membrane of the canal in a circular manner to a depth of 4 or 5 centimetres, starting from the vaginal orifice. A silk suture in the form of a purse-string is passed around the lower orifice on the raw surface of the free vagina. This is tightened, and the vaginal mucous membrane is pushed into the depths as the suture is tightened. A fine continuous, antero-posterior suture unites the bleeding surfaces in front. The vulva is united with Florentine hair. Two urethral catheters are tied in, one being attached to an evacuating apparatus to ensure emptying the bladder. The other escapes as air enters.

### 7. *Nephrectomy.*

Some women prefer nephrectomy to closure of the vagina. It must never be attempted unless the other kidney is healthy. Lumbar nephrectomy is the preferable operation.

### Operations by the Suprapubic Method.

#### 8. *Suprapubic Lithotomy in the Woman.*

This operation is more rarely performed in women than in men. The general technique is the same.

**CALCAREOUS INCRUSTATION OF THE BLADDER.**—The author has performed the suprapubic operation on a woman in order to enette the vesical mucous membrane, which was inflamed and incrustated with calcareous salts. The bladder was sutured to the skin, and the fistula was closed, after cicatrization and repair of the mucous membrane.

**CURE OF VESICO-VAGINAL AND VESICO-UTERINE FISTULE BY THE HYPOGASTRIC METHOD.**—The hypogastric incision can be employed to close a vesico-vaginal fistula when the vaginal operation has failed.

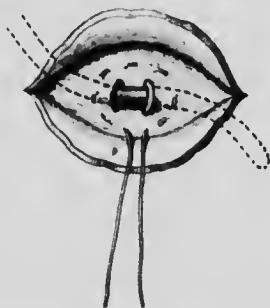


FIG. 727. CURE OF A URETERO-VAGINAL FISTULA FOLLOWING HYSTERECTOMY.

The author is of the opinion that the hypogastric method will become less and less necessary when surgeons become familiar with the rules which he has laid down for the closure of these abnormal orifices by the vagina, which are the tracing out and detachment of two strong and extensive vaginal flaps, "umbilical" closure of the bladder by a double purse-string suture, and union of the vaginal flaps with an interrupted suture.

The hypogastric operation is reserved, therefore, for cases where the fistula cannot be reached by the vagina by reason of the narrowness of the canal, where, for instance, it is stenosed and partially obliterated by cicatricial bands.

The operation is performed as in the male, with the bladder distended. In the woman it is filled with air.

The bladder is exposed by a longitudinal suprapubic incision and lifted by the blunt end of a catheter. It is seized before opening by a toothed

forceps. Two Florentine hair sutures are then passed through its tunics to avoid escape into the depths of the wound. These sutures are held by two hæmostatic forceps. A small perforation is then made in the bladder. This orifice is enlarged by division and the fistula is brought into evidence, either by using two retractors or by Doyen's short-bladed speculum. The fistula is then treated in the usual manner: circular incision of the orifice, lateral liberating incisions (these incisions take in only the mucous membrane), and detachment of two mucous flaps. The deep suture of the vesico-vaginal orifice is of the purse-string variety, and the flaps formed from the mucous membrane of the bladder are sutured either with interrupted sutures in silk, or, which is preferable, with a continuous silk suture, using intestinal silk.

This method has the drawback of exposing the patient to the formation of calculi round the sutures left in the bladder. Thus it is better to perform the intravesical suture with a continuous very fine suture of silk, which can be more easily pulled away with the calculus should a calculus form.

The author has already cited a case of calculus formation (phosphatic) following suture of the ureter by the vagina, one of the sutures having protruded into the canal (p. 574). The patient complained of localized pain. The calculus, which was of small dimension, was discovered on intravesical examination. It was seized by a forceps and pulled away, together with the sutural loop on which it had formed.

#### 9. *Uretero-vaginal Fistula. Uretero-vesical Anastomosis by the Extra-peritoneal Suprapubic Route.*

If every attempt to close a uretero-vaginal fistula by the natural passages fails, an attempt may be made to form an opening between the ureter and bladder by the suprapubic route.

The patient is placed in Trendelenburg's position. The linea alba is incised from the pubis for a distance of 12 to 15 centimetres, and the peritoneum is pushed back by large sterilized compresses. A catheter introduced by the vagina into the ureter brings the course of the canal into evidence.

The pelvic peritoneum is stripped from the lateral wall of the bladder as far as the ureter. The ureter divided across is isolated for a distance of 10 to 12 millimetres. It is ligatured on to a small catheter. This catheter is drawn into the bladder by an orifice made at the most favourable spot by incising on to a ridge made by a long curved forceps. The circumference of the ureter is sutured to the external wall of the bladder, to the interior of which the ligature has been drawn. The pelvic peritoneum is reinforced when necessary to the neighbourhood of this suture by a continuous silk suture.

The field of operation thus isolated from the serous membrane is plugged, as a measure of prudence, by a sterilized gauze mesh, which is removed after forty-eight hours if no leakage of urine has occurred in the angle of the wound.



10. *Accidental Section of the Ureter during Laparotomy. Uretero-vesical Anastomosis by the Peritoneal Route.*

Accidental section of the ureter in the female may occur during the enucleation of tumours from the broad ligament, which may develop below the ureter. The ureter may be ruptured by want of care during the enucleation of the tumour. It may happen that it is mistaken for a fibrous band, and divided between forceps. It will be recognized immediately by the characteristic aspect of the sectioned surface and the thickness of the mucous membrane.

If the section has occurred very high a uretero-ureteral anastomosis may be tried. But, as a rule, the ureter is divided quite close to the bladder, and the narrowness of the canal at this point renders the union of the two ends quite impossible.

Two operations will be described. First, the vesical anastomosis of the ureter, when wounded during a laparotomy for tumour of the broad ligament.

Second, the technique is described for vesical implantation of the ureter to remedy a uretero-vaginal fistula.

These two operations are become rare, since they are designed to remedy the effects of an operation accident which is easily averted by a skilful surgeon.

The author's method of subserous decortication preserves the ureter, which is kept from all risk of being wounded.

11. *Accidental Section of the Ureter during Laparotomy for Tumours of the Broad Ligament. Ureteral or Vesical Implantation of the Upper End.*

**Operation.**—As soon as the accidental section of the ureter is discovered a forceps is placed on the upper end, and the principal stages of the operation are completed. When the tumour is removed and hæmostasis is assured, the ureter is connected with the bladder. In the majority of cases the uterus has been completely removed. If not, it is removed by one of the procedures described later. The vagina is thus widely opened up.

URETERO-VESICAL IMPLANTATION.

*First Stage.*—The ureter is lengthened. This can be done by traction to a certain degree. Care is taken not to tear the peritoneal covering.

*Second Stage.*—The bladder is emptied and disinfected by an assistant. A catheter is placed in the bladder, united to an evacuating apparatus, in order to remove the urine from the opposite ureter. An examination is then made to ascertain if the damaged ureter can be directly anastomosed to the lower end, or if it be necessary to unite it to the bladder by an artificial opening.

**FIRST CASE—DIRECT ANASTOMOSIS OF THE TWO ENDS OF THE URETER.**—The lower end of the ureter is dilated with a grooved sound or with a long thin-nosed forceps, which penetrates into the bladder. It can be dilated

to a diameter of 4 to 5 millimetres. The mucous membrane is then removed to a depth of 15 to 20 millimetres.

The upper end of the ureter is ligatured on to a No. 6 or No. 8 gum catheter. This catheter is introduced into the lower end as far as the bladder, whence it is brought out by the meatus. Following it the upper end of the ureter is drawn through into the bladder, and if possible even outside, the urinary meatus.

*Third Stage.*—Suture of the cellular covering of the lower end to the cellular covering of the upper end. These sutures are made with very fine enterorrhaphy or arteriorrhaphy needles. Three or four series of sutures are made, which are reinforced by uniting the external wall of the bladder to the cellular tissue and peritoneum in relation with the upper end of the wounded ureter.

**SECOND CASE—DIRECT ANASTOMOSIS—THE UPPER END OF THE URETER INTO THE BLADDER.**—If uretero-ureteral anastomosis is impossible, a direct anastomosis of the wounded ureter into the bladder must be performed.

The most favourable point for this anastomosis is determined in the following manner: A long curved forceps with thin blades is introduced by the meatus, and the posterior vesical wall is made to bulge towards the wounded ureter. The point of the bladder which allows of the best distension is quickly found. A small perforation is made through which the forceps seizes the catheter, on to which the upper end of the ureter has been ligatured. This catheter is drawn into the bladder, and thence outside the meatus, and the exterior wall of the bladder is sutured to the external tunic of the ureter. This suture is easy, but must be performed with rigid care. Three superimposed layers of suture are made.

The union of the ureter to the bladder is then fortified by sutures which intersect the peri-urethral cellular tissue and the parietal peritoneum.

*Fourth Stage.*—A compress and three large glass drains are placed in the vagina, and the peritoneum of the pelvis is closed by suture to the sigmoid (see Peritonization).

*Fifth Stage.*—Toilet of the peritoneum. Closure of the abdomen.

The urine from the sutured ureter is collected outside the bladder. Two catheters are placed in the bladder, one with an evacuating pump to remove the urine and the other to allow the air to enter.

During the same operation the author was able to implant both ureters in the bladder. The ureters were divided during the removal of a uterine cancer which had invaded their vesical ends. This double implantation succeeded without the formation of a fistula.

#### OLD-STANDING URETERO-VAGINAL FISTULA. VESICAL ANASTOMOSIS OF THE URETER.

In this case it is impossible to find the lower end of the ureter.

**Operation—Preliminary.**—Introduction of a large catheter by the vagina into the fistulous ureter. Evacuation and disinfection of the bladder

and introduction of a bladder catheter connecting with an evacuating apparatus.

*First Stage.*—Laparotomy in a semi-reclining position; the peritoneum is protected with compresses.

*Second Stage.*—Exposure and dissection of the fistulous ureter, which is brought into evidence by the vaginal catheter. The lower end is seized in forceps and drawn into the wound.

*Third Stage.*—Wide opening of the vagina and removal of the uterus, allowing the bladder to be directly drawn towards the wounded ureter.

*Fourth Stage.*—Vesical implantation of the ureter by the technique which has just been described.

#### VESICO-INTESTINAL FISTULE.

A vesico-intestinal fistula may occur following the opening into intestine and bladder of a suppurating salpingitis. In some cases a large proportion of the intestinal contents may pass by the bladder.

One of these cases under the author's care was cured after two injections of mycolysine. The fistula cicatrized in three weeks, and there was no return. An intestinal constriction below the fistula would cause its recurrence.

*Operation—Preliminary.*—Asepsis and evacuation of the bladder.

*First Stage.*—Laparotomy and discovery of the fistulous loop.

*Second Stage.*—Isolation of the loop as far as the fistulous point. Expression of the intestinal contents and application of coprostatic forceps.

*Third Stage.*—The adhesion is detached, care being taken to avoid contamination of the peritoneum, and the orifice is closed by a double purse-string suture. The orifice in the bladder is closed by the same method.

*Fourth Stage.*—The posterior vaginal cul-de-sac is incised, and drains and a compress are placed in position.

The peritoneum of the upper outlet is closed (see Peritonization).

*Fifth Stage.*—Closure of the abdomen.

#### EXTIRPATION OF THE URINARY RESERVOIR.

##### 1. *Creation of a Vaginal Bladder.*

Total extirpation of the bladder, followed by the creation of a new urinary reservoir at the expense of the vagina, has been realized by Pawlick of Prague.

This operation requires a certain number of successive interventions at intervals of several weeks. The indications are exceptional. It may be described as a very curious surgical experiment.

The following are the steps of the operation:

1. Anastomosis of the ureters with the vagina. The ureters, catheterized with Pawlick's silver catheters, are exposed at the level of the anterior vaginal wall. They are divided close to the bladder and sutured to corresponding incisions in the vaginal wall.

The urethra is divided transversely above the neck of the bladder. The

bladder is disinfected and closed by a continuous suture, and the upper circumference of the neck of the bladder is united to the anterior wall of the vagina.

2. The extirpation of the bladder is performed several weeks later by the hypogastric route.

3. The vulva is closed later by the procedure described above, and two sounds are placed in the urethra, one of which is connected to an evacuating pump.

#### *2. Creation of a Bladder at the Expense of the Cæcum and Appendix.*

This intervention requires three successive operations.

**First Operation—First Stage.**—Right lateral laparotomy.

*Second Stage.*—Exclusion of the cæcum, after division of the ileum at the valve of Bawkin. Closure of the cæcum at this point. Closure of the ileum and ascending colon with a purse-string suture and ileo-colic anastomosis.

*Third Stage.*—Attachment of the upper end of the cæcum and appendix to the skin.

*Fourth Stage.*—Closure of the abdomen.

The appendix and cæcum are disinfected with daily washings of boric solution to which 1 in 100 Labarraque's fluid is added.

**Second Operation—First Stage.**—The upper part of the cæcum is detached from the skin and closed.

*Second Stage.*—Median laparotomy; exposure of the two ureters, which are connected with the cæcum. The uterus is removed and the vagina widely opened up.

*Third Stage.*—Implantation of the appendix in the position of the new urinary meatus.

*Fourth Stage.*—Peritonization of the upper pelvic inlet.

*Fifth Stage.*—Closure of the abdomen.

**Third Operation.**—Removal of the bladder.

### OPERATIONS ON THE CERVIX UTERI.

#### **Stenosis of the Cervix.**

Stricture of the cervical canal of the uterus may occupy the vaginal portion of the cervix or, which is frequent, the upper orifice of the canal. The stenosis of the internal orifice may be sufficiently narrow to prevent the entry of a hystrometer.

Dilatation of the cervix is a simple operation. It can be performed with a lithotome, with a concealed blade, or, which is more simple, with a bistoury. A more frequent procedure is the dilatation with Hegar's graduated metal bougies.

Hysterometry has fallen into disuse. Bimanual examination gives much

more precise information than mensuration of the cavity (which is often inexact) with regard to the position and volume of the uterus.

Hysterometry and the introduction of laminaria tents are far from being inoffensive, and abuse of this method of exploration was frequently followed by grave accidents of pelvic peritonitis, and even death from perforation of the uterus.

Perforation of the uterus is particularly to be feared in cases of accentuated retroversion and anteflexion complicated with chronic congestion and softening of the uterine parenchyma, which allows the instrument to perforate without appreciable effort.

This accident calls for immediate action. The author has intervened in a case of this nature, where the patient already presented signs of peritonitis. The case was one of anteversion. The instrument had pierced the posterior wall of the cervix. It had remained caught in this orifice, and as a result of clumsy manœuvres intended to seize the still accessible portion, it had penetrated the peritoneum.

The operation took place twenty-four hours after the tent had dropped into the peritoneal cavity.

The cervix was tightly closed. Posterior colpotomy allowed 200 grammes of red, odourless serum to escape.

The tent was seized without difficulty with a curved forceps and removed.

After toilet of the peritoneum and plugging, recovery was without incident.

#### PLASTIC OPERATIONS ON THE CERVIX.

The cervix is frequently the seat of local lesions calling for special treatment.

Tears of the cervical orifice occurring during childbirth: hypertrophy of one or both lips of the cervix: ectropion and chronic inflammation of the cervical mucous membrane: habitual congestion of the vaginal cervix, which in some cases resists local treatment—all call for surgical treatment.

Extensive unilateral tear of one of the commissures of the cervix is a cause of repeated abortions. Cervical metritis, at the onset of which inflammatory phenomena are localized to the vaginal portion of the canal and the lips, if not treated in time, soon reach the uterine cavity and parametrium.

Abuse of cauterization and local treatments aggravate these cases, and, far from allaying the condition, so-called medical applications frequently cause the evolution of lymphangitis (peri-uterine) and suppurating salpingitis.

Surgery of the cervix has only entered upon a profitable phase for the patient since the increase in exact knowledge of intraperitoneal peri-uterine conditions—conditions almost unknown to the older gynecologists, and which aggravated ill-considered interventions on the cervix and uterine cavity.

Amputation of the cervix was, in the earlier part of the nineteenth century, a much abused practice. The results of these amputations were all

the more disastrous, since they were performed with the *céruse* or the galvanic loop, as the author observed when he began his medical studies in 1877.



FIG. 728. TEAR AND MEIBITIS OF THE LEFT COMMISSURE OF THE CERVIX.

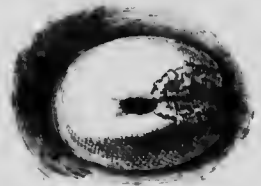


FIG. 729. SUPERFICIAL TEAR OF THE LEFT COMMISSURE.

An extensive wound was produced in the fundus of the vagina which suppurated for several months, ending in a fragile and defective cicatrix, often complicated by stenosis of the cervical orifice.



FIG. 730. THE SAME. OUTLINE OF INCISIONS.



FIG. 731. THE SAME. FRESHENING THE EDGES AND APPLICATION OF INTERRUPTED SUTURES.

Plastic operations on the cervix give good results only when performed with cutting instruments and when an immediate autoplasmic repair can be performed by using flaps formed from healthy neighbouring tissues.



FIG. 732. THE SAME. CONTINUOUS SUTURE. THE FINISHED OPERATION.

This conservative surgery of the uterus is of great value in young women with tears of the cervix or cervical metritis, who are quite infirm and oblige-

to live a life of repose. In cases of this nature the least fatigue brings on pelvic pain.

If the cervix is the real origin of the trouble, an appropriate intervention restores these women to health and strength by causing the muco-purulent flow to cease, and by bringing about a considerable diminution in the volume of the uterus, hitherto congested and inflamed.

Operations on the cervix can be performed with success in the case of women who have originally suffered from peri-uterine inflammation when the peri-uterine lesions have resolved.

Plastic operations on the cervix, however, are contra-indicated in the case of grave bilateral lesions involving the adnexa, where a radical intervention is the sole chance for a recovery.

Plastic operations on the cervix are three in number:

1. Emmet's operation in the case of unilateral tear.
2. Simon's operation, or vaginal amputation of the cervix with two flaps.
3. Schroeder's operation, *i. e.* amputation of the vaginal portion of the cervix with a single flap, and resection of the mucous membrane of the cervical cavity.

#### EMMET'S OPERATION.

In a case of unilateral tear of the cervix the vivification (freshening) should consist, following the principle which guided us in the operation of perineorrhaphy, in an exact reproduction of the primitive wound.

A tear of the cervix is followed by ectropion and suppuration of the bleeding surfaces. There is a tendency to superficial cicatrization, with the result that the limits of the original wound correspond to the limits of the cicatrix of the cervical commissure.

**Operation—First Stage.**—The cicatrix is resected, either with the bistoury or with strong straight scissors. The whole suppurating or cicatricial surface must be removed.

Where a certain degree of ectropion of the cervix exists, resection of the altered mucous membrane is followed to the interior of the cavity of the cervix, care being taken to spare along the opposite commissure a canal, which is gutter-shaped, and of sufficient extent to assure the permeability of the cervix.

As soon as the freshening is finished the loss of substance is cone-shaped, and the two cervical segments are ready when united to exactly reconstitute the cervix as it existed at the moment of the rupture.

**Second Stage: Suture.**—Suture is made with catgut, either interrupted or continuous. The continuous suture is made from the lateral cul-de-sac of the vagina towards the cervical orifice—that is to say, from the deeper part of the field of operation towards the more accessible part. The commissural angle of the freshened surface must be brought together with great care. No puckering of the vaginal mucous membrane must be allowed where it becomes inserted into the cervix.

At the level of the body of the cervix the surfaces in contact are firm,

resistant, and unite perfectly. Coaptation of the external commissure of the cervical canal in cases where the mucous membrane has been deeply resected requires one or two deeper sutures, which are placed on the inner side of the uterine orifice.

The vagina is plugged with an aseptic compress, which is left twenty-four hours in position. Three or four antiseptic irrigations are given per day.

AMPUTATION OF THE CERVIX WITH TWO FLAPS.

Amputation of the cervix by this method is suitable in hypertrophic elongation of the cervix, complicated perhaps by bilateral tear, when the internal cervical mucous membrane is not altered.

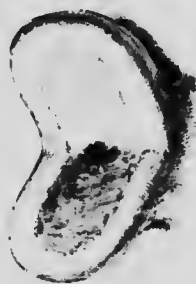


FIG. 733. —BILATERAL TEAR OF THE CERVIX.

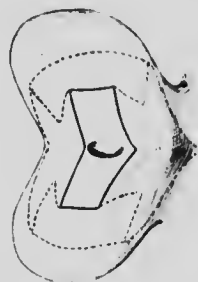


FIG. 734. THE SAME. INCISIONS FOR FRESHENING.

Hypertrophy of the vaginal portion of the cervix may attain 6 or 8 centimetres in length. The hypertrophied cervix may appear at the vulva without true prolapse of the uterus.



FIG. 735. THE SAME. ASPECT OF THE BLEEDING SURFACES.



FIG. 736. CONTINUOUS SUTURE, USING ONE SUTURE.

The cervix in these cases may affect several different aspects. If the commissures are intact it is generally conical. When the tear is bilateral, the hypertrophy may affect one lip or both. Fig. 733 represents a deformity of this nature.



Regular or irregular hypertrophied lengthening of the cervix, whether complicated or not complicated by unilateral or bilateral tear, is treated by amputation by two flaps of one or both exuberant lips.

Vivification should be performed in such a manner as to permit of the reconstruction of the cervix in its normal shape.

We will describe as a type a case of bilateral tear. If we are in the presence of a case of simple conical hypertrophy, the first stage of the operation consists in bilateral cuneiform resection of the commissures of the cervix as far as the vaginal insertion.

**Operation—First Stage: Vivification.**—This comprises amputation of both lips with two flaps and cuneiform resection of the commissures. The line of the incisions is traced in Fig. 734. The double quadrangular surface, limited in front and behind the uterine orifice by a firm line, represents the mucous surface which must be spared for the reconstruction of the lower segment of the cervical canal.



FIG. 737. THE SAME. THE SUTURE IS FINISHED.



FIG. 738. THE SAME. USING TWO SUTURES.

Vivification is performed in four stages: (1) Cuneiform excision of the two commissures; amputation, with two flaps of the anterior, then the posterior lip. The shape of the flaps can be modified before the sutures are placed in order to have perfect coaptation along the whole line of union.

*Suture using a Single Thread.*—The whole suture can be performed with a single thread of catgut, without danger of obliterating the cervical canal, if the tract shown in Figs. 736 and 737 be followed.

The suture is passed and tied at the left commissure: the two lips of the cervix are then sutured, from behind forwards and from without inwards, as far as the cervical orifice. The small flap of mucous membrane is then sutured to the corresponding lip of the cervix. The suture is then directed obliquely in front of the cervical orifice, and passes from its right commissure towards its left commissure to penetrate the anterior lip, where it fixes the small median anterior mucous flap. The suture reaches the right commissure of the cervical orifice, and finishes the coaptation at the level of the right lateral vaginal cul-de-sac.

This technique of suture is very elegant, and spares the cervical canal with certainty.

*Suture using Two Threads.*—The first thread is tied close to the left vaginal cul-de-sac and the external border: the left commissure and the anterior part of the cervix are sutured. When the uterine orifice is reached,

the suture abandons the anterior lip of the cervix and passes to the median part of the posterior lip, to which it attaches the small flap of cervical mucous membrane. The thread is tied at this point. Another thread is



FIG. 739. INTERNAL METRITIS OF THE CERVIX.



FIG. 740. THE SAME. BILATERAL OPENING OF THE CERVIX.

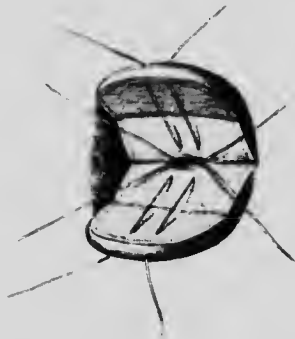


FIG. 741.—THE SAME. VIVIFICATION WITH ONE FLAP.

Sutures placed to reconstruct the cervical canal.



FIG. 742.—THE SAME. ASPECT OF THE CERVICAL FLAPS WHEN THE FIRST SUTURES ARE TIED.



FIG. 743.—THE SAME. BILATERAL VIVIFICATION AND RECONSTRUCTION OF THE CERVICAL COMMISSURES.

disposed in the same fashion from the right commissure of the cervical incision, ending in a symmetrical suture of the flap of cervical mucous membrane corresponding to the anterior lip of the cervix (Fig. 738).

## AMPUTATION OF THE CERVIX WITH A SINGLE FLAP.

Amputation of the vaginal portion of the cervix with a single flap or Schroeder's operation, is designed to cure one of the most obstinate forms of metritis of the cervix—namely, catarrhal, necrotic, and follicular metritis with integrity of the external mucous envelope.

The aspect of the cervix varies according to whether there be unilateral or bilateral tear, or whether there exist an ectropion of the inflamed mucous membrane.

**Operation—First Stage: Virification.**—If the two commissures are intact they are incised as far as the vaginal mucous membrane. The altered surface is then brought into evidence. The lower lip, then the upper lip, are resected successively, the flaps being shaped either from below upwards or by transfixion, following the outlines in Fig. 740. The healthy external mucous membrane of the cervix is thus preserved, and the mucous membrane of the cervix which is altered is resected to a considerable height. The two small flaps are detached as high as possible by a transverse section perpendicular to the axis of the cervical canal.

**Second Stage: Suture.**—Repair is accomplished by turning the two exterior flaps towards the cervical canal (Fig. 742). These two flaps are sutured at first in the middle line, the mucous membrane being united to the mucous membrane of the anterior and posterior flaps in front of and behind the new cervical orifice.

The exuberant tissues are removed in the neighbourhood of the two commissures, and union is proceeded with (Fig. 743). The cervix is thus reconstructed in its normal configuration.

## SUPRAVAGINAL AMPUTATION OF THE CERVIX.

Supravaginal amputation of the cervix is entirely abandoned. It would be performed if some exceptional indication presented itself after circular incision of the vaginal cul-de-sac and detachment of the bladder (see Vaginal Hysterectomy).

## CURETTING.

Curetting the uterus has been much abused by some gynaecologists, who mention it to their patients as a major operation.

Curetting, indeed, is not always an inoffensive operation. In the same manner as hysterometry, which is practised by some gynaecologists without conscience on every woman offering herself for examination, this operation can cause abortion at the commencement of an unsuspected pregnancy. The indications for curetting are restricted almost exclusively to cases of typical metritis in young women following abortion or an attack of gonorrhœa. Curetting in such cases must be practised with restraint, and is followed by the disinfection of the cavity of the uterus with tincture of

iodine or with a mesh soaked with pure Labarraque's fluid, which is left in position for twenty-four hours.

Curetting thus performed is followed by cure, and pregnancy may occur after three or four months. If, however, pelvic pain and salpingitis are present, curetting is quite useless, as it will provoke a renewal of the inflammatory phenomena. In such cases it is preferable to tampon the vagina with a glycerinated tampon of iodoform. Mycolysine is administered at the same time by injection and by the mouth. This helps to remove the congestion of the uterus and the adnexa, and facilitates the destruction of the infecting microbes.

In mild cases an attempt may be made to cure the condition by the application of silver nitrate, which is introduced towards the fundus uteri on a grooved sound.



FIG. 744. TOTAL UTERINE STENOSIS AND PYOMETRA FOLLOWING CAUTERIZATION WITH CHLORIDE OF ZINC.



FIG. 745. STENOSIS OF THE CERVIX FOLLOWING THREE SUCCESSIVE CURETTINGS.

A small quantity of melted nitrate of silver in the cavity of the uterus destroys the microbes and assists cicatrization. The application is inoffensive. But the same cannot be said with regard to the chloride of zinc. An immoderate use has been made of it in the form of Canquoin's paste. Canquoin's paste in the uterine cavity is very dangerous. It may cause grave disorders and even death following perforation of the uterus causing acute peritonitis.

In 1896 the author removed a very painful uterus which had been treated with Canquoin's paste. A bilateral purulent salpingitis was present. Examination of the parts removed showed that the cervical canal had been completely obliterated by cicatrization, whilst the cavity of the body was

irregular, deprived of all mucous covering, and filled with foetid pus. The operation was followed by complete cure of all the painful symptoms.

In connection with the lesions produced by chloride of zinc (Fig. 744), it is useful to compare a figure (Fig. 745) showing cicatricial stenosis of the isthmus of the cervical canal following three successive curettings. At the level of the stenosis no trace of mucous membrane existed. This triple intervention only resulted in aggravating the patient's suffering, and caused several attacks of pelvic peritonitis.

Hysterectomy was performed in the presence of Professor Simpson of Edinburgh, who examined the parts removed. Curetting had destroyed the mucous membrane of the isthmus on three separate occasions, without reaching the body of the uterus, where the mucous lining was found to be intact. The cicatricial stricture was 20 millimetres in length.



FIG. 746. VASCULAR VEGETATIONS OF THE UTERINE MUCOUS MEMBRANES.

Curetting has been practised often in cases of repeated hæmorrhage. It is useful to note in this connection that grave lesions of the adnexæ often produce obstinate metrorrhagia, for which curetting is impotent. These reflex uterine hæmorrhages are provoked by lesions of the adnexæ, and require vaginal hysterectomy.

I insist upon the reflex nature of metrorrhagia due to diseases of the adnexæ because their true origin is so frequently unrecognized.

Many practitioners have abused the operation of curetting by employing it during the early months of a developing cancer of the uterine mucosa. The results are deplorable: the curette in its blind work creates gaps and loss of substance where the neoplasm propagates immediately.

Cancer of the uterine cavity should be treated by electro-coagulation.

Curetting is also a failure in the treatment of benign vascular papillomata of the fundus. I have observed a case of this kind in a young woman of eighteen who suffered from repeated metrorrhagia. The hæmorrhages were so abundant that the patient's life was in danger. The first curetting, which brought away a mass of mucous debris, only gave transitory relief; a second attempt was also inefficacious, although canterization of the uterine cavity was employed as a complementary measure.

The hemorrhages continued, and the patient became more and more feeble. Gradually pelvic pain became established, and the signs of double purulent salpingitis supervened. Another grave hemorrhage occurred which was more obstinate than those preceding.

The patient was brought to the clinic in almost a dying condition. A vaginal hysterectomy was performed on the same day, the adnexa being removed at the same time. The tubes were enormous and full of pus. The uterus, which is shown in Fig. 746, contained at the end of the cavity a cluster of vascular loops 3 to 4 centimetres in length, which, destroyed by curetting, became reproduced in a few weeks.

The hysterectomy was followed by complete recovery. This rare case corresponds to what was described in former times as "vascular polyp of the uterus."

In order to condemn further, if possible, the abuse of curetting, I will mention the deplorable results which follow this operation when performed by accoucheurs in puerperal infection. The use of the curette is very dangerous in puerperal infection, for the placental fragments are usually very adherent and the curette wounds the internal surface of the uterus in a variable degree.

Inconsiderate curetting thus aggravates the danger and hastens the evolution of fatal complications, which can only be prevented by continuous irrigation and the free use of massive doses of mycolysine injections.

The curette should be absolutely forbidden in the extraction of the debris of delivery.

This operation is performed with Doyen's gonge forceps, which evacuate the cavity without wounding the mucous membrane (Vol. I., p. 196 Fig. 228).

The use of these forceps often allows the debris to be extracted in one piece. The operation is thus greatly shortened and becomes inoffensive.

**Operative Technique of Curetting.**—Curetting instruments consist of two or three long-stemmed curettes, some round, others oval. The curettes are the same as are used in general surgery, and differ from them only in the length of their stem.

The cervix is first dilated with Hegar's bougies. The commissures of the cervix are then seized with two-toothed forceps. The curette is introduced into the cavity of the uterus, and the posterior wall, the anterior wall, the fundus, the lateral walls, and the cornua, are methodically scraped in turn.

It has already been pointed out how difficult it is to curette the whole of the uterine cavity. Certain gynecologists are therefore in error who claim to open up the ends of tubes full of pus by means of curetting. Such a procedure would risk perforation of the uterus, whose walls are thin and fragile in the neighbourhood of the cornua in cases of old infective metritis.

The cavity of the uterus after action of the curette is swabbed with a sterilized gauze mesh. It is then cauterized by means of another mesh soaked in pure Labarraque's fluid. The patient must remain in bed for eight to ten days. Antiseptic vaginal irrigations with 1 in 5,000 sublimate solution are made daily.

When the patient rises, a tampon formed of a sterilized compress is placed in position to sustain the cervix. The stretching of the uterine ligaments produced by traction on the cervix may become the source of pelvic neuralgia or a permanent lowering.

The patient continues the use of the tampon for a certain time, using a gauze mesh which is glycerinated and sterilized. This she introduces into the vagina every morning after an antiseptic irrigation and before she adopts the erect posture.

Thanks to these precautions the author has observed pregnancy to occur several months after ennetting in young women who have suffered from leucorrhœa from the commencement of marriage and who had considered themselves sterile.

The use of mycolysine by injection and by the mouth expedites the cure.

#### **Forepressure of the Cervix in Cases of Obstinate Hæmorrhage.**

The following device was adopted for a case of grave uterine hæmorrhage following abortion:

The vagina was dilated by a speculum (unilateral articulation) and two Museaux rack forceps were applied to the cervix. These forceps were left in position during forty-eight hours. Since this the author has applied forepressure to the cervix in every analogous case.

The anaemia is treated in the usual way: injection of artificial serum, elastic bandages to the legs, etc. Forepressure of the cervix is the sole means of immediately stopping the bleeding. The cavity of the uterus which is not dilatable in such cases is filled with clot, and the vessels become obliterated.

#### **OPERATIONS TO REMEDY DISPLACEMENTS AND DEVIATIONS OF THE UTERUS.**

Displacements and deviations of the uterus are frequent, and occur chiefly after repeated pregnancies. Forward displacements often appear in relation with symptoms of metritis, which occurs either spontaneously or under the influence of fatigue or local irritation in virgins. Operative cure of displacements and deviations can be attempted either by laparotomy or by the vagina.

Anteversio and ante-flexio more rarely require operation than do retroversion and prolapse. Retroversion and retroflexion are often indolent. Many women, without their knowing it, have the uterus curved forwards towards the symphysis; on the other hand, persons of a certain age may have the uterus retroverted into the pouch of Douglas who have never suffered. In some cases the deformity may be exaggerated to such a point that the uterus bulges into the vagina, while the cervix, hidden by a fold in the anterior cul-de-sac of the vagina, is so inaccessible in the dorsal position that only the posterior lip can be reached. These women

may never have suffered any other inconvenience than sterility from this unnatural position of the uterus. Sterility is the rule in such cases.

Why is retroversion so easily tolerated by some women, while in others, free from any peritoneal or adnexial lesion, it may cause intolerable suffering? Pain makes its appearance in relation with a local infectious state.

The painful phenomena from which women suffer who are afflicted with uterine retroversion are nearly always related to vascular troubles, and these disorders are evidently dependent on an obstacle to the venous circulation. The retroverted and painful uterus is very large and violet in colour. The parenchyma is softened and tears during hysterectomy, under the action of the toothed forceps.

Retroversion is generally acquired, following abortion or childbirth in women who are not properly looked after, and who resume the upright position before the uterus and ligaments return to their normal situation.

*Post-partum* retroversion, if taken in time, can be reduced by methodical dilatation of the cervix and temporary fixation of the organ by a metal pessary or pliable stem. Should a fresh pregnancy occur, the after-care consists in establishing a treatment which lasts until the complete involution of the organ.

Grave prolapse, with slackening or tear of the perineum, cystocele or rectocele, and total prolapse, are beyond the reach of palliative gynaecology: these acquired malformations call for surgical intervention.

Retroversion and prolapse are generally accompanied by diverse lesions, such as cervical metritis, tear or hypertrophic elongation of the cervix, cystocele, rectocele, and even fistula (vesical or rectal).

The author has seen, in an old woman suffering from complete prolapse, a calculus like a bunch of nuts. This was removed by the vagina by Champonnière in 1883.

The concomitant lesions of uterine prolapse and retroversion require appropriate operations, which for the most part have already been described.

This chapter will be confined to conservative operations on the uterus itself, in order to rectify the displacements.

Vaginal hysterectomy is a measure which is cited here only to be described later. The indications for this operation alone have place here. It will be seen that it is the sole resource in cases of deviation and displacement of the uterus, complicated with grave conditions which resist all conservative measures.

The operations devised to remedy displacements and deviations of the uterus are the following:

1. Abdominal hysteropexy.
2. Vaginal replacement of the uterus.
3. Alexander's operation.

The first of these operations may be suitable for anteversion, simple prolapse, or retroversion. Vaginal replacement of the uterus may be practised in cases of retro- or ante-flexion.



Alexander's operation, when combined with vaginal replacement of the uterus, is suitable for retroversion and retroflexion, also for cases of slight prolapse.

**Abdominal Hysteropexy.**

This operation fixes the uterus as high as possible to the anterior abdominal wall.

A suprapubic incision 5 to 6 centimetres in length will suffice. Traction is made on the fundus of the organ, which is then raised with a ring forceps or silk loop, and three silk sutures are passed through its anterior wall to a depth of several millimetres.

The lower extremity of the incision is closed by two or three interrupted silk sutures, taking in the peritoneum and the aponeurosis. The uterine sutures are passed in turn in such a way as to strongly fix the organ: in the

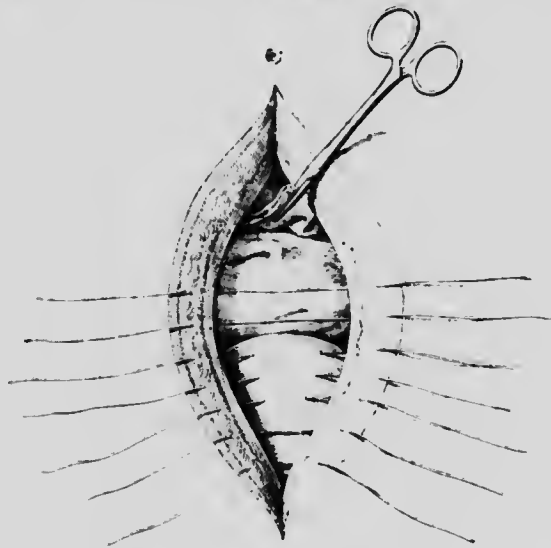


FIG. 747. ABDOMINAL HYSTEROPEXY.

The sutures, the third, fourth, and fifth of which are passed through the uterus.

peritoneum, then in the linea alba, and they are then tied as the first. As soon as the deep suture is terminated the skin is closed with metal clips. The silk sutures become encysted.

The efficacy of this method has been proved in cases operated on as long ago as ten years. Abdominal hysteropexy, however, is not to be recommended in cases of retroversion nor in prolapse, for it is observed, even where the suture has been very highly placed, that it dragged upon the bladder and raised but to a small degree the cervix. The cervix is drawn behind the pubis, and on examination is found close to the anterior com-

missure of the vagina. These conditions were reported on at the International Congress of Gynecology at Brussels in 1892.

The ulterior result of abdominal hysteropexy is, therefore, far from being as satisfactory as was thought. Hysteropexy, therefore, must be placed amongst the category of rare operations. It can be performed after ovariectomy in cases of simple prolapse or painful retroversion. The same operation performed after tubo-ovarian castration gives bad results. The patient continues to suffer, and often suffers from reflex nervous troubles, which later on call for vaginal hysterectomy.

The author on three occasions has had to perform a vaginal hysterectomy after this operation. The silk sutures in the linea alba caused great resistance. In one of the cases the sutures had to be cut after they had been brought to the fundus of the vagina by energetic traction on the body of the uterus.

#### Vaginal Replacement of the Uterus.

In 1896 I devised the following operation, which gives excellent results. It can be applied in cases of simple painful retroflexion, also in cases of retroflexion complicated with retroversion and slight prolapse. Replacement of the uterus is performed by the vaginal route, acting on the organ itself and on the edges of the broad ligament, without taking any fixed point from the vaginal mucous membrane.



FIG. 748. UTERUS IN RETROFLEXION. LENGTHENING OF THE ANTERIOR WALL. *a* TO *b*.



FIG. 749. UTERUS REPLACED BY BRINGING THE POINTS *a* AND *b* TOGETHER.

It will be seen that this method may be applied either to deviations or displacements backwards or forwards, according to whether the anterior or posterior wall of the uterus is concerned in the operation.

The operation is based upon the observation that in the permanent flexion of the uterus the convex wall of the organ distends in a considerable sense, having regard to its length (Fig. 748).

Let us consider a fresh pregnancy, followed by normal involution. If the uterus become re-established, in its normal situation of slight anteversion it will appear not as in Fig. 748, but as in Fig. 749. If we measure in the two figures the anterior wall from the cervix to the fundus (represented by

the thick line in the figure), we find that this line is too long by a distance *a* to *b*.

All that is necessary is to bring the point *a* to the point *b* by an appropriate suture. The suture takes in only the superficial layers, and the organ is immediately brought into a normal position. This causes no kink in the cervical canal, an inconvenience which occurs after incision and deep resection of the anterior uterine wall. The same method applied to either the anterior or posterior wall is applicable either to anteversion or retroversion.

Replacement of a retroverted uterus is performed much more often than that of an anteverted uterus, which is rarely painful.

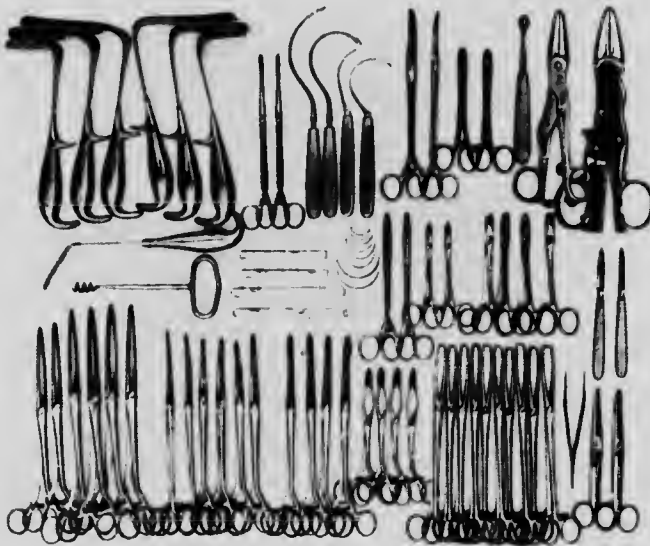


FIG. 750. INSTRUMENTS FOR VAGINAL REPLACEMENT OF THE UTERUS AND FOR VAGINAL HYSTERECTOMY.

From below upwards, and from right to left: 2 strong scissors; Doyen's toothed dissecting forceps, 10 ringed and toothed forceps, 4 oval-mouthed forceps, 4 Doyen's oval eccentric forceps, 6 large curved forceps, 4 Doyen's elastic forceps for the broad ligaments, and 2 reinforcing forceps.

2 bistouries; 4 short-nosed Doyen's artery forceps; 2 small Doyen's needle-holders; 2 Doyen's eccentric needle-holders; open-eyed needles; 4 glass drains; 1 helicoid hook; 1 oblique retractor.

2 Doyen's cerasours (large and small model); curette; 2 forceps with innervated ends for ligature of the broad ligaments; 4 mounted needles for the broad ligaments; 2 bullet forceps; 6 Doyen's retractors for the vagina (Doyen).

OPERATION FOR THE RETROVERTED UTERUS.

*Preliminary.*—Two forceps are fixed on the commissures of the cervix, or, should these be destroyed by tearing, on the anterior and posterior lips, and the cervix is drawn as far as possible towards the vulva.



FIG. 751. POSITION OF THE PATIENT (LEGS AND THIGHS FLEXED) FOR VESICO-VAGINAL FISTULA.

The axis of the vagina is ascending.



FIG. 752. POSITION OF THE PATIENT (SEMI-FLEXED THIGHS, LEGS EXTENDED AND ABDUCTED) FOR VAGINAL HYSTERECTOMY.

The axis of the vagina is horizontal.

The immediate result of this manœuvre is to replace the uterus, which held by its superior attachments, places itself in the axis of traction in exactly the same way as in the case of an oblique fracture of a long bone when traction and counter-extension are employed in the axis of the limb.

The uterus is thus replaced without calling upon any accessory manœuvre and using no special instrument. We will now proceed to describe the operation.

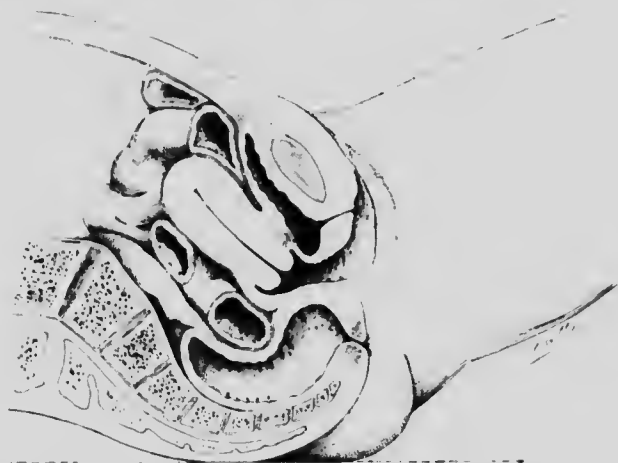


FIG. 753. NORMAL RELATIONS OF THE UTERUS, SHOWING THE CERVICO-VESICAL MUSCULAR BAND.



FIG. 754. UTERUS IN RETROFLEXION AND RETROVERSION.

*First Stage.*—Opening of the anterior peritoneal cul-de-sac. The cervix is drawn backwards and the retractor is placed below the pubis. The anterior vaginal cul-de-sac is incised as in the first stage of vesico-uterine

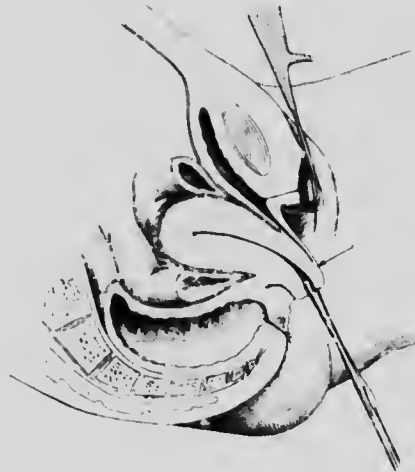


FIG. 755. —THE SAME. REPLACEMENT OF THE UTERUS BY TRACTION ON THE CERVIX.

The arrow shows where the anterior vaginal cul-de-sac will be incised.

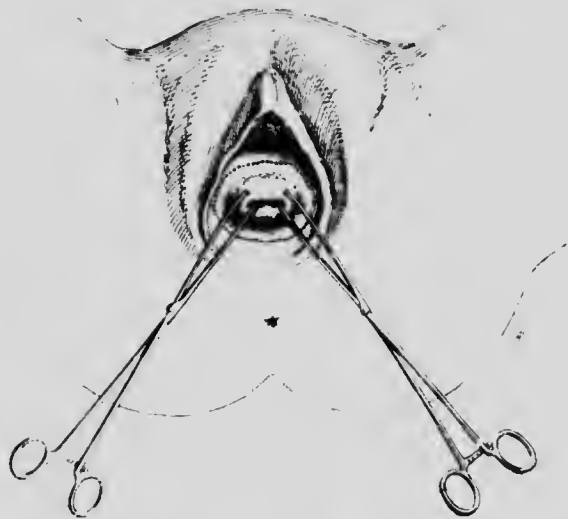


FIG. 756. THE SAME.

The commissures of the cervix are seized by two toothed forceps. The dotted line indicates the outline of the circular incision in the vaginal mucous membrane.



FIG. 757. -THE SAME. SAGITTAL SECTION. INCISION OF THE VAGINAL MUCOUS MEMBRANE IN FRONT OF THE CERVIX.



FIG. 758. -INCISION OF THE VAGINAL MUCOUS MEMBRANE IN FRONT OF THE CERVIX.



FIG. 759. THE SAME. EXPANSION OF THE EDGES OF THE VAGINAL WOUND.



FIG. 760. THE SAME. DETACHMENT OF THE BLADDER.  
The anterior peritoneal cul-de-sac remains adherent to the anterior surface of the uterus.



fistulae. The bladder is pushed up by the index finger and the anterior edge of the vaginal opening is charged upon the retractor. Traction exercised on the cervix below and forwards drags downwards the anterior peritoneal cul-de-sac.



FIG. 761.—THE ANTERIOR PERITONEAL CUL-DE-SAC IS OPEN. APPLICATION OF THE FIRST SUTURE.

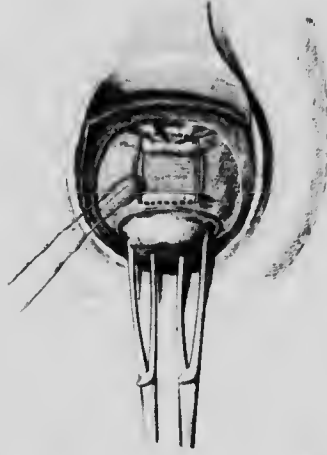


FIG. 762.—THE SAME. THE TWO ENDS OF THE FIRST THREAD ARE TIED.

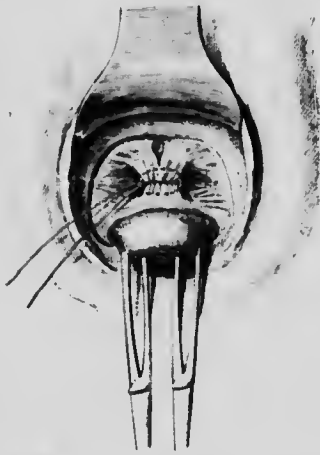


FIG. 763. THE SUTURE IS TIGHTENED AND TIED.

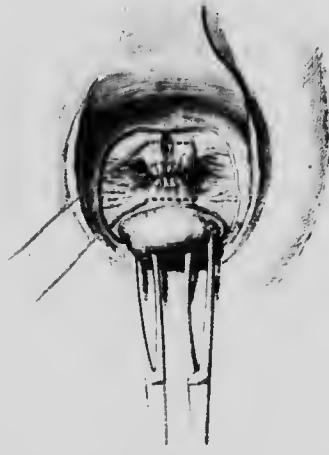


FIG. 764.—THE SAME. SECOND SUTURE.

The peritoneum soon makes its appearance as a thin white curvilinear fold, which is transparent and looks like an empty hernial sac. It is seized with a toothed forceps and incised by a cut with scissors.

*Second Stage: Replacement of the Uterus.*—The field of operation is brought well into view and a first silk suture is placed transversely as high up as is possible in the anterior uterine wall. The other end is passed in the anterior wall of the cervix close to the vaginal collarette. The two ends of the suture are tied.



FIG. 765.—THE SAME.

The operation is at an end. Aspect of the vaginal suture.



FIG. 766.—SAGITTAL SECTION, SHOWING RESULT OF OPERATION.



FIG. 767.—SHORTENING THE POSTERIOR WALL OF THE UTERUS IN A CASE OF ANTEVERSION (DIAGRAM).

The anterior uterine wall, which is elongated by retroflexion, is thus shortened by the vertical distance which separated the two interuterine paths of the silk suture when the suture was passed (Figs. 748 and 749).

A reinforcing suture placed above the first insures the result of the operation (Fig. 764).

The second suture may be passed laterally, if convenient, in the internal border of the broad ligaments.

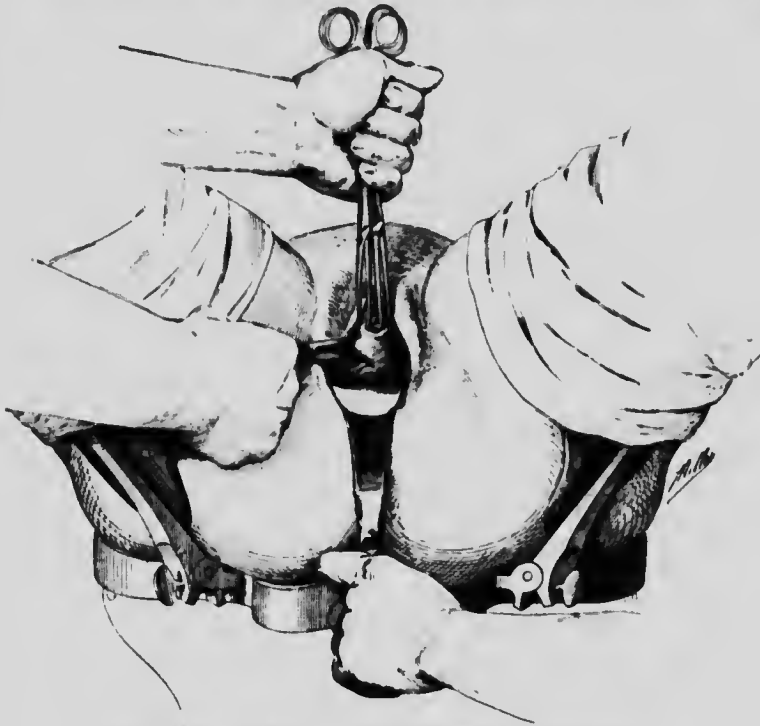


FIG. 768.—INCISION OF THE POSTERIOR CUL-DE-SAC.

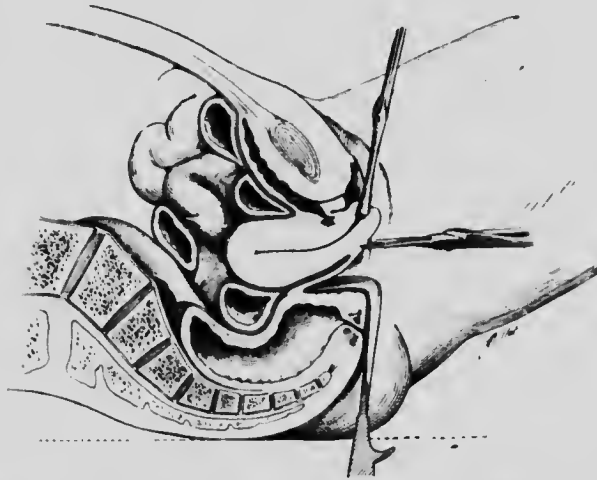


FIG. 769.—SAGITTAL SECTION, SHOWING INCISION OF THE POSTERIOR VAGINAL CUL-DE-SAC.

*Third Stage: Suture of the Anterior Vaginal Cul-de-Sac.*—The vaginal wound is repaired by a transverse suture.

This intervention, which is quite simple, lasts but five to six minutes. This operation has the following advantages over all others: (1) It replaces the uterus without causing a bend in the cavity, this can be ascertained by

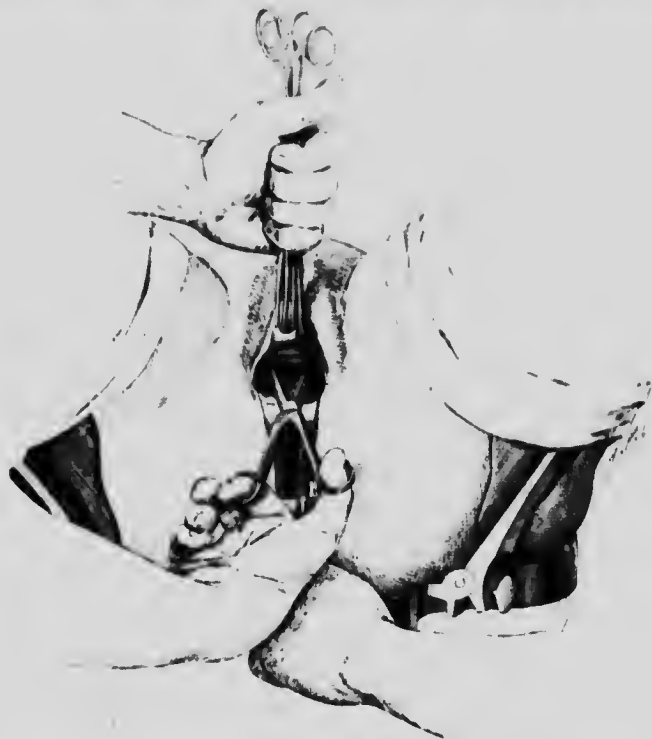


FIG. 770. THE SAME. DIVISION OF THE POUCH OF DOUGLAS.

the immediate or later introduction of a hysterometer or bent forceps. (2) It re-establishes the anterior surface of the uterus in its normal relations, and the anterior wall regains its normal dimensions. (3) The operative technique engenders no loss of substance of the organ, and requires no vaginal fixation which may cause grave trouble in the event of a future confinement.

#### Shortening the Round Ligaments.

In long standing retroversion the round ligaments become considerably elongated. It is a useful measure to restore them, as soon as the vaginal operation is finished, to a convenient length (Alexander's operation). This operation will be described later.

### Vaginal Replacement of Anteverted Uterus.

Pathological anteversion may be radically cured by a similar intervention to that which cures retroversion.

**Operation -Preliminary Stage.** The uterus is exposed and mobilization of the cervix.

*First Stage : Opening of Douglas's Pouch.* The cervix is seized with toothed forceps and drawn upwards and forwards, the posterior vaginal cul-de-sac is then opened.

The fundus is brought into view by the aid of a No. 3 long and narrow retractor. An assistant presses it down by pressure exerted above the pubis.

As soon as the anteversion is reduced a thick silk thread is passed transversely in the posterior surface of the uterus as high up as possible. This renders the second stage more easy.



FIG. 771. ALEXANDER'S OPERATION. THE ANTERIOR WALL OF THE INGUINAL CANAL IS HELD ON A FERRIÈR'S FORCEPS.

*Second Stage.* The bend in the posterior uterine wall is now accessible and a first silk suture is passed transversely as high as is possible. The other end is passed close to the vaginal insertion 15 or 20 millimetres lower down. The thread is tightened and tied. A second reinforcing thread is immediately applied.

*Third Stage : Toilet of the Cul de Sac of Douglas.* The wound is plugged with a sterilized compress.

**Alexander's Operation.** The shortening of the round ligaments, proposed by Alquié of Montpellier in 1840, was performed for the first time by Alexander in 1881 (December 14).

Shortening the round ligaments brings each uterine cornu closer to the corresponding inguinal canal. This operation combats both retroversion and retroflexion of the uterus. In cases of prolapse Alexander's operation completes the result of plastic operations performed by the vagina.

The author describes this operation in this connection, for he never performs it except as a complement to vaginal plastic operations.

The operation is very simple, and requires but four to five minutes for each side.

**Operation—First Stage.**—Exposure of the external inguinal orifice and section of the anterior wall of the inguinal canal. The external orifice of the inguinal canal is recognized by the index finger, which easily feels, through the skin and subcutaneous tissues, the corresponding depression.



FIG. 772.—THE SAME.

The round ligament is drawn outwards. First suture.

An incision is made parallel to, and 15 to 20 millimetres from, the crural arch about 6 centimetres in length, slanting below towards the pubic spine. The subcutaneous fat is torn through by divulsion to prevent bleeding; the external orifice of the canal is now brought into view.

A limb of a pair of blunt scissors is introduced into this opening, and the anterior wall is incised for a length of 20 to 25 millimetres.

**Second Stage.**—Extraction and fixation of the round ligament, all which comes from the depths of the wound; the round ligament and the tissue surrounding it is charged *en masse* on the left index finger.

The round ligament, which is of large size, in the neighbourhood of the upper inguinal ring, appears as a red cord 2 to 3 millimetres in diameter. As it is drawn outwards the cord becomes thicker, reaching a thickness of

4 to 5 millimetres. It is fixed to the aponeurosis of the great oblique by two silk sutures, which serve at the same time to close the anterior wall of the inguinal canal. The exuberant extremity of the ligament is in its turn sewn to the fibrous tissue of the external ring.

*Third Stage.*—Toilet of the wound suture of the skin with clips. The operation is repeated on the other side.

For the cure of displacements and deviations of the uterus the author combines several of the operations described above at the same sitting. Following the particular requirements of each case, the operations are

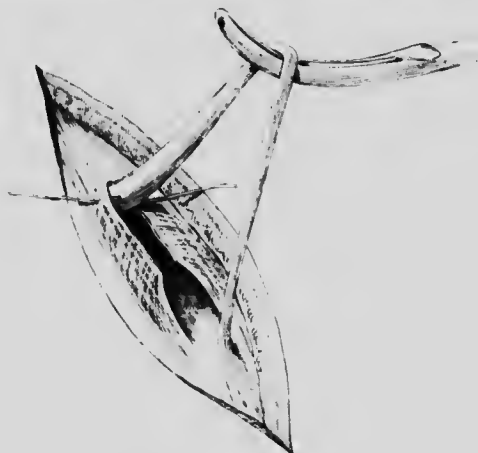


FIG. 773. —THE SAME. DIAGRAM SHOWING FIRST SUTURE.

The suture closes the inguinal canal, fixing the round ligament to the aponeurosis of the great oblique.

grouped in the following manner: Plastic operations on the cervix, vaginal replacement of the uterus, colpo-perineorrhaphy, and Alexander's operation. At the same time a vesical or rectovaginal fistula may be treated. The operations are performed in the following order: Vaginal replacement of the uterus amputation or antoplasty of the cervix, rectovaginal fistula, colpo-perineorrhaphy, Alexander's operation.

Thus the author has on many occasions operated in one sitting on women suffering from perineal tear, metritis of the cervix, retroversion and prolapse, and rectovaginal fistula. This complicated operation lasted but fifty minutes and gave remarkable results.

#### **Inversion of the Uterus (Post-partum).**

##### **DOYEN'S PROCEDURE.**

Inversion of the uterus at the moment of delivery must be reduced immediately. If this manœuvre be not carried out the cervical orifice tightens as involution of the organ proceeds.

The uterus, turned inside out like the finger of a glove, becomes proci- dent in the vagina and may protrude from the vulva, presenting the aspect of a red soft pyriform tumour, on the sides of which the two small infundibula leading to the tubal orifices can be perceived.

If the inversion be of long standing the uterine mucous membrane, which has been for a long time in contact with the vaginal mucous membrane, takes on a different aspect, becoming smooth with atrophied glands. In inversion with prolapse the uterine mucous membrane is often the seat of ulcerations of varying depth and extent.

The cervical ring strangles to a greater or less degree the body of the organ, from which it is separated by a groove, whose depth varies according to the extent to which the upper part of the cervix participates in the inversion. It is rare that the cervical ring entirely disappears.



FIG. 774. POST-PARTUM INVERSION OF THE UTERUS.

The orifices of the tubes can be seen.



FIG. 775. THE SAME. FRONTAL SECTION, SHOWING RELATION OF THE TUBES.

The adnexæ are dragged to the edge of the infundibular orifice on the peritoneal side, where the round ligaments and their pedicles are dragged upon (Fig. 775).

The serous canal, plunging to the lower part of the vaginal tumour, is apt to become indurated and narrowed in time. Post-partum inversion is the easier to perform the nearer it be attempted to the hour of delivery.

The author has on certain occasions operated upon inversions which were several months old.

The cervical ring was closed and narrow, and the majority of the doctors who saw the case considered that amputation of the protruding part, or vaginal hysterectomy, was the sole possible means of relieving the patient.



I decided to apply my usual method of hemisection of the cervix after incision of the anterior vaginal cul-de-sac and detachment of the bladder in order to reduce the uterus by an opposite manœuvre to that which I employ for its extraction in vaginal hysterectomy. This attempt was justified, inasmuch as the section of the anterior wall of the cervix became, in the case of failure, the first stage of hysterectomy (see later, Vaginal Hysterectomy).

**Operation.**—The cervix is seized on either side in a toothed forceps.

*First Stage.*—Incision of the anterior cul-de-sac and detachment of the bladder, whose wall is protected by a retractor, as far as the point of the inversion of the uterine mucous membrane.



FIG. 776. THE SAME. TRANSVERSE INCISION OF VAGINAL CUL-DE-SAC AND MEDIAN ANTERIOR HEMISECTION OF THE CERVIX.



FIG. 777. THE SAME. The uterus is reduced by the thumbs. Sutures of vagina and cervix.

*Second Stage.*—Median anterior section of the cervical ring.

*Third Stage.*—The edges of the cervical section are held open, the forceps, fixed on the lateral parts of the cervix, are seized with the four fingers of either hand, and the fundus of the uterus is reduced by the thumbs. This can be accomplished without a great effort, thanks to the liberation of the cervical ring, which becomes slightly torn at the moment of reduction.

*Fourth Stage.*—The reduction is examined and verified, the peritonium is examined for breach, and the cervix and vaginal wound are repaired by a continuous catgut suture.

This procedure is the more interesting inasmuch as it demonstrates the value of median anterior hemisection of the cervix. It is interesting to note that this manœuvre enables the realization of the removal of the uterus by inverting it outwards or to replace the organ by an absolutely opposite movement should it be accidentally inverted into the vagina.

**Removal of Uterine Polypi by the Vaginal Route.****HYSTEROTOMY.**

The removal of pedunculated uterine polypi, with vaginal evolution was once an operation to be dreaded.

Towards the end of his medical studies, in 1885, the author saw many young women in perfect health succumb to septicæmia after the removal of a simple polypus bulging into the vagina. Chassaignac's linear éraseur, Maisonneuve's ligaturing machine, and the galvanic loop, became very popular for this reason.

**Hysterotomy**, or simple incision of the uterus, not followed by the removal of the organ, an operation which had been practically abandoned, was proposed and described by Péan. The following is a brief history of this operation: Emecleation of fibromata accessible by the vagina and having a large surface of implantation had been conceived by Dupuytren and Velpeau. Amussat in 1840 was the first to perform the operation. He lost 1 patient out of 3. Velpeau performed it twice. Both his patients died.

Demarquay having no better success, Nélaton pronounced himself decidedly against the bloody operation.

Emecleation was practised in England and America by Attlee and Hutchinson who gave, in 1857, 18 cases with 6 failures. Langenbeck introduced in Germany the emecleation of large fibromata. Brawn, Hégar, Martin, and Guisseron practised it frequently. Hégar and Kaltenback (1885) cited 154 operations, with 51 deaths (33 per cent.); 15 operations were incomplete, of which 9 were fatal. Schroeder lost 3 out of 11. Hégar 4 out of 19, Frankenhauser 9 out of 23.

These operations were practised without any precise technique. Péan proposed to use the cutting instrument at a time when French surgeons were unanimous in favour of the éraseur or the galvanic loop in dealing with large fibromata.

Péan's technique is described in detail in the thesis of his pupil Néchetron (1888), and in his treatise (1889) Péan proposed to substitute incision of the cervix and body of the uterus for slow dilatation. The cervix was drawn down, detached from its insertions, and transversely incised. The two flaps thus obtained allowed the incision to be prolonged to the body of the uterus and the fibroma could then be cut in morsels with toothed forceps and a specially designed bistoury. Péan audaciously opened the peritoneum in order to attack certain inaccessible fibromata which could not be reached through the cavity of the uterus. The uterine wound was sutured with silver wire. The first morselling operation reported by Péan was dated June 16 1884. It is therefore two years later than his first vaginal hysterectomy. Péan employed his saw forceps until 1886, when he abandoned their use.

*Discovery of Hysterotomy by Amussat.*

We have seen (Vol. I., p. 100) that the employment of these slow method was not excluded before the discovery of antiseptic methods, and the

clever operators knew how to obtain in the first half of the nineteenth century remarkable results in the bloody operation for the removal of large interstitial fibromata. Amussat, who instituted the practice of "morselling" large uterine fibromata, outlined (1840) the post-operative antiseptic treatment thus: "Cure is accomplished by practising, after operation, properly used vaginal injections."

Amussat's operation soon fell into disrepute. Surgeons of his time did not observe necessary habits of cleanliness even in their own persons, and carried infectious germs from hospital to private patients. They had reason to fear the open operation.

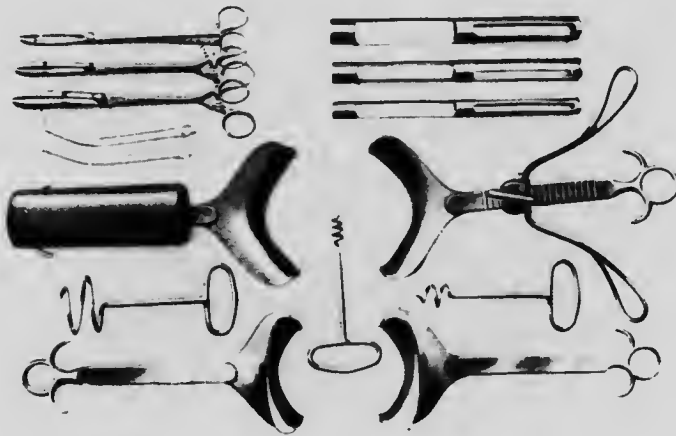


FIG. 778. SPECIAL INSTRUMENTS FOR THE ENUCLEATION OF UTERINE FIBROMATA BY THE VAGINA OR BY LAPAROTOMY.

4 large Doyen's laparotomy retractors, one of which is fitted with an inter femoral fixing apparatus. Another is fitted with a lead weight which serves to keep it in the umbilical commissure of the incision when the patient is in the Trendelenburg position. 3 Doyen's helicoid hooks; 2 glass drains for Douglas's pouch; 3 cutting-tubes for scooping out fibromata by the vagina; 3 gouge forceps for removal of interstitial fibromata by the vagina.

The popularization of the mechanical ligature, and later of the galvanic loop, was beneficial to the patient, but was a check to surgery, which still waited the laws of asepsis.

Amussat's operations are remarkable. This audacious and brilliant operator discovered at once, and established, the proper rules for the morselling of vaginal fibromata, and was immediately successful.

Amussat's method was not adopted because his contemporaries were incapable of employing it. The removal of large intra-uterine fibromata with the cutting instrument was rediscovered by Péan in 1884.

But what a difference between the two methods! Péan, preoccupied by

the fear of hemorrhage, dared not divide any tissue without enumbering the wound with pressure forceps; whereas Amussat enucleated intra-uterine fibromata of the size of an ostrich egg without any attempt at hemostasis during the course of the enucleation. Amussat rejected from the first, to his great credit, the central scooping out of the tumour, "as is practised for calculi in the principle of lithotomy." From his earliest operations he enucleated the tumour either *en masse* or by incision and division, by

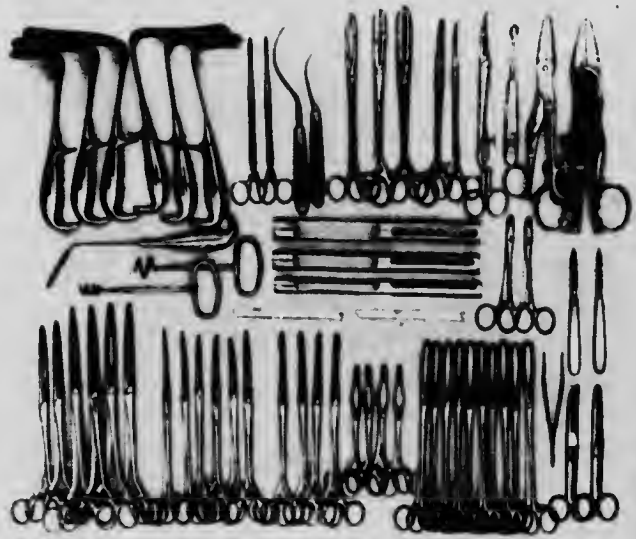


FIG. 779. INSTRUMENTS FOR VAGINAL MYOMECTOMY AND VAGINAL HYSTERECTOMY.

From below upwards and from right to left: 2 pairs of scissors, straight and curved; 10 toothed forceps; 4 oval forceps; 4 Doyen's eccentric forceps; 6 long curved forceps; 6 elastic forceps for the broad ligaments (Doyen's).

2 bistouries; 2 Doyen's needle-holders; 2 glass drains for the vagina; 3 Doyen's cutting tubes; 2 Doyen's helicoid hooks; 1 oblique retractor.

2 Doyen's cerascurs; 1 curette; 1 pair long scissors (curved); 2 curved nosed forceps; 3 uterine gonge forceps; 2 mounted needles; 2 bullet forceps; 6 graduated Doyen's vaginal retractors.

making tangential tractions which pushed the tumour forwards. Péan, who seems to have ignored Amussat's operations, hindered the progress of this operation for more than forty years. The dates are precise and well known. Péan's central morselling and conoid scooping invented by Péan in 1881 had been rejected by Amussat in 1840. Péan would apply the process of morselling and preventive hemostasis to the whole of surgery. The smallest pedunculated polyp of the cervix, according to him, should not be divided

except a strong pressure forceps be placed beforehand on the pedicle. This idea of preventive forcipressure does not originate with him, since we find that special clamps existed long before his time. Thus Thierry's forceps figures in Charrière's catalogue for 1862, and similar clamps can be traced back to the eighteenth century ("Atlas de Seerig").

*Operative Technique in Hysterotomy.*

I removed a large interstitial uterine fibroma for the first time in 1887. I had never seen one of these operations, of which Péan was then the sole performer. I therefore worked out the technique which seemed to me to be the simplest and best, without outside influence. I had no knowledge of Amussat's method, and was very surprised, when I read his works in 1896, to find so close an analogy between my own operation and Amussat's: tangential traction on the tumour, enucleation by pushing forwards and rotation, successive morselling of the tumour surface, and division of the principal mass in cases where extraction *en bloc* proves to be impossible.

My method, which is exactly the opposite to Péan's complicated and laborious method, is entirely governed by the principles which guided Amussat—safety and simplicity.

We will study successively—

1. Removal of pedunculated polypi inserted in the cervix or in the cavity of the uterus which have passed the cervical orifice.
2. Enucleation of submucous polypi which are yet completely included in the uterine cavity.
3. Enucleation of interstitial polypi.

*Removal of Pedunculated Uterine Polypi inserted in the Cervix or in the Uterine Cavity, and which pass the Cervical Orifice.*

**A MEDIUM-SIZED POLYP.**—If the polyp be of moderate size (glandular cervical polyp, pedunculated fibrous polyp, with pedicles in the cavity of the uterus) it is seized in a ring forceps and drawn downwards to explore the pedicle. The pedicle is divided as high up as is possible with a single cut of the scissors.

Section of the pedicle with long curved scissors assures the ablation better than tearing or twisting. The implantation-point is then cauterized with hot air. Perforation of the uterus is not to be feared when the polyp is distinctly pedunculated.

If the pedicle is wide, the eventuality of an inversion of the fundus must be borne in mind. The mucous membrane over the surface of the polyp must be incised. It can then be extracted either by simple traction or in pushing farther the detachment of the mucous membrane by the fingers. The special consistence, the whitish aspect, and its spheroidal shape all aid this manipulation. The neoplasm is surrounded by a cellular compartment which is very yielding, and receives no vessel of any importance from the uterus.



FIG. 780. —REMOVAL OF A SMALL PEDUNCULATED POLYP FROM THE CERVIX.  
The cervix is drawn down and the pedicle is cut by strong scissors.

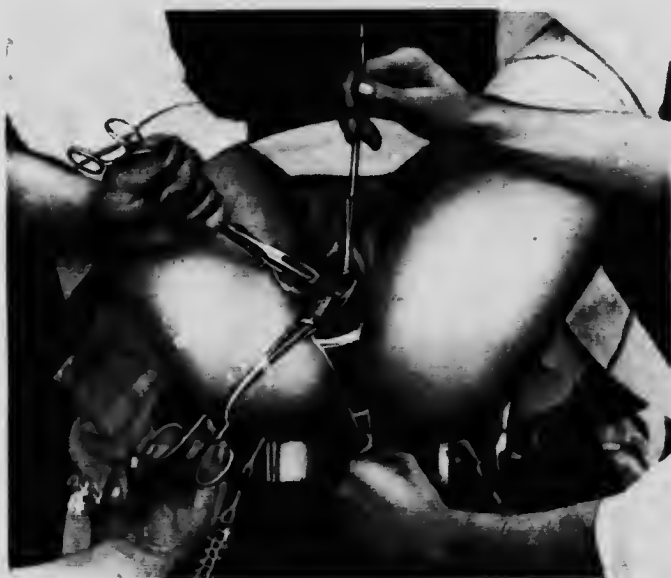


FIG. 781. —REMOVAL OF A POLYP IMPLANTED IN THE CERVICAL CAVITY.  
The cervix is strongly drawn down. Section is made at the point of implantation.



FIG. 782. — REMOVAL OF A LARGE UTERINE POLYPUS WHICH IS TOO LARGE TO PASS THE VULVA.



FIG. 783. EXTRACTION BY THE GOUGE FORCEPS OF A CYLINDER FROM THE FIBROMA SHAPED OUT BY THE CUTTING-TUBE.

As soon as the enucleation is complete the loose edges of the uterine mucous membrane are resected, and the inversion if produced, is reduced. Bleeding is generally insignificant; it can be arrested by a hot irrigation of the cavity of the uterus. Antiseptic irrigations are repeated four to six times in the twenty-four hours. When rigid antiseptic rules are followed, this operation requires a rest of four to six days in bed.

*B. GIANT POLYPI INCARCERATED IN THE VAGINA.*—Cases exist where the polyp, having passed the cervix, fills the vagina, distending the walls like a foetus during labour.



FIG. 784.—THE SAME.

Canal cut in the accessible part of the tumour. A branch of a pair of forceps with teeth is inserted in this hole.

These large polypi may be so tightly incarcerated in the pelvic cavity that the finger cannot reach the equator and the pedicle is unattainable.

Difficulties of extraction depend exclusively on the size of the neoplasm. It may happen that the pedicle is torn through by turning the fibroma a number of times, the rupture of the pedicle not aiding in any way the extraction of the tumour. It is almost impossible to seize in a certain fashion the smooth, firm surface of the fibroma, which can only be reached over a small proportion of its surface.

I adopted the following method in 1887 to overcome this difficulty. The fibroma is pressed down from above by an aid, who presses above the pubis. The lower pole of the fibroma is attacked by a large diameter cutting-tube. The tumour is perforated in the same way as rubber stoppers



are perforated in the laboratory. An assistant holds the tumour in place by means of a strong toothed forceps. A canal 15 to 20 millimetres in diameter is thus dug in the lower accessible pole of the tumour, into which one branch of a strong forceps can be easily introduced. The anterior surface of the fibroma is then incised in the shape of a V. This first fragment is resected, and other V-shaped masses are shaped to the right and left, and removed in their turn. As soon as the volume of the neoplasm is sufficiently reduced the last V-shaped mass is seized by the strong gouge forceps. The remainder of the fibroma turns inside out, and can be easily extracted. This extraction is accomplished in a few minutes. There is no bleeding, since the pedicle is broken by twisting during the operation.

*Enucleation of Sessile Submucous Polypi retained in the Cavity of the Uterus.*

Large solitary submucous uterine polypi are only capable of enucleation without removal of the organ when the periphery of the tumour is sufficiently thick to obviate all risk of perforation during operation or of



FIG. 785.—MYOMECTOMY OF A LARGE SUBMUCOUS FIBROMA.

The cervix is not dilated. Median anterior hemisection of the cervix.

ultimate sphacelation. When the uterus is distended by a large submucous fibroma it remains contractile, and retracts as soon as the removal of the tumour is accomplished.

But this is not the case when the tumour is interstitial and separated

from the peritoneum by a thin layer of fibro-cellular tissue containing no healthy muscular tissue. In such cases a thin pocket remains after operation, which suppurates and only diminishes very slowly. For this reason hysterotomy should be reserved for solitary submucous fibromata. This operation is indicated in fecale patients, especially when the tumour is breaking down.

Indeed, when the uterine cavity is infected, simple enucleation followed by free antiseptic irrigation is less grave than total hysterectomy. The latter operation can be performed later if other interstitial tumours, spared during the first operation, should call for it.



FIG. 786. THE SAME.

The lower pole is brought into view by a Doyen's retractor.

**Operation.**—A retractor is introduced into the vagina either in front or behind, and the cervix is seized in two toothed forceps applied on the commissures. It is drawn down as far as is possible. The state of the cervix varies greatly. The vaginal portion sometimes is normal, and the orifice hardly admits the end of a finger or a simple curved forceps; at others, dilatation preparatory to spontaneous expulsion of the tumour are already far advanced.

In former times great importance was attached to the alternative dilatation and tightening of the cervix, the polypus making its appearance at the time of menstruation, and remounting into the cavity of the uterus until a strong contraction expelled it into the vagina. At present it is a matter of indifference whether the cervix be gaping or not at the time of operation.

*First Stage.*—Exploration of the cavity of the uterus. Median anterior hysterotomy.

In some cases the cervix is open to the extent that one of the author's

small retractors can be slipped between the anterior uterine wall and the tumour.

If the lower end of the tumour be difficult of access, the anterior vaginal cul-de-sac is incised and the bladder is detached. A retractor is then introduced by the vaginal wound, and the anterior lip of the cervix is incised in the middle line.



FIG. 787. —THE SAME.

The retractor is placed between the uterus and the bladder. Cutting-tube applied to the lower pole and perforation of the tumour.

If the cervix be too narrow to admit the retractor, the anterior wall must be incised. We have already seen that anterior median hysterotomy was performed by Amussat in 1840, who combined it with multiple divulsion of the cervical orifice, taking care to wound neither peritoneum nor bladder.

Although a wound of the anterior peritoneal cul-de-sac is fraught with

less danger in modern times, yet this complication is to be avoided if simple enucleation not followed by hysterectomy is sought. A breach in the peritoneum is of grave import should the tumour be breaking down and infiltrated with septic micro-organisms.

*Anterior Hysterotomy in V or Y.*

In some cases longitudinal section of the anterior wall of the cervix does not give sufficient access to the tumour. The following technique was instituted in 1897: When the cervix is effaced, the section of the anterior wall of the uterus is V-shaped. If the cervix is not effaced, a longitudinal incision is made, which is continued by two divergent incisions as soon as the inferior pole of the fibroma is reached, thus constituting a Y-shaped incision. The anterior cul-de-sac is easily avoided if the bladder be pushed up with a compress. The anterior retractor is then employed to protect it.



FIGS. 788 AND 789. VAGINAL MYOMECTOMY FOR A LARGE SUBMUCOUS FIBROMA. ANTERIOR SECTION OF THE CERVIX AND THE UTERINE WALL IN V AND IN Y.

As soon as the lower portion of the tumour is brought well into view, the largest possible cutting-tube is applied, the neoplasm being fixed by the left hand applied to the lower part of the abdomen. The fibroma is perforated directly towards the umbilicus and then in three or four divergent directions. This can be quite easily done without traversing the uterus, as the penetration of the instrument is easily regulated, and care is taken to keep clear of the uterine body. The cylindrical masses thus cut are removed with a gouge forceps, and the tumour is occupied by a cavity into which a branch of a strong toothed forceps is introduced. The other branch of the forceps grips the surface of the fibroma. The forceps is strongly gripped and the tumour dragged down. A retractor is employed to protect the anterior vaginal wall. A double V-shaped section is now made, and by two complementary A-shaped sections a lozenge-shaped mass is removed (Figs. 791 and 793).



FIG. 790. THE SAME. Y SECTION OF THE ANTERIOR WALL AND BODY OF THE UTERUS.

This manoeuvre is repeated, successive masses being removed in the same fashion.



FIG. 791. THE SAME. THE FIBROMA PERFORATED BY THE CUTTING TUBE.

As the fibroma diminishes in volume, and by reason of the tractions exercised on the flaps of the **V** sections, it becomes rotated and snug on its base, thus rendering its sides accessible and the top. When the portion remaining in the uterus appears to be small enough to pass the vulva, the



FIG. 792. —THE SAME. SAGITTAL SECTION.



FIG. 793. THE SAME. THE FIRST LOZENGE-SHAPED MASS SEIZED IN A TOOTHED FORCEPS.

most accessible **V** is seized with a powerful gouge forceps and drawn outwards. As soon as the last **V**-shaped mass passes out of the uterus the index finger introduced into the wound liberates the adhesions of the upper end of the tumour, and helps the extraction.

It may happen that the last portion of the fibroma is more voluminous



FIG. 794.—THE SAME. SAGITTAL SECTION OF FIG. 793

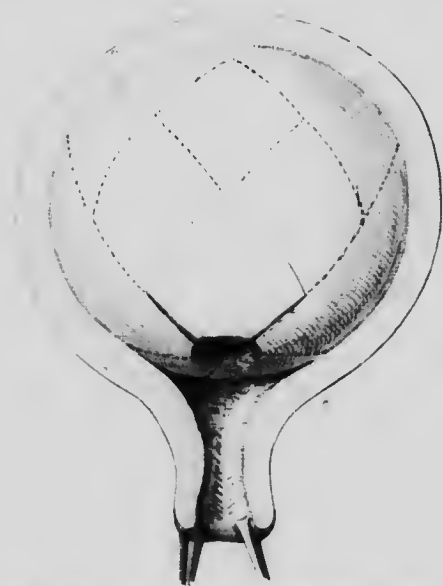


FIG. 795.—THE SAME. OUTLINE SHOWING MORSELLING OF A LARGE INTRA-UTERINE FIBROMA.

The four central lozenges are removed at first, followed by the lateral portions of the tumour.

than was expected, and that it must still be made smaller. In such a case all that is outside the vulva is resected. The remainder of the fibroma is seized, V-shaped incisions are prolonged to a deeper level, fresh masses are removed, and the upper part finally presents itself at the vulva. Care is taken to detach the upper pole of the fibroma from the body to prevent inversion.

One view of this operation will convince the spectator of its sureness and speed.

The tumour treated in this way is turned alternatively to the right, forwards, backwards, and to the left. If we suppose that the anterior and left lateral portions are already resected by several lozenge-shaped excisions,

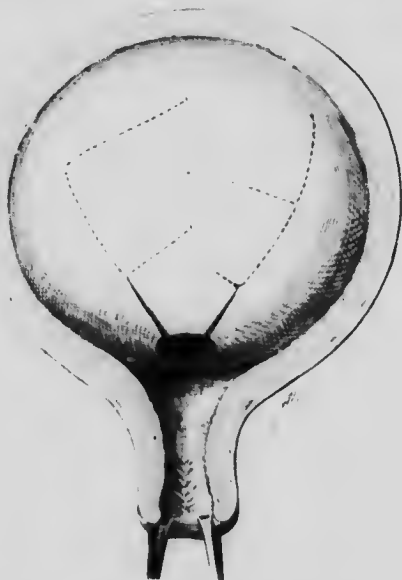


FIG. 796 THE SAME. LADDER-SHAPED MORSELLING OF A LARGE INTRA-UTERINE TUMOUR.

and it becomes difficult to reach the deeper portions, the last V-shaped portion (the highest) is caught with a pair of forceps and, with the index finger in the cavity of the uterus, another portion of the tumour can be seized cut in pieces, and twisted out of the vulva.

The last fibromatous mass extracted in a single block may weigh from 600 to 800 grammes.

The technique of the operation will vary according to the volume of the fibroma, its consistence, and the size of the field of operation, but the rules governing the various stages apply to each particular case: (1) Perforation of the tumour with the cutting-tube; (2) lozenge-shaped morselling of its anterior, then its lateral parts; (3) extraction of the superior pole by seesaw movement and twisting.



*Ladder-shaped Morselling.*

The process of morselling ladder fashion of uterine fibromata can be employed in fibromata of medium size. If the tumour be small it is cut in two, and one half is drawn to the vulva; the fibroma opens like a book, and quits its compartment in a seesaw manner without difficulty.

In the case of a larger fibroma the central portion is attacked three or four times with the cutting-tube, and a V-shaped portion is shaped out. When this V-shaped portion is drawn down and out it is easy, if the consistence of the tumour be not too hard, to continue its extraction by making



FIG. 797. REMOVAL OF AN INTRA UTERINE FIBROMA BY LADDER-SHAPED MORSELLING.

alternatively to the right and left of the first V section deep but incomplete incisions, as is shown in Fig. 287, thus realizing the ladder-shaped morselling (Figs. 797 and 801).

The median anterior V, instead of being resected by lozenge-shaped morselling, unwinds and becomes as is shown in Fig. 797. The manoeuvre can be continued on the lateral parts of the tumour, and ends in its total extraction.

This latter method is very rapid. The tumour can be extracted in a single piece, which can be reconstructed in its primitive shape by bringing together the morsels after removal. Submucous fibromata can thus be removed by one of the following procedures:

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- I. Extraction *en bloc* if possible.
- II. Morselling by simple median section of Lisfranc and by division if the tumour is small.
- III. Lozenge-shaped morselling or ladder-shaped removal if the fibroma is very voluminous.



FIG. 798. -RELATIONS OF A LARGE INTERSTITIAL FIBROMYOMA OF THE ANTERIOR UTERINE WALL.



FIG. 799. THE SAME.

The cervix is drawn towards the vulva for incision of the anterior vaginal cul-de-sac.

These manœuvres require, as a preliminary stage, when the cervix is not sufficiently dilated, median anterior hemisection in V or in Y.

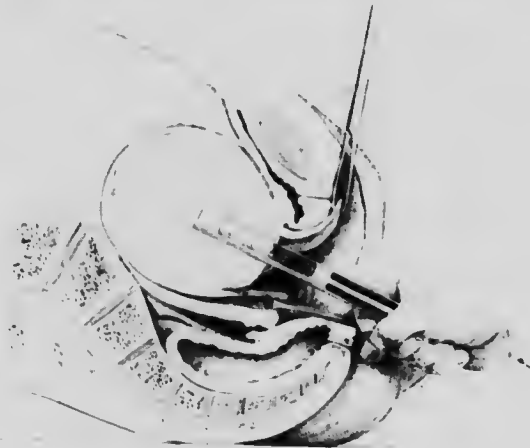


FIG. 800. THE SAME.

The median V is drawn upwards. Application of the cutting-tube.

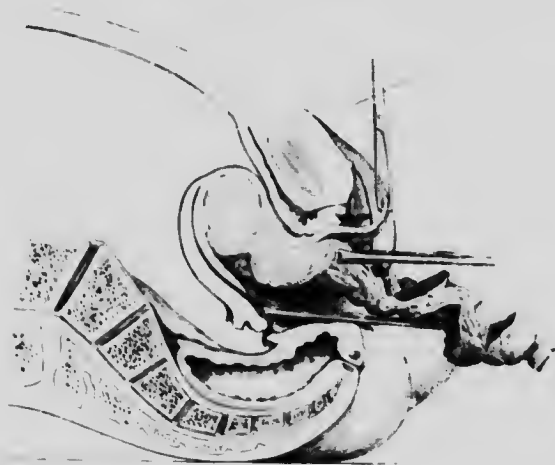


FIG. 801. THE SAME. LADDER-SHAPED REMOVAL OF A LARGE UTERINE FIBROMA.

*Myxomatous and Arcular Fibromata.*

The operations just described are particularly applicable to fibromata of normal consistence.

Some of these tumours are, however, very friable: this applies specially to myxomatous and arcular fibromata, which contain as a rule serous cysts.

The author has met with myxoid uterine tumours with so little resistance that traction with forceps was useless owing to the instrument slipping. These tumours must be dealt with by the author's gouge forceps.

**Operation—First Stage.**—The tumour is exposed, when the cervix is not sufficiently open, by median anterior hemisection, and the largest possible cutting-tube is applied to the lower pole. The fundus uteri is fixed by the left hand on the abdomen, and the tumour is perforated in five or six different directions.

**Second Stage.**—The cylinders thus formed are removed. A strong gouge forceps is then introduced into the uterus, or if the tumour is very friable a ring forceps, and the tumour is extracted fragment by fragment.

**Third Stage.**—When the volume of the tumour is sufficiently reduced the upper portion is twisted out.

#### *Sphacelated Fibroma.*

The above methods can be applied in the same way to a fibroma which, originally hard, has become sphacelated. The tumour is blackish in colour, but preserves sufficient resistance to give a hold to toothed forceps and to allow of morselling. When the tumour is extracted the uterus, if inverted, must be reduced. When the uterine covering to the fibroma is very thin, the fundus of the uterus may be inverted as the upper portion of the tumour is being removed in order to see if the uterine wall has been perforated or rendered so thin that ulterior sphacelation is to be feared at certain points. Subcutaneous injections of mycolysine are given, and intra-uterine irrigations of Labarraque's solution  $\frac{1}{4}$  (50).

#### *Indications for Hysterectomy.*

The enucleation of fibromata of the cavity and interstitial fibromata has lost much of its importance since the popularization of total hysterectomy. This operation should be confined to the removal of solitary fibromata of medium volume (200 to 400 grammes). It is applicable also to cases of multiple fibromata where the general condition is bad (diabetes, albuminuria, etc.), when the removal of a single tumour protruding into the uterine cavity would appear to prevent hemorrhages. Indeed in such cases enucleation of the principal submucous fibroma often causes the hemorrhage to cease, and total hysterectomy would be performed at a later date when the general condition is improved.

We will see that this line of conduct—operation in two stages at an interval of several weeks or even several months—is also the best in cases of grave pelvic suppuration in very enfeebled cases where in the first stage it is advisable only to evacuate the abscess by colpotomy.

#### *Indications for the Removal of the Uterus after Vaginal Myomectomy.*

The thinned uterine walls floating in the peritoneum after the removal of large interstitial fibromata are very feebly contracted, for they contain

but a small number of degenerated muscular fibres on which ergot has no action. Hot antiseptic irrigations have no power to prevent infection of the cavity, which retracts only after several weeks, following an abundant suppuration, during which time the temperature of the patient is subject to oscillations which are very disquieting. These conditions do not occur when the uterine wall is thick, muscular, and contractile.

If after myomectomy of an interstitial fibroma the wall of the uterus be found to be excessively thinned, a vaginal hysterectomy is immediately performed. This can be done in a few minutes. It is prepared for by the detachment of the bladder and the section of the anterior wall of the cervix.

When the uterus is left in place, the incision of its anterior wall is closed by a continuous catgut suture. The cavity of the uterus is plugged with aseptic gauze; a hypodermic injection of 50 c.c. of mycolysine is made immediately. The plug is removed on the second day, and each day four or five intra-uterine injections of 1-5,000 sublimate are made.

The best uterine sound to use in cases of this kind is a stout tin catheter whose curve is appropriate to the direction of the intra-uterine tract. Should the temperature rise above 38.2°, the injections are increased in number up to eight in the twenty-four hours.

If the temperature rise to 39° and beyond, ice-bags are placed on the abdomen and continuous irrigation is installed, using 1/10 Labarraque's solution. Daily subcutaneous injections of mycolysine (20 c.c.) are continued.

*Weight of Uterine Fibromata with Relation to their Diameter.*

It is of interest to mention as a complement to the above technical description the relation which exists between the diameter and the weight of spherical or almost spherical abdominal tumours. This table reduces to their just value some observations where the weight of the tumour is wrongly given, where an 0 is added, carrying the weight from 400 to 4,000 grammes—*i.e.*, to double the weight of the brain or liver of an adult man.

A fibroma or cyst with a diameter of—

Diameter (cm)	Weight (grammes)
6	110
8	270
10	520
12	900
15	1,700
16	2,150
18	3,000
25	8,200
30	14 kilogrammes.
40	34
46	50

The last weights may be attained by multilocular ovarian cysts or by fibrocystic tumours of the uterus.

The density of various abdominal tumours varies little except in cases of calcification. The above figures will allow the reader to appreciate their real weight in relation to their diameter with sufficient exactitude.

### Colpotomy.

The first operations for ovarian castration were performed through the vagina. Battey (1872) incised the posterior cul-de-sac close to the cervix. Battey's method was not followed, and surgeons in general preferred to follow the example of Hegar and Lawson Tait in performing laparotomy. The merit of the re-establishment of the vaginal route for the removal of small tumours of the ovaries and the uterus belongs to Péan. Péan abandoned in 1889 the removal of inflamed adnexæ by posterior colpotomy, and substituted for it uterine castration. Lately certain surgeons have exaggerated in the opposite sense, and have proposed colpotomy as a regular method for the removal of ovarian cysts. The technique, however, is only applicable to exceptional cases, where the cyst is unilocular. Diagnosis of the number of loculi and adhesions can never be made in advance: a surgeon can have no practical sense if he propose vaginal ablation in ovarian cysts of recognizable volume. To suggest the operation by the anterior cul-de-sac, as has been done abroad, is worse.

The indications for colpotomy in cases of intraperitoneal lesion are, however, quite precise. I have outlined them on several occasions, notably in 1894 at the German Surgical Conference, in the following terms: "*Every uterine or peri-uterine pelvic lesion should be approached by preference by the vagina, if the excessive volume of the tumours or the extent of their adhesions does not seem to be a definite contra-indication. In border-line cases the surgeon must allow himself to be guided solely by his own experience: he will choose the vaginal operation or laparotomy according to whether the one or the other appears to him to be the surest.*"

Young and inexperienced surgeons should only attempt by the vagina uterine tumours or adnexal lesions of moderate volume and sufficiently mobile.

Whatever be the objective of the vaginal incision—exploration of the pelvis or unilateral removal of the adnexæ—I always recommend the incision of the posterior cul-de-sac, which assures better drainage than anterior colpotomy. The habitual predominance of adhesions and peri-uterine inflammatory lesions in Douglas's pouch are also sufficient reason that the incision be made at this point, giving the most direct access to the adnexæ.

Posterior colpotomy is *par excellence* the exploratory operation of the pelvic cavity. It allows the index finger to ascertain the condition of the posterior surface of the uterus and the adnexæ, which can be pushed down when necessary by abdominal palpation. This combination of abdominal palpation and direct examination with the finger is a very precious measure when the lesions are confined to the cavity of the pelvis.

Battey's operation (removal of the adnexæ by the vagina, leaving the uterus in place) fell into discredit because the majority of operators had not sufficient dexterity to perform it. They preferred laparotomy, whose technique indeed is easier.

The author's experience in vaginal hysterectomy permits him to affirm

that, far from giving a narrow and blind field of operation, simple incision of the posterior cul-de-sac allows the index and medius to reach the upper straight and even the subumbilical region.

Inflamed adnexal pouches, which almost always bulge into the pouch of Douglas, are more directly reached by this method than by laparotomy, especially when the vagina is wide. The vaginal route is particularly advantageous in women, whose abdominal wall is covered by a dense and thick covering of fat.

Posterior colpotomy is also superior to laparotomy where it is desired to spare the uterus and the adnexæ on the healthy side.

The operation is simple and rapid. It has another advantage over laparotomy in that in less space of time and with no further risk it allows of either simple opening of peri-uterine pouches, unilateral removal of adnexæ, or, if the lesions are bilateral, total castration.

We may take two examples. A young woman suffered for five years from peri-uterine pain. A small left adnexal tumour was present, which was extremely painful. Operation was performed by the vagina. As soon as the uterus was drawn down the pouch of Douglas was incised. A left hæmosalpinx was detached from its pelvic adhesions, and removed with its corresponding ovary. The adnexæ of the opposite side were drawn into the wound and examined. They were healthy, and left in place, together with the uterus.

Two small forceps sufficed to arrest hemorrhage. The patient rose on the tenth day. Cure was permanent.

In another patient a large salpingitis was found on the right side. As soon as the pouch of Douglas was incised the finger felt on the left side a cystic pouch of large volume. This cystic pouch had not been perceived by combined palpation and vaginal examination even under chloroform. The lesion was bilateral, and total castration was performed.

Posterior colpotomy therefore permits of a procedure as good as, if not better than, laparotomy for the exploration of the adnexæ by Douglas's pouch. The author considers that it is much superior to laparotomy for the rapid examination of pelvic lesions.

An objection has been offered that the vaginal method does not lend itself easily to conservative surgery of the uterus and its adnexæ. This is true only in the case of inexperienced operators. As soon as a diagnosis of a unilateral lesion is made by posterior colpotomy the sole adnexæ that are diseased can be removed, sparing the uterus and healthy adnexæ.

If the lesions be bilateral, total castration can be performed at once, which is preferable to the removal of the adnexæ. The advantage, then, rests with posterior colpotomy in every case where it is possible to perform it.

#### APPROACH TO THE BROAD LIGAMENTS BY THE VAGINA.

Incision of the posterior cul-de-sac and the lateral culs-de-sac of the vagina allows the thick portions of the broad ligaments to be reached. Here purulent foci can be dealt with and the removal of cystic or solid tumours reaching to the size of a foetal head.





In 1893 I removed by posterior colpotomy an inflamed dermoid cyst of the size of a foetal head, which was included in the left broad ligament. Diagnosis of dermoid cyst was made by vaginal examination, owing to the consistence of the tumour, which gave the sensation to the finger of a compact block of butter.

This mass had pushed the uterus to the right and forwards. On incising the cul-de-sac the finger reached the surface of the tumour without penetrating the peritoneum. The tumour was therefore subperitoneal. It appeared

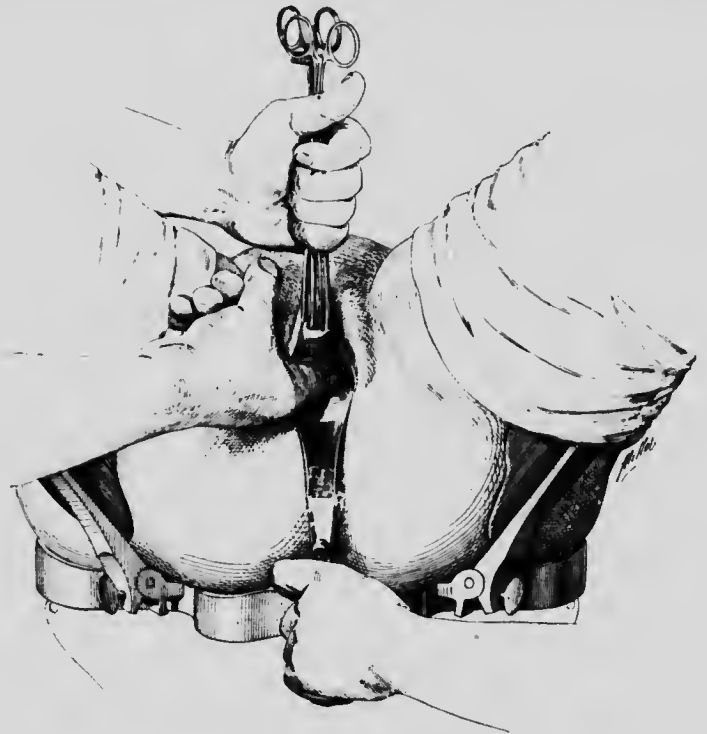


FIG. 802. POSTERIOR COLPOTOMY. DIGITAL EXPLORATION OF DOUGLAS'S POUCH.

between the retractors white and doughy. An incision by the scissors gave issue to the hairy and sebaceous contents, and the pouch was removed. The operation lasted three minutes, and the peritoneum was undamaged. The pouch of Douglas was then incised to explore the adnexæ. These being diseased on both sides, immediate castration was performed.

By the same route I have also removed large subperitoneal fibromata which originated in the lateral wall of the uterus and perforated it to develop in the broad ligament.

These examples serve to show that posterior colpotomy is an excellent

operation, and can be considered as a method of choice whenever it can be practised. Laparotomy should be reserved for tumours with a distinct abdominal evolution.

We will see later that it is of necessity the primary stage in the author's operation for all vaginal hysterectomies by the procedure of anterior median hemisection. The removal of the uterus can be practised after direct determination of the diagnosis.

This method also escapes the strictures passed upon Péan's operation of hysterectomy by morselling, since the uterus is not sacrificed before the condition of the adnexæ is verified.

**Operation.**—The exploratory incision of the posterior vaginal cul-de-sac is practised in the position of vaginal hysterectomy. The patient lies on her back, the seat is placed at the edge of the operating table, and the legs are extended on the thighs, which are in abduction. This position is preferable to the lithotomy position, where the legs are flexed on the thighs and the thighs on the pelvis. The axis of the vagina is not ascending, but horizontal, which renders it more accessible to the use of instruments (Fig. 752).

The vulva is shaved and well washed with soap, as is the vagina, and disinfected with 2 per 1,000 sublimate solution.

*Preliminary Stage.*—The cervix is seized by its posterior lip by two toothed forceps, and drawn upwards by the left hand. The fourchette is depressed by a short retractor.

*First Stage.*—The mucous membrane of the posterior vaginal cul-de-sac is incised with strong straight scissors 8 to 10 millimetres behind its insertion in the cervix from the right lateral cul-de-sac to the left. This curved incision with concavity forwards measures from 5 to 6 centimetres, and extends on either side towards the lateral parts of the vagina. The cervix is drawn upwards and forwards, while the retractor depresses the posterior edge of the wound, and the pericervical cellular tissue is incised. If the peritoneal cul-de-sac be normal it is immediately opened. The shut scissors are introduced and brought out widely opened; 15 to 30 grammes of lemon-coloured serosity flows out. Incision of vagina and Douglas's pouch are generally effected in fifteen to twenty seconds.

*Second Stage: Exploration of the Pelvic Cavity.*—The right index finger is immediately introduced by the wound in order to explore the posterior surface and fundus of the uterus. The adnexæ on either side are brought out for examination if necessary. If the lesion be unilateral and there exist few adhesions, the diseased adnexæ can be seized between the jaws of a ringed forceps and drawn as far as the vaginal orifice. When there are adhesions the forceps is held in the right hand for the left side, and the left index finger penetrates Douglas's sac in order to liberate them, and gradually the ovary and Fallopian tube appear outside. The pedicle, if long enough, is ligatured *en masse*. It is then ligatured after transfixion, and the ligature is fixed by a third knot to the commissure of the vaginal orifice.

Whether the pedicle be ligatured or held by forceps, it is useful to crush it in the jaws of the author's éraseur. The pedicle becomes reduced by this means to its two peritoneal strips, and hæmostasis can be assured by a

simple silk ligature. A circular ligature is made, which is turned into a Dionis knot by double transfixion of the pedicle above the circular ligature. A second circular reinforcing ligature is applied, and the silk is fixed to the mucous membrane at the fundus of the vagina. For double security a ring forceps may be placed on the pedicle, which is left in position forty-eight hours, and which will serve as a drain.

If forceps are left in position, preliminary crushing of the pedicle has this advantage, that the tissues to be held in the jaws of the forceps are thinned and reduced to the thickness of fibrocellular tissues only. Elimination of the sloughed portions, which used to be very slow, becomes rapid.

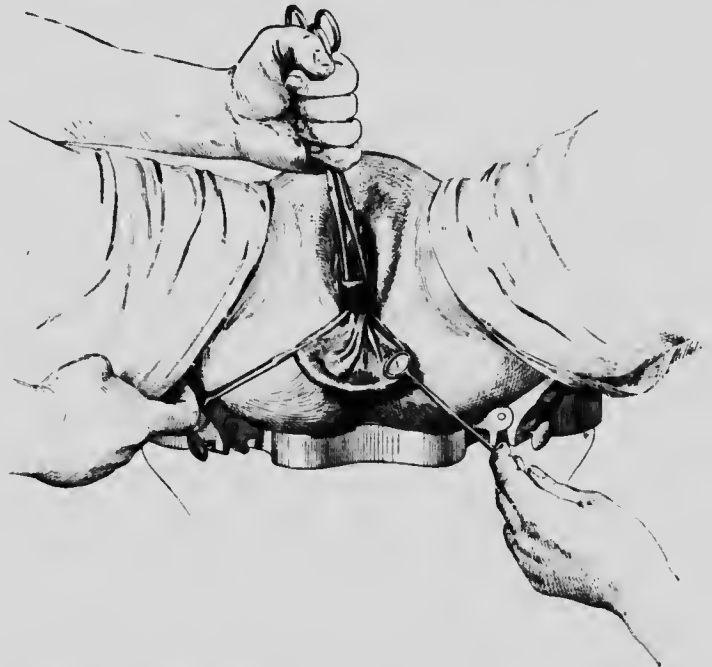


FIG. 803. THE SAME. REMOVAL OF AN OVARIAN CYST BY THE VAGINA.

Whether ligature or forcipressure be adopted, the principal point is to hold the pedicle in the upper part of the vagina and to prevent it mounting high up in the peritoneum, where it may provoke grave complications.

The application of forceps in unilateral ablation of the adnexæ by colpotomy should therefore be followed by the application of a ligature with No. 10 silk placed immediately above the upper pair of forceps.

Combination of ligature and forcipressure alone gives absolute security. An aseptic compress is placed in the peritoneal orifice, which is removed on the fifth day should no complications arise. The forceps is removed in fifty to sixty hours.

## COMPLICATIONS OF POSTERIOR COLPOTOMY.

*Obliteration of the Pouch of Douglas.*

The operation is not always so simple as is described. Old adhesions may obliterate the pouch of Douglas. The uterus, immobilized, is situated very high, and forceps placed on the cervix cannot bring it down. Certain modifications of detail are necessary.

As soon as the posterior vaginal cul-de-sac is brought into view by combined action of retraction and traction on the cervix, the wall is sectioned as far as the uterine tissue. Blunt scissors are introduced into the open wound and the wound is opened by divulsion. The right index finger, introduced into the wound, feels at once that the posterior wall of the uterus is not free. The adhesions are destroyed by the finger following the surface of the uterus, which is a sure guide. Often serous or purulent cysts are opened, and drain during this manœuvre. If extensive peri-uterine disorders are found vaginal hysterectomy is performed at once.

Exploration of the pouch of Douglas, by liberating the posterior surface of the uterus, prepares this organ for extirpation.

Colpotomy is an excellent method of exploring cases of widespread encysted pelvic suppurations, which extend beyond the true pelvis and reach the umbilicus. If the lower part of the pouch be distinctly felt by vaginal examination, it is almost always possible to reach it and evacuate it by retrocervical colpotomy. Simple incision of peri-uterine purulent foci is much less grave than immediate hysterectomy, since total removal of the uterus creates a wide communication between the purulent foci and the peritoneal cavity. Wide incision of the posterior cul-de-sac allows the purulent foci to be evacuated below the adhesions and avoids contamination of the peritoneum. Simple evacuation of purulent foci by posterior colpotomy is the method of choice in very extensive pelvic suppuration. The foci are plugged and free irrigations are commenced after the sixth day. A definite cure may follow this intervention; this has already been observed to occur after spontaneous opening of an abscess into the intestine. Why, then, should not cicatrization occur after a wide vaginal incision followed by methodical plugging and antiseptic irrigations?

If the vaginal orifice remains fistulous and the patient be subject to fresh suffering, vaginal hysterectomy can be performed several weeks after the colpotomy. The purulent foci which have been evacuated are then reduced in dimension, and the total ablation of the uterus and adnexæ is practised under excellent conditions.

Colpotomy, then, should be reserved for certain distinct cases. It is the method of choice when the incision of the pouch of Douglas can give direct access to peri-uterine tumours. In cases with distinct abdominal evolution reaching the iliac fossæ or the umbilical region, colpotomy serves as an exploratory operation only, followed by the opening and evacuation of the pelvic purulent foci.

Ovarian cysts containing several litres can be removed by colpotomy provided that there exist no high adhesions. These cases are rare. If this operation be attempted the cyst is removed after evacuation, using the greatest precaution not to tear any omental adhesion which may be the site of secondary hemorrhage. Should this complication arise a laparotomy is performed.

*Crushing the Oviducts without Removal of the Adnexæ.*

It has been proposed to extirpate the adnexæ to stop fecundation in women who suffer repeatedly from eclampsia. In 1908 I attempted to obtain the same result by crushing the two oviducts at several points with my short-jawed forceps. This operation is performed by posterior colpotomy. The adnexæ, first on the left side and then on the right, are recognized and drawn to the vulva. On either side two forceps are placed on the oviducts about their middle and are firmly compressed. They are left two minutes in position. The oviduct is then cut in the groove formed by the forceps. They are reduced, and a compress is placed in the wound. The compress is left in position for two to three days.

**Vaginal Hysterectomy.**

The indications for vaginal hysterectomy have extended by degrees to cover a large variety of cases. Originally reserved for the cure of cancer, where it was found to be absolutely powerless, the total removal of the uterus by the vagina has been applied to the cure of fibromata, grave uterine neuralgia, prolapse, bilateral lesions of the adnexæ, and pelvic suppurations.

**History.**—The first total vaginal hysterectomy is attributed to Andreas of Cruce (1560). Marshall (1783) and Langenbeck (1813) seem to have performed incomplete hysterectomies in cases of prolapse. We may note next the operations of Santer (1822) and Blandell (1828), and of Récamier (1829), who applied preventive ligature to the broad ligaments and cured his patient; Kieter (1848) and Henning (1876), who removed the ovary and left tube with the uterus in a case of grave metrorrhagia.

Vaginal hysterectomy was now abandoned. It became a definitely regulated operation only after Czerny's researches. Czerny was the first, in 1879, to perform this operation in series. He followed Récamier's method of ligature of the broad ligaments. Billroth, Schroeder, Martin, Woelfler (1880), Mikulicz, Tenffel, Kocher, and Muller (1881) followed Czerny's method.

In 1881 Haidlen published statistics of fifty-two total vaginal hysterectomies, with a mortality of 32 per cent.

In 1884 the proportion of unsuccess was still considerable. Martin, in 1886, united in statistics the operations of six of the most eminent operators. He obtained 311 cases, with a mortality of 15 per cent. The mortality soon diminished in the hands of experienced surgeons.

The first series of statistics published by myself at the Gynæcological

Congress of 1892 comprised 112 cases: 23 hysterectomies for cancer, with 2 deaths; 28 for fibroma, with 1 death; and 61 for inflammatory lesion, with 3 deaths; giving a mortality of 5.3 per 100. Of the first 18 cases I lost 3 patients. The first fatality was caused by the use of defective forceps, which allowed the utero-ovarian arteries to slip. In the following 41 cases I had 2 failures, and 1 during the following 53. Since this date it is an exceptional event to lose a case of vaginal hysterectomy.

I found during my first operations that the proportion of failures varied according to the severity of the case, and particularly if it were performed in cases of cancer, fibroma, or inflammatory lesion.

The mortality in cases of cancer oscillated between 6 and 10 per 100; for fibroma between 4 and 6 per 100; for inflammatory lesions between 2 and 5 per 100. These figures concord with the provisions which were possible. Operations for cancer were often incomplete, and the peritoneum became infected during the course of the operation; the patients were cachectic and of very feeble resistance. Patients with fibroma are more resistant as a rule, but the operation may be difficult and the breach in the peritoneum is generally very extensive. In cases of inflammatory lesions, with a good technique the uterus is usually rapidly removed, together with its adnexæ, and old adhesions help, in a singular fashion, the rapid closing of the pelvic peritoneum.

I never perform hysterectomy for cancer at present, and the mortality has fallen in consequence below 2 per cent, since I have employed combined ligature and forcipressure of the broad ligaments.

The history of the operative technique of vaginal hysterectomy is very succinct. Czerny and the German school practised, as did Récamier, ligature in stages of the broad ligament.

To whom should be given the credit of the methodical application of definitive forcipressure by instruments of the broad ligaments? Spencer Wells was the first to think of leaving forceps gripped on the broad ligament. His pupil, E. Jenning, in 1885, cured a patient by this method. Péan on June 19 and August 5, 1885 (Obs. 773 and 774), combined ligature and forcipressure, his operation of August 5 lasting four hours. On August 21, 1885, he was forced to leave forceps in position on the broad ligaments, the uterus being softened and cancerous and difficult to extirpate. The patient died on the third day (Obs. 775). The operation lasted two hours.

On July 6 and 19, 1886 (Obs. 906 and 907), Péan still practised ligature of the broad ligaments and suture of the vagina, using his special needle and metal sutures. At this date he did not methodically leave forceps on the broad ligaments. It was only on July 21, 1886, after Richelot's communication to the Academy, that he began methodically to leave forceps on the broad ligaments, which he had hitherto only made use of for preventive hæmostasis. Richelot had already proposed on November 11, 1885, to leave forceps in position, following the idea of Spencer Wells. On July 8, 1886, he put this plan in execution, and communicated his result to the Academy of Medicine on July 13, 1886. His method was followed by the majority of his colleagues.

These dates can easily be verified, and assure incontestably to Richelot the priority in the routine application of forceps which are left in position after vaginal hysterectomy.

Richelot employed specially made forceps, curved on the flat, which he applied from below upwards. He left four forceps at least in position.

In my first case I used Richelot's forceps. These forceps were badly made, and the ligaments slipped from them as they were tightened. The two utero-ovarian arteries bled into the peritoneum, and the patient died (the case was one of cancer of the uterine body).

Remarking the defects of Richelot's forceps and of all long forceps whose extremities were driven apart as they were closed more tightly, I caused M. Collin to construct my first elastic-jawed forceps (January, 1887). These forceps, conceived on a new principle, have canalized jaws which are slightly concave on the flat. Their extremities touch, while the middle parts are still 8 to 10 millimetres the one from the other.

When the handles are strongly pressed together the extremities tighten; the central part then tightens and finally comes into contact.

If the jaws of a Richelot's forceps are used to compress a folded handkerchief, the tighter the forceps are shut the freer becomes the part of the handkerchief held between the ends of the jaws which divulge. But if the same handkerchief be held between the jaws of my elastic forceps, the extremities first press into the tissue and the central part of the jaws only bite when the forceps is shut as far as it will go. The same will be observed if a small cylinder of wood is used. With these elastic forceps, when properly placed in position, there is no danger of seeing a part of the broad ligament escape at the moment of section.

This instrument, presented for the first time at the Paris Surgical Conference of 1887, caused a revolution in the construction of other types of long forceps, and Richelot was one of the first to adopt the principle of elasticity of jaws for his curved forceps, which to-day are no longer used.

The ancient models were definitely transformed according to the principle I established; their jaws which hitherto were rigid and which came into contact equally over their whole length, were constructed curved on the flat and elastic.

#### METHOD OF APPLYING DOYEN'S FORCEPS ON THE BROAD LIGAMENTS.

In my first operation, using Richelot's forceps, I entirely detached the uterus from the bladder and rectum before gripping the broad ligaments, which were seized from below upwards.

In the second operation I used elastic forceps from below upwards, and the patient recovered.

In the third case, which was for fibroma, I first employed median anterior hemisection followed by morselling in **V**. The forceps were applied from above downwards on the broad ligaments, which were twisted 180 degrees on their axes.

Finally, I adopted the method of crushing the uterine pedicle with the

large model éraseur. The application of this instrument reduces the pedicles to the thickness of their fibrocellular tissues. Crushing the ligamentary pedicles makes it necessary to grip and ligature only one thickness of tissue, which is much reduced. By the attrition of the tissues all danger of secondary hæmorrhage is avoided.

Cicatrization is more rapid, for the elimination of the tissues treated by the éraseur is very rapid.

My first technique for this operation, in 1887, has not altered except in slight modification of detail. My two principles—median anterior hemisection, either simple or in **V**, and the rejection of all preventive hæmostasis—rest intact.

### Hysterectomy in Cases of Metro-Salpingitis without Adhesions and without Large Increase in Size of the Uterus or its Adnexæ.

*Preliminary Precautions.*—The patient is purged before the operation. If the vagina be narrow, an air pessary is applied the evening before the operation. The patient is anaesthetized, the vulva is shaved under chloroform, and the vagina is washed with hot water and soap several times, and finally with 2 per 1,000 sublimate solution. The bladder is emptied by a sterilized catheter, the vulva is again washed with sublimate, the legs and thighs are covered with sterilized towels, and the operation commences.

*Position of the Patient.*—The best position for vaginal hysterectomy is that represented in Fig. 752.

In this position the thighs are in semiflexion and abducted; the legs are extended on the thighs. The axis of the vagina is horizontal and almost descending (Figs. 752-753). The manœuvres of traction and reversing the uterus are thus greatly facilitated.

*Operation—Preliminary.*—The cervix is seized by its lateral commissures with two toothed forceps. It is drawn down as far as is possible, and a final bimanual exploration is made. At the same time an attempt is made to mobilize the uterus.

*First Stage.—Opening and exploration of the pouch of Douglas.* A retractor,  $4\frac{1}{2}$  centimetres in width and 6 centimetres long (No. 1), is placed on the fourchette. The cervix is drawn upwards with the left hand as for posterior colpotomy. The posterior vaginal cul-de-sac is immediately incised with scissors from the patient's right to left (Figs. 768 and 769).

The wound gapes open; the retractor depresses the posterior vaginal wall; several deeper cuts of the scissors are made towards the posterior part of the cervix, and Douglas's pouch is perforated. A small quantity of lemon-coloured serous fluid escapes.

The scissors are now introduced shut into the peritoneal breach and brought out open, to open the orifice by division without the risk of hæmorrhage (Fig. 770).

The retractor is removed, and the right index finger, introduced by the orifice, exposes the posterior surface of the uterus, the adnexæ, and the cavity



of the pelvis. In simple cases this exploration is practically instantaneous (Fig. 802). The diagnosis can now be completed. When the patient is young, hysterectomy should not be performed unless the adnexæ on both sides are altered and the patient thus condemned to sterility.

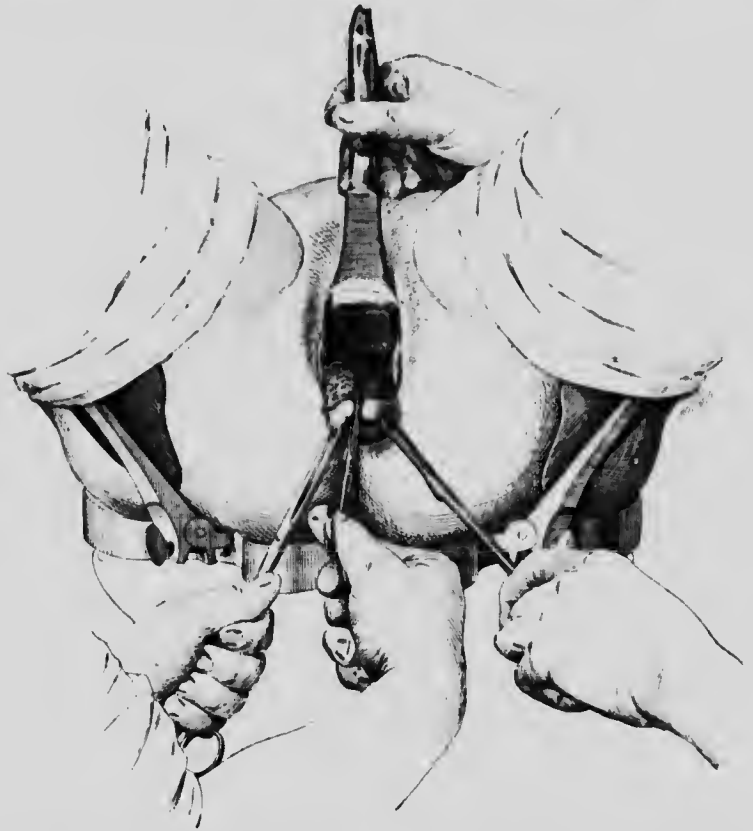


FIG. 804. —VAGINAL HYSTERECTOMY. THIRD STAGE: ANTERIOR HEMISECTION OF THE CERVIX.

Nothing is left to chance, and a precise diagnosis is made before a particle of uterine tissue is sacrificed. At the moment of exploration of Douglas's pouch the surgeon may reduce the intervention to a simple colpotomy or to unilateral ablation of the adnexæ.

*Second Stage.—Incision of the anterior vaginal cul-de-sac and detachment of the bladder.* The retractor is placed in front below the pubis, and the cervix is drawn downwards. From his left to right the surgeon incises with blunt-nosed scissors the anterior vaginal cul-de-sac, thus completing the circular incision of the vaginal attachments of the cervix.

This incision is made, directing the extremities of the scissors towards the cervix. The reflexion of the anterior vaginal mucous membrane is exactly severed, keeping close to the cervix in order to avoid any risk of wounding the bladder (Figs. 757 and 758). Downward traction on the forceps, combined with the action of the retractor, makes the wound in front of the cervix gape open.

The bladder is fixed at this point to the anterior vaginal cul-de-sac by a very clear and constant bundle of muscular tissue. This is represented in Figs. 753 and 757. It must be cut across transversely in order to obtain access to the loose cellular space (that of Jobert de Lamballe), separating the bladder from the supravaginal portion of the cervix.

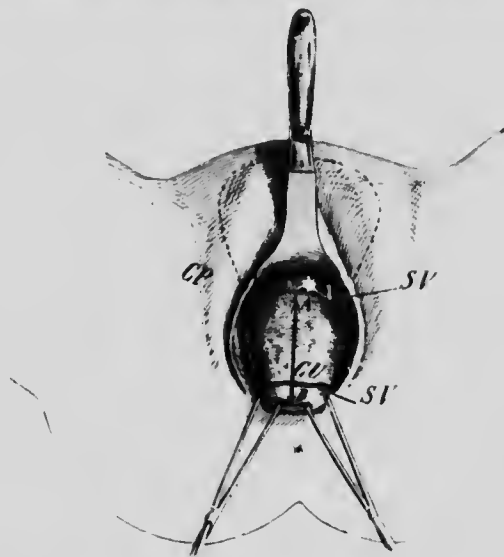


FIG. 805. THE SAME. DIAGRAM SHOWING INCISION OF ANTERIOR VAGINAL CUL-DE-SAC AND ANTERIOR HEMISECTION OF CERVIX.

This section is brought about by directing the ends of the scissors towards the cervix. In some cases it is useful to push toward the deeper parts everything in front of the cervix, using the finger and a sterilized compress. The finger pushes the compress and tears through the last vesico-uterine adhesions, and pushes high up into the depths of the wound the base of the bladder, and the ureter, which is separated from the bend of the uterine artery. The latter is drawn towards the vulva by traction on the cervix. This step is very important, for it definitely separates the ureters from the uterine arteries and prevents any wounding of these canals, wounds which are so frequent when a technique such as that of Péan or Segonde is employed.

*Optional Stage.*—The broad ligaments can now be crushed with the large model écraseur. The crushing obliterates the utero-ovarian arterial system. It is useless to section the ligaments between the écraseur, which is left in position for two minutes, and the uterus. This manoeuvre greatly facilitates the extraction of the uterus.

*Third Stage.*—*Median anterior hemisection of the cervix. Opening of the anterior peritoneal cul-de-sac. Median anterior hemisection of the body and extraction of the uterus.*

The anterior retractor is made to retract the bladder. The toothed forceps are more solidly placed on the lateral portions of the cervix, which is now entirely free. The anterior lip is incised with a cut of the scissors.

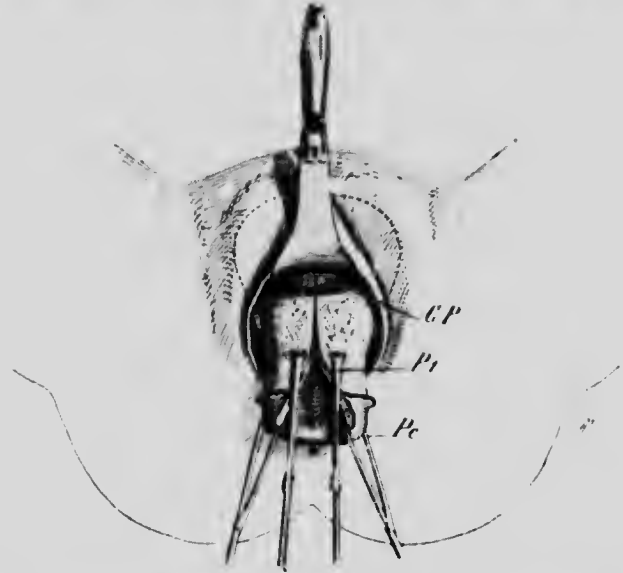


FIG. 806. THE SAME. APPLICATION OF FORCEPS  $P_1$  ON THE TWO EDGES OF THE SECTION OF THE ANTERIOR WALL OF THE CERVIX.

The vesico-uteric peritoneal cul-de-sac, during the detachment of the bladder, remains applied to the anterior surface of the uterus (Fig. 816). It is opened, when the uterus comes down easily by the second or third cut of the scissors. If it be not apparent, a forceps is applied on the left lip of the cervical cut as high up as possible, and another on the right lip. These forceps are drawn down by the left hand, the retractor is removed, and the right index finger is pushed between the bladder and the uterus in front of the anterior peritoneal cul-de-sac.

The retractor is replaced in position and the anterior median section of the uterus is continued. The peritoneal cul-de-sac is opened; the orifice is enlarged by division, as in the case of the pouch of Douglas.

A third forceps is placed on the right edge of the uterine section, this time on the body of the organ, which is visible through the gaping wound in the serous membrane. The subjacent forceps is brought to a symmetrical position (see Fig. 808).

The hemisection of the uterus is prolonged with a further cut of the scissors, and at a higher point,  $P_3$ , the forceps which were applied on the cervix,  $P_1$ , are applied. Traction is made on these two upper forceps, and the fundus of the uterus appears gaping at the vulva (Fig. 809).

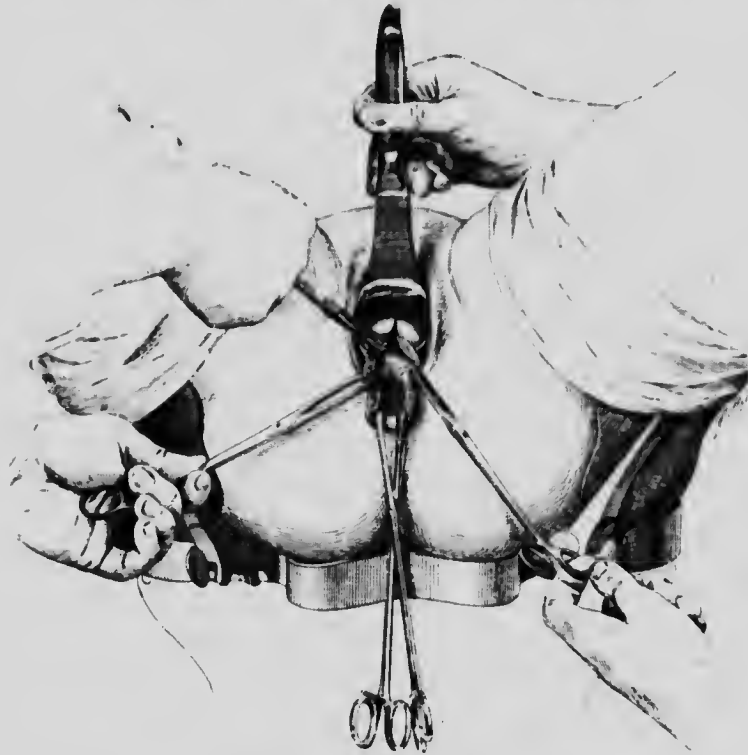


FIG. 807. THE SAME. APPLICATION OF THE FIRST FORCEPS  $P_2$  ON THE LEFT (SURGEON'S) EDGE OF THE ANTERIOR UTERINE SECTION.

Tractions on forceps  $P_2$  have lowered the uterus and hemisection has been prolonged on the body of this organ, opening the anterior peritoneal cul-de-sac.

If this stage of the operation be rendered difficult by the narrowness of the vagino-peritoneal opening, which may be very rigid in women who have never borne children, the index finger is introduced below the retractor as far as the peritoneum.

The retractor is now removed, and the front of the finger, passing beyond the uterus, depresses it and pulls it down, while the other hand pulls down-

wards and forwards on the two forceps, which are fixed high up on the edges of the median anterior hemisection of the body of the organ (Fig. 810).

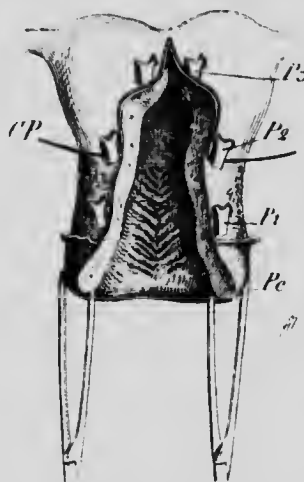


FIG. 808. THE SAME.

The cervical forceps  $P_3$  remain in position until the end of the operation. CP, the anterior peritoneal cul-de-sac, and  $P_1$ ,  $P_2$ ,  $P_3$  the different prehensions of the cervix and body of the uterus.

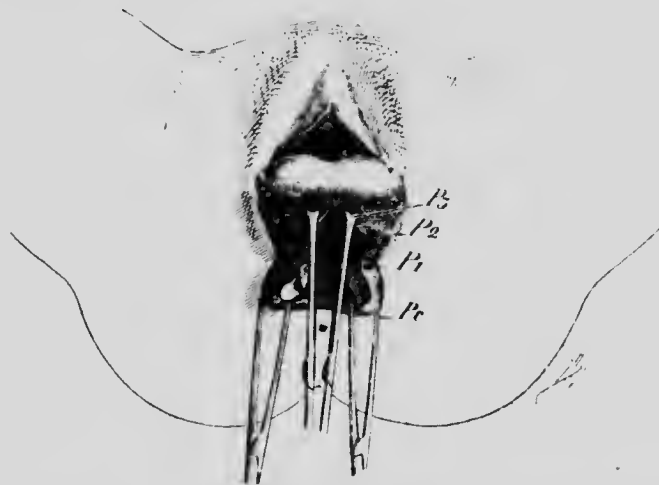


FIG. 809. THE SAME.

The two forceps  $P_3$  by their traction on the edges of the anterior hemisection of the uterine body bring down the fundus of the uterus and bring it out of the vulva.

*Fourth Stage.*—Removal of the adnexa. *Hæmostasis of the broad ligament by ligature and forcipressure.*

If the uterus and adnexæ are small and free from adhesions, the latter appear at the vulva with the fundus. If the adnexæ remain in the depths of the wound, two fresh toothed forceps are placed on the uterus, which are drawn downwards as far as possible; a retractor is introduced in front below the bladder, and an attempt is made to bring the Fallopian tubes and the ovaries into view. The most accessible adnexæ are seized by ring forceps provided with a catch (Fig. 811). Their pedicle lengthens by traction, and they are gradually drawn towards the vulva, where they are fixed, and the same manœuvre is repeated on the opposite side.



FIG. 810.—THE SAME.

The finger passing between the bladder and the uterus depresses the fundus and facilitates the removal of the body.

Hæmostasis is carried out at the end of the operation. The ligament on the left side is crushed; a Doyen's elastic forceps is applied from above downwards below the adnexæ on the left broad ligament; a reinforcing forceps is immediately placed beyond. Section is made below the forceps. The same procedure is carried out on the right broad ligament, and the uterus is detached, to the two cornua of which are attached the adnexæ.

#### SAFETY LIGATURES.

I place a strong circular ligature, completed by two safety ligatures in a Dionis knot, above the highest pair of forceps on each broad ligament. These ligatures are applied in order to prevent the ascension of the ligatured pedicles into the peritoneum when the forceps are removed. The ends of the ligatures are tied together so that the two broad ligaments are fixed in

the neighbourhood of the fundus of the vagina, and the ends are fixed outside the vulva.

*Fifth Stage.*—The retrovesical peritoneum is seized in a long curved forceps; the peritoneum of the pouch of Douglas is seized in another forceps, a No. 2 retractor is introduced in front, a No. 3 retractor behind; and the field of operation is carefully sponged with aseptic compresses. Hæmostasis is thus verified.



FIG. 811. —THE SAME.

The uterus hangs at the vulva. Extraction of the left adnexæ.

One or two compresses are then applied as plugs, according to the diameter of the vagina. The upper compress must reach exactly the level of the ligatures. The forceps left in position on the right and on the left are sufficient to assure drainage.

*Advantages of this Procedure.*

Vaginal hysterectomy by the author's method is a very simple operation, and can be successfully attempted by all surgeons.

Hæmorrhage is not to be feared; the vaginal arteries are negligible.

Should an ill-directed cut of the scissors wound an artery of the lower edge of the broad ligament, the vessel is seized by short-nosed forceps, and the operation proceeded with. This little incident occurs once or twice in a hundred hysterectomies. It is quite useless to encumber the field of operation, as did Péan and Segonde, by placing two strong forceps on the lower edge of the broad ligaments. The anterior and posterior vaginal incisions give rise to no appreciable loss of blood in the absence of arterial abnormality.

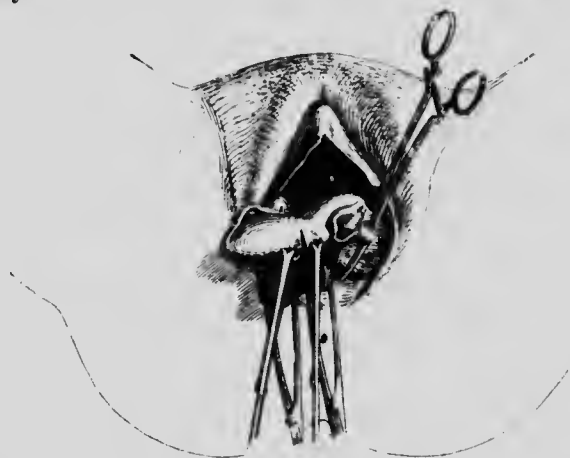


FIG. 812.—THE SAME.

Application of the first elastic forceps below the adnexæ on the broad ligament.

*Treatment of Pedicles.*

Much discussion has taken place on the subject of the ligature of the broad ligaments; whether they should be ligatured, or if forceps should be left in position upon them. In resolving this question the surest procedure should be adopted—namely, that which prevents all post-operative complication. The great inconvenience of buried ligatures, even when applied in stages, is that the tubo-ovarian pedicles mount into the peritoneal cavity. If these pedicles are cut by the thermo-cantery they may become infected in the vagina. The broad ligaments, lengthened during the operation, retract, and the ligatures rise as high as the upper inlet. It is in this way that intrapelvic septic phenomena may supervene several days after operation.

If the ligature is only moderately tightened, a secondary hæmorrhage may arise, which is all the more dangerous in that it is intraperitoneal and



gives no external sign of its presence. But the tubo-ovarian pedicles are difficult to ligature at the vulval orifice, and the dragging on the broad ligaments is against the proper tightening of the thread. The ligatured tissues may escape by degrees under the efforts of the patient in vomiting, etc.

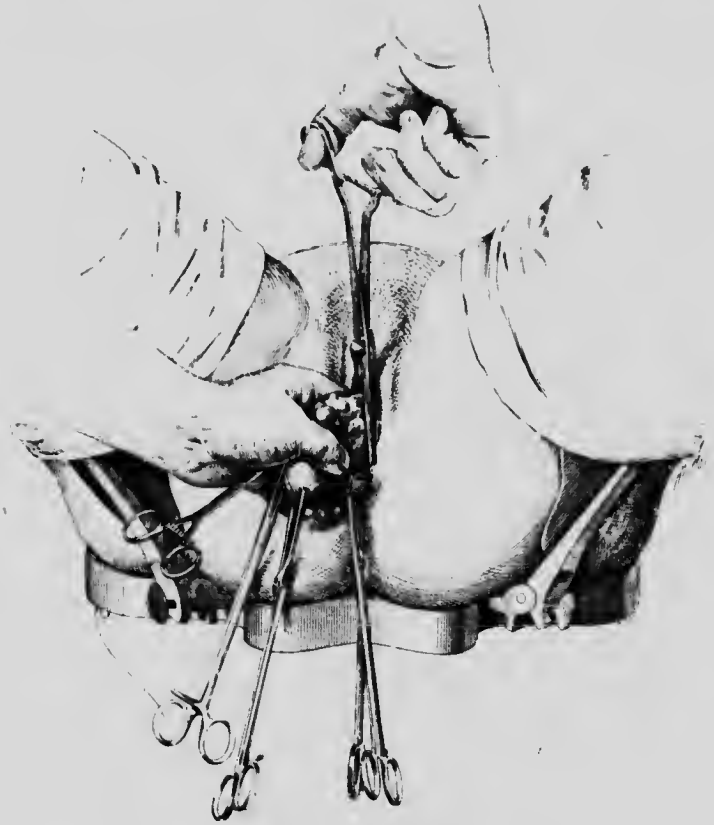


FIG. 813. THE SAME.

Application of elastic forceps to the left broad ligament. The ends of the jaws must pass beyond the lower edge of the ligament.

#### DRAWBACKS OF PREVENTIVE FORCIPRESSURE.

Preventive forcipressure as recommended by Péan was as defective as the hurried ligature. It is irrational and dangerous, because it exposes the ureters to the risk of damage without removing the danger of secondary hemorrhage. The forceps placed on the broad ligaments from the commencement of the operation encumber the field of operation without properly assuring hemostasis.

ADVANTAGES OF DEFINITIVE FORCIPRESSURE COMBINED WITH LIGATURE.

Preventive hæmostasis having been abandoned, we are left with two methods: Ligature, and forceps left in position. The application of forceps at the end of the operation is simple and sure. The forceps are placed on the whole breadth of the broad ligaments from above downwards. But the pedicles are still liable to ascend into the abdominal cavity after removal

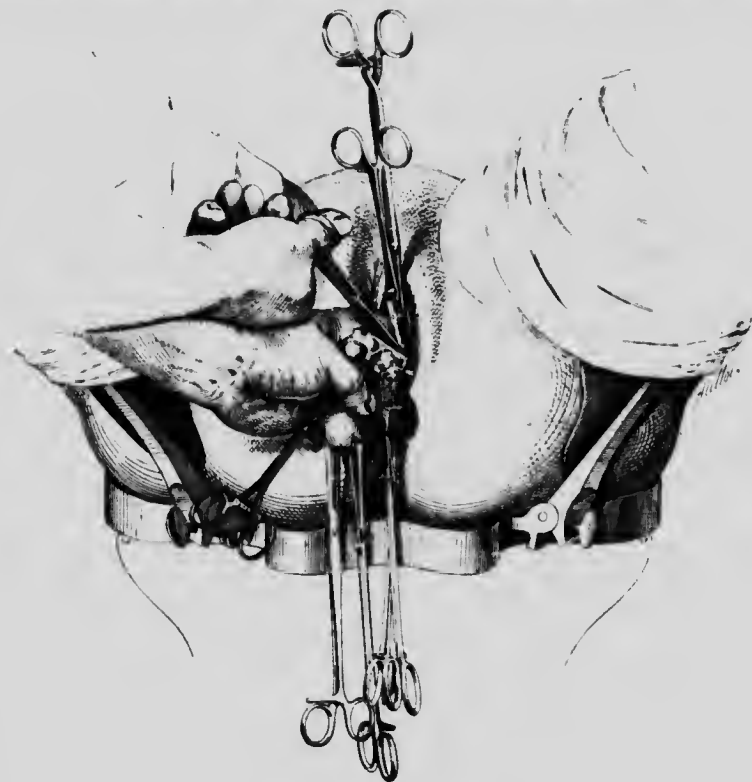


FIG. 814. THE SAME.

The reinforcing forceps is in place. Section of the broad ligament.

of the forceps. The pedicles, dragged upon and lengthened at the moment of extraction of the uterus, automatically regain their normal situation in the pelvic cavity. The forceps, too, may have been ill-placed. To grip the broad ligament is not difficult, but it may be gripped in an awkward manner, and the secondary ascension of the pedicles is to be feared above all where great difficulty has been experienced in drawing the ovaries out of the vulva. It is for these reasons that I place a strong ligature above the



FIG. 815. —THE SAME.

Aspect after operation. Two Doyen forceps are left on each broad ligament.



FIG. 816. VAGINAL HYSTERECTOMY. SECTION OF THE ANTERIOR VAGINAL CUL-DE-SAC.



FIG. 817. —THE SAME. SECTION OF POSTERIOR VAGINAL CUL-DE-SAC. DIVULSION.

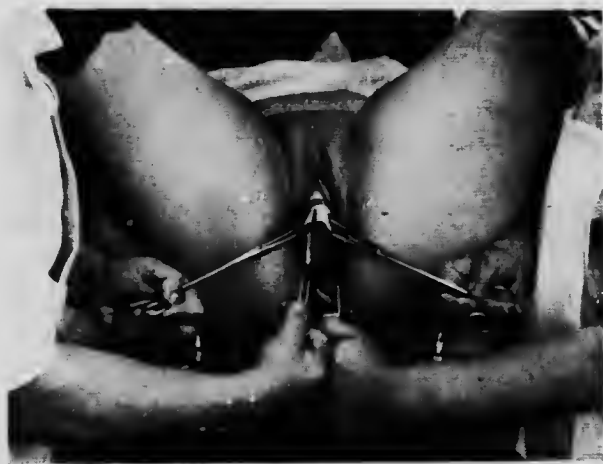


FIG. 818. —THE SAME. THIRD STAGE: MEDIAN ANTERIOR HEMISECTION OF THE CERVIX.

forceps. The ends of these ligatures, left long, are tied together. This prevents sloughing stumps from mounting into the abdominal cavity.

In simple cases, where the broad ligaments are extensive they may be ligatured instead of being gripped by forceps. In such cases I make first a circular ligature; three or four successive ligatures are then made by transfixion, using the same thread, followed by a final circular ligature. As soon as the broad ligaments are divided below the ligatures, two pedicle forceps are placed on the stumps above the knots. The right and left ligatures are then tied together. It will be seen that for prolapse outside the vulva, ligature is the better procedure. The indications for forcipressure and for ligature of the broad ligaments are precise.

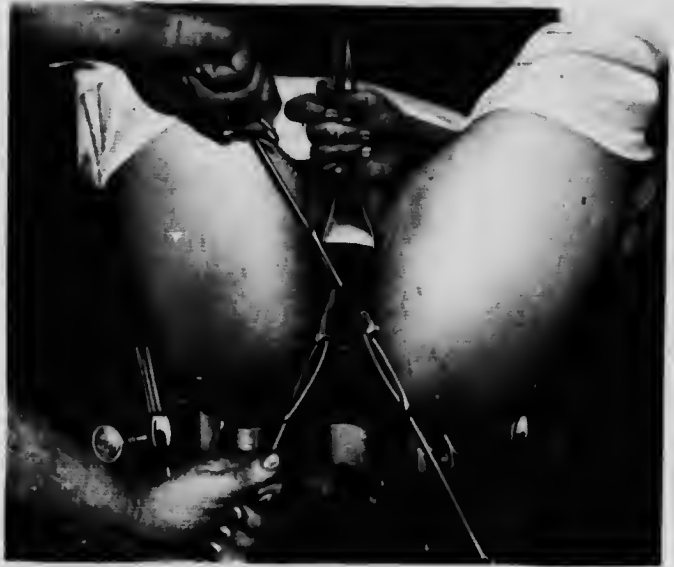


FIG. 819. THE SAME. APPLICATION OF A THIRD FORCEPS ON THE LEFT EDGE OF THE ANTERIOR HEMISECTION OF THE CERVIX.

1. **Ligature.**—Ligature can be practised when the ligaments are very lax and the adnexæ can be drawn out with ease. The uterine ligamentary pedicles are reduced to a thin consistence if, at the beginning of the operation, care be taken to push as high as possible the lower border of the broad ligaments with the fingers. A curved forceps is applied and the *écraseur* is employed above the forceps. Ligature is applied *en masse*. The ligature transfixes the pedicle at several points, and each time is tied. On each pedicle a forceps is placed, in order that they may be easily found in the case of oozing.

Toilet is then made of the field of operation, and the long ends of the ligatures are tied together. Drains and compresses are then arranged.

The compresses and forceps can be removed in forty-eight hours in the operating-room. Toilet is then made of the pouch of Douglas and a new compress is applied. This is left in position for four or five days. The peritoneum quickly closes above the ligatures, and the stumps of the broad ligaments are eliminated, at a later date, by the vagina.

**2. Forcypressure.**—Surgeons who often perform hysterectomy are aware that simple cases are the rarest. The extraction of the adnexæ, which should be the rule, is very difficult in the case of old adhesions. After extraction of the uterus the ringed forceps have great difficulty in seizing the Fallopian tubes and ovaries. Ligature of the broad ligaments is a labour of difficulty and by no means secure. Forcypressure must be adopted.



FIG. 820.—THE SAME.

A symmetrically placed forceps is applied on the right edge. The uterus is lowered. Continuation of the anterior hemisection on the body of the uterus.

The forceps are applied in the following manner: the left adnexæ, which are the first to be seized when the two sides are equally accessible, are drawn down by a ring-jawed forceps and brought outside. The broad ligament is seized between the left index and the middle, which are introduced from above. The cervix uteri, which has been isolated laterally as high up as is possible, by division from the lower part of the broad ligaments, is now quite close to the fourchette.

If the intestine and omentum tend to form a hernia, they are pushed back by a compress, which is pushed into the peritoneum. This compress is fixed by a long curved forceps, with a view to its ultimate removal.

The fingers penetrate from above downwards and feel for the limit of the lower border of the broad ligament. A large forceps is introduced from above downwards. The ends of the forceps are pushed beyond the inferior border of the ligament and the handles are brought together. The forceps is clipped together. The left hand is removed, and an examination is made to be sure that the labia minora are not caught in the forceps. As soon as the forceps is found to be in a satisfactory position the forceps are closed to their maximum. A reinforcing forceps is placed above the first, and the broad ligament is divided between this forceps and the uterus. The adnexæ remain adherent to the uterus. The manoeuvre is repeated on the right side, which is exposed, since the uterus, detached on its left side,



FIG. 821. THE SAME. APPLICATION OF A NO. 5 PAIR OF FORCEPS.

hangs at the vulva. If care has been taken from the beginning of the operation to detach as high as possible the cervix from the lower edge of the broad ligaments (which can be done by the fingers, without bleeding, at the end of the second stage), the portion of broad ligament which is seized in the forceps measures but 5 to 6 centimetres in extent. It occupies, therefore, about three-quarters of the length of the large forceps.

The extremity of the forceps corresponds to the lowest point of the ligament, which is twisted 180 degrees on its axis.

On either side, beginning with the left, a No. 10 silk ligature is passed above the forceps. Each broad ligament is ligatured, then transfixcd, and, finally, ligatured again. The peritoneal compress is withdrawn and a No. 3 retractor is applied behind. Toilet of the peritoneum is



FIG. 822.—THE SAME.

The uterus is extracted from the vulva. Application of a forceps to the broad ligament.

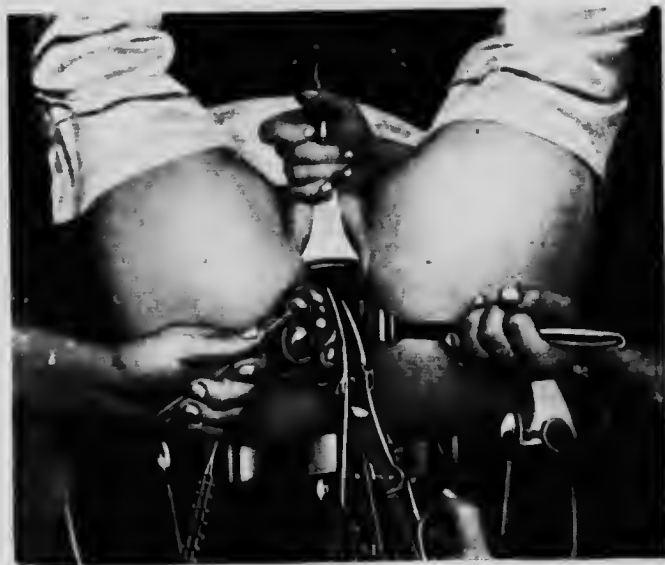


FIG. 823.—THE SAME. CRUSHING THE BROAD LIGAMENT BEYOND THE FORCEPS.



performed with sterile dry compresses mounted on a long curved forceps.

The anterior and posterior peritoneal folds are seized by two straight forceps, and the two ends of the ligatures are tied together.

The four forceps on the ligaments are held two by two in the left hand. The anterior serous fold is drawn forwards. A compress is introduced between the posterior retractor and the forceps, reaching to the lowest point of Douglas's pouch. The retractor is removed, and a compress is placed in front of the anterior serous fold, which is drawn downwards. If the vagina be wide three compresses can be employed.

Examination is made to see that the urethra has not been pushed into the vagina by the anterior compress, and the patient is removed to bed.

### Complications of Vaginal Hysterectomy.

#### HEMORRHAGE AT THE END OF THE OPERATION.

Exceptionally the posterior vaginal incision causes sufficient bleeding to call for the application of forceps at this point. If a jet of blood be observed after section of the broad ligaments, the source of the hemorrhage

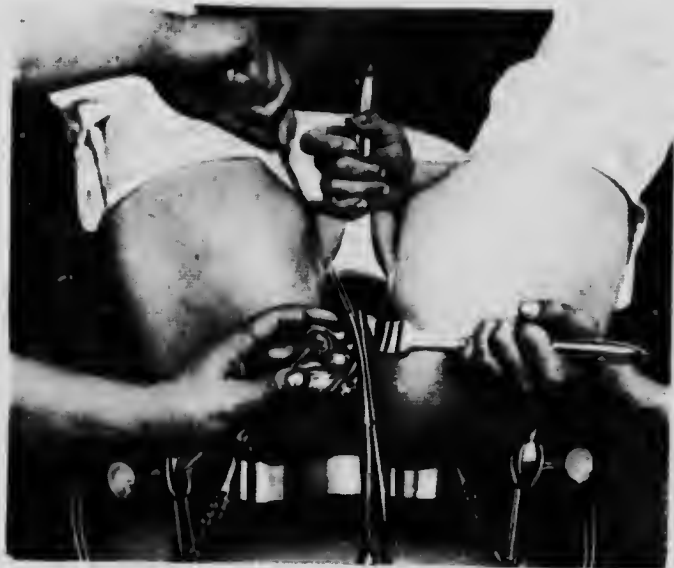


FIG. 824. THE SAME. APPLICATION OF ELASTIC FORCEPS IN THE GROOVE FORMED BY THE ÉCRASEUR. PASSAGE OF NO. 10 SILK LIGATURE TO LIGATURE OF VASCULAR PEDICLE.

is soon found either on the right side or the left. It is nearly always caused by the rupture of the utero-ovarian or uterine artery. When these arteries

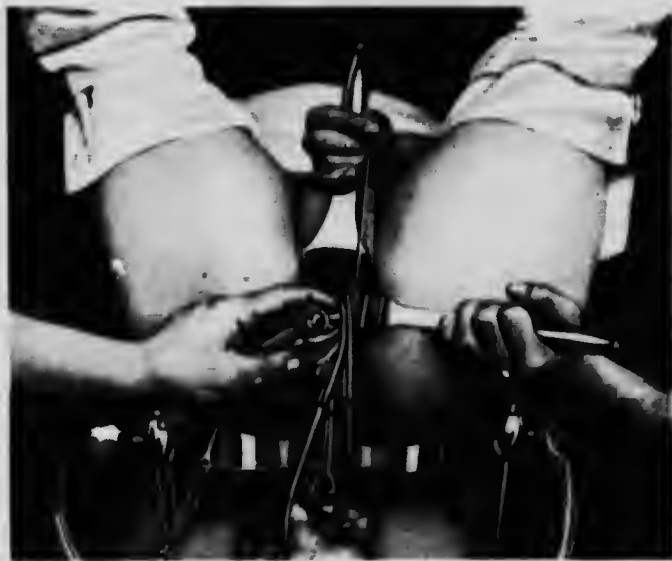


FIG. 825.—THE SAME.  
The ligature is tied above the forceps.



FIG. 826.—THE SAME. CRUSHING THE RIGHT BROAD LIGAMENT FROM ABOVE  
DOWNWARDS.

are atheromatous they may tear in the course of tractions on the uterus with the friable and inflamed tissues surrounding them. Retractor No. 3 is placed behind, a compress is placed in the peritoneum to push back the intestines, and the table is swung 15 to 20 degrees backwards. It can be seen at once, by the side on which the compress reddens, from which side the blood comes.

A second compress is employed as a sponge. Retraction is made, turning inwards the forceps holding the ligaments by a slight rotating movement: and the bleeding-point is sought. First the tear in the serous membrane appears, then a jet of blood which hits the opposite wall of the vagina with violence. The vessel is caught and the wound is plugged.

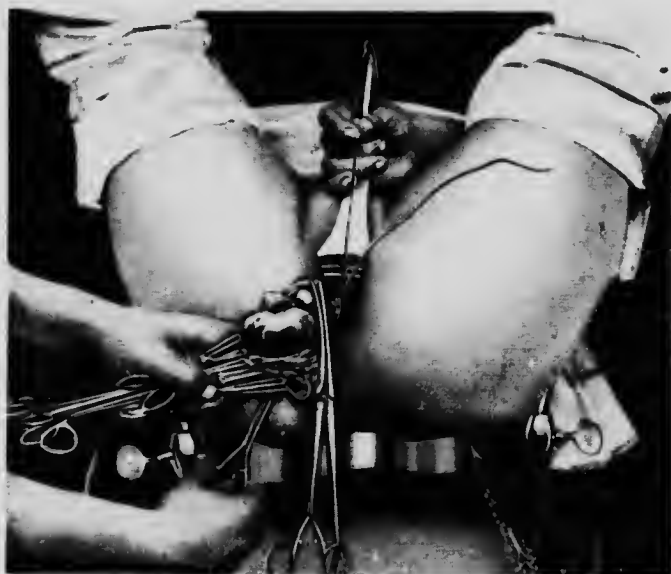


FIG. 827. —THE SAME. PASSING THE LIGATURE ON THE RIGHT BROAD LIGAMENT.

When the ligaments have been treated by one of the methods just described, a gaping artery is easily found and seized. In fact, seeing arterial blood come from the depths in the course of a hysterectomy for large fibromata, I have sometimes rapidly removed the uterus after placing forceps on but one broad ligament.

A compress is introduced at once into the peritoneal cavity. Retractor No. 3 is placed behind and No. 2 in front. The serous edges of the tear in the ligament are seized as far as its upper limit. The principal bleeding-point is caught separately and a large hysterectomy forceps is placed on the broad ligament, together with a reinforcing forceps.

An accidental tear of this nature of the whole of the broad ligament

happened in a virgin of forty years who had an ankylosed left hip, with the thigh in adduction and flexion. This woman had a fibroma weighing 1,000 grammes.

I performed vaginal hysterectomy. I was obliged to operate below the left ankylosed thigh, which crossed the field of operation. The uterus was almost entirely removed, when a flow of blood appeared at the vulva. A forceps was placed on the left ligament, which was severed. The blood came from the right side. The broad ligament on this side was almost completely torn through, so I tore away the uterus to complete the removal.

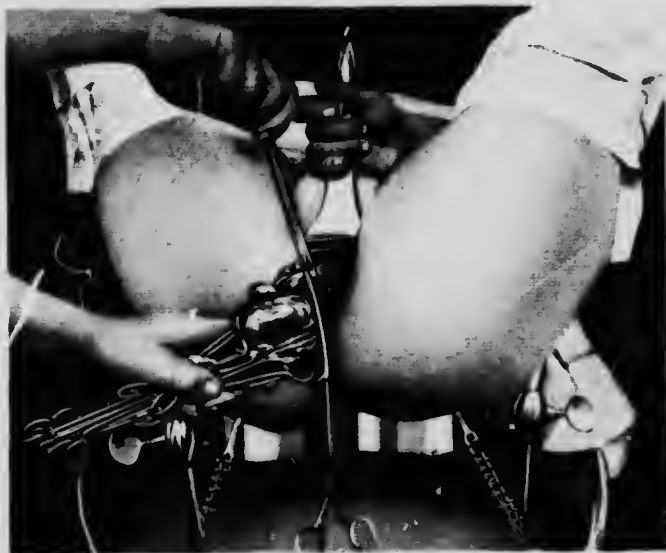


FIG. 828. THE SAME.

The elastic forceps is removed and the silk ligature slips into the groove formed by the *écraseur*.

A compress was placed in the peritoneal cavity, a retractor No. 3, placed behind. The tear in the ligament was found and progressively seized, and the ligament was clamped throughout its whole breadth. Safety ligatures were then applied above the forceps, and 50 c.c. mycolysine were injected beneath the skin of the thigh.

**AFTER-CARE.**—The patient is placed in bed on her back with the legs and thighs flexed. Three or four long icebags are placed on the lower abdomen. If much suffering exist, owing to the dragging on the broad ligaments, in spite of the icebags, an injection of morphine is given, and repeated if necessary. The vulva is packed with cotton-wool.

## IMMEDIATE POST-OPERATIVE HEMORRHAGE.

If hemorrhage occurs on the first day the patient must be immediately transported to the operating theatre. Any temporization is highly dangerous, for a clot in the depths of the wound may remain inoffensive for two or three days, and then putrefy and cause a mortal septicæmia. The compresses are removed, also any peritoneal clots. The bleeding-point is discovered and a forceps applied. It is not always necessary to anæsthetize the patient. Toilet of the peritonæum and plugging.

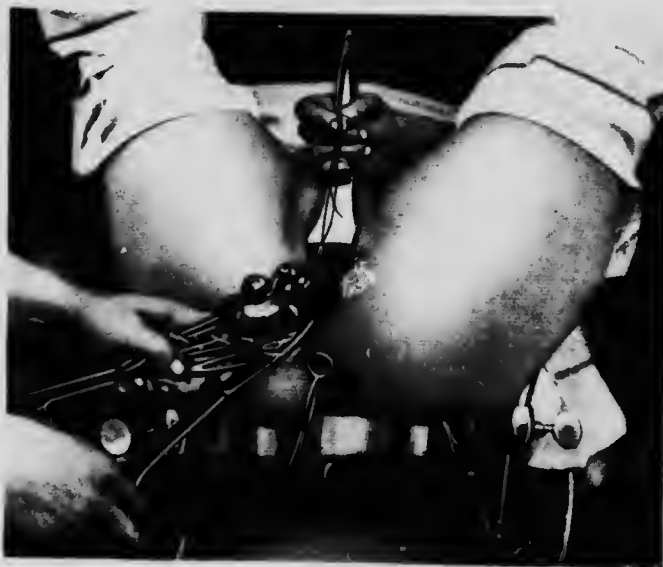


FIG. 829. THE SAME.  
The right ligament is ligated.

**Operative Sequelæ.**—In normal cases the vaginal temperature should remain below  $38^{\circ}$  C. A thermometer is introduced either between the compress and the vaginal wall or in the rectum. Distension is rare if the patient has been well purged before the operation.

Applications of icebags calm any tendency to colic caused by displacements of intestinal gas. The bladder is evacuated by catheter two or three times in the twenty-four hours. Constipation is the rule until the forceps are removed. Absolute starvation is the best means of preventing vomiting. If nausea occurs the patient should gargle with Vals water or cold Vichy without swallowing a drop. A small quantity of alcohol may be given in cases where great feebleness exists. Rum tea is well supported by the feeble. Nausea exists for twelve to twenty-four hours, and is rarer in patients who have been well purged before operation.

The forceps remain in position for forty-eight hours, and are removed on the second day after the operation.

All that is necessary to remove the forceps is to press together the finger-holds with the first three fingers of the right hand, at the same time using all the force of the left hand. The catch is disengaged, the jaws come apart, and the forceps come away without difficulty. The author's large forceps are specially designed for easy detachment.

The small forceps are more difficult to remove than the large. They sometimes remain tightly fixed. They must first be gently opened and then liberated by small rotating movements on their axes. The vaginal plug is kept in place by the finger when the forceps are drawn out.



FIG. 830. THE SAME.

The anterior and posterior edges of the peritoneum are seized by curved forceps. The compress, two drains, and the ends of the ligatures are seen.

The ligatures *en masse*, placed above the forceps, prevent the ascension of the pedicles into the upper part of the pelvis.

A purge is given on the next day (sulphate of magnesia). The plugs are removed on the third day if the temperature rises above  $39^{\circ}$  C. and the pulse has a tendency to become peritoneal.

This peritoneal irritation generally is not grave: it may be caused by the deep compresses which have been placed too high and bulge into the pelvis. They may have been placed in this way to avoid a deep oozing. The compresses are removed with care, separating them one from the other; brisk traction is painful and must be avoided, as it incurs the risk of drawing down an intestinal loop or omentum by aspiration.

The patient is placed on a basin used for vaginal irrigations. The fundus of the vagina is examined with a speculum, an electric lamp being used for illumination.

The fundus of the vaginal cavity, which contains some black debris, is sponged with small tampons of wool soaked in sublimate solution. The two pedicles are observed by drawing lightly on the safety ligatures.

New compresses soaked in sublimate and half wrung out are placed in position. They are interposed between the sloughing debris seen at the bottom of the wound, and a subcutaneous injection of 20 c.c. of mycolysine is administered.



FIG. 831. THE SAME.

The four ends of the ligatures are tied together to prevent the ascension of the pedicles.

When the peritoneal folds and the forceps on the ligaments have been placed in juxtaposition and fixed by compresses, and when hæmostasis is satisfactory, no elevation of temperature takes place.

When the operative sequelæ are normal and the vaginal compresses have not been changed before removal of the forceps, they are not removed until the fifth day. It matters little if they smell, for the pelvic peritoneum is closed, which is the capital point. The vulva is washed and a primary vaginal injection is made to the depth of 5 or 6 centimetres, using the left index finger for a guide, covered with a rubber glove.

The vagina is then examined with a speculum. If all is normal, vaginal injections are now given to the number of five or six in the twenty-four hours. Ice is again applied, when the sloughs on the ligaments become



FIG. 832.—VAGINAL HYSTERECTOMY. CRUSHING THE BROAD LIGAMENT AT THE END OF THE SECOND STAGE.

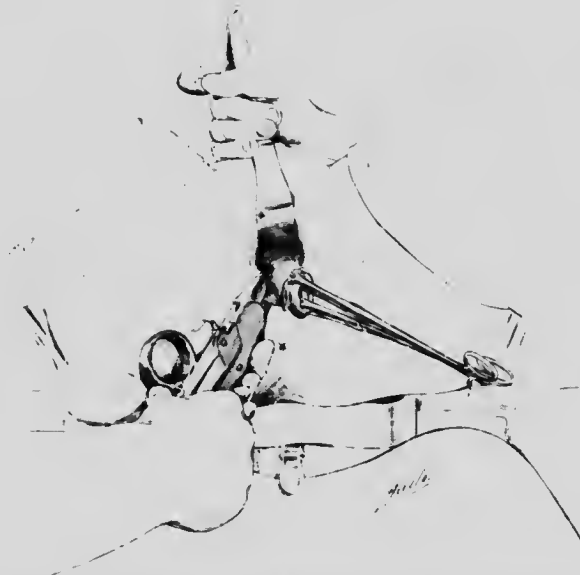


FIG. 833. THE SAME. CRUSHING THE RIGHT BROAD LIGAMENT.



detached, if the temperature rise. The elimination of the pedicles may be accompanied by fever and a dry tongue. A grave septicæmia is to be feared under such conditions.

An examination is made with the speculum. A curved forceps is introduced laterally on either side. Generally pus is observed to flow. The tract is plugged with a mesh soaked in 2 per 1,000 sublimate solution, or an obtuse-angled glass drain is introduced through which hourly small irrigations of peroxide and Labarraque's solution can be made by means of a syringe. The icebags are renewed. The lavages are renewed every two to three hours, and the patient is constantly purged.



FIG. 834.—THE SAME. DIAGRAM SHOWING THAT THE ÉRASEUR CRUSHES THE UTERO-OVARIAN ARCADE.

Section can be made between the uterus and the éraseur without wounding any but secondary arterioles.

Application of icebags lowers the vaginal temperature by  $1^{\circ}$  or  $1.5^{\circ}$ , calms the colic due to intestinal gas, and diminishes the distension.

The guiding principle in after-care is to avoid interfering with the curative effect of Nature.

If the temperature remains normal, the pulse satisfactory, and the abdomen flat, no hurry should be shown either to remove the compresses or for the administration of the first purge. In the event of the slightest complication action is taken at once by the simplest methods.

#### SECONDARY HÆMORRHAGE.

Secondary hæmorrhage seldom occurs when the forceps have been properly applied and are reinforced by ligatures. If hæmorrhage occurs when the sloughs fall and when the peritonæum is closed, it is arrested generally

by placing a Doyens speculum in the vagina. This is disposed either transversely or obliquely until the bleeding ceases. The gaping vessel ceases to leak when compressed directly by one of the valves.

A compress soaked in Labarraque's solution 5 per 100 is used to plug tightly the interior of the speculum, which is removed in twelve or eighteen hours, to be replaced by an ordinary antiseptic plugging.

If arterial hæmorrhage persists in spite of the above treatment, the patient must be anæsthetized in order that toilet of the vagina may be made. The offending vessel is then found and caught in the jaws of a bullet forceps.

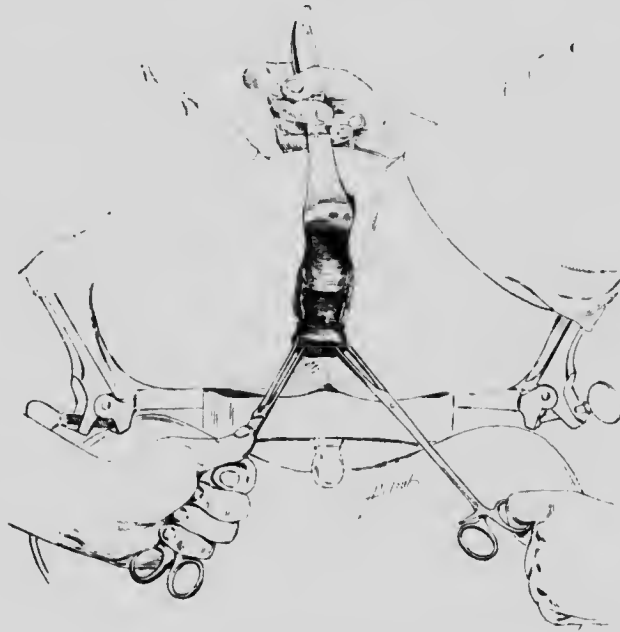


FIG. 835. THE SAME.

Considerable lowering of the cervix under the influence of direct traction after lamination of the lower stage of the two broad ligaments.

In 1897 I began to use the Doyen écraseur to crush the broad ligaments before clamping or ligature.

In certain cases, at the second stage of the operation I crush all that is accessible of the lower portion of the broad ligaments. The écraseur is left two minutes in position, the tissues being reduced to the thickness of a sheet of paper. The same manœuvre is carried out on the opposite side, and the operation continues (Figs. 832-835).

This crushing of the lower stage of the broad ligaments allows of their detachment from the cervix by tearing much higher than can be accom-

plished without the use of the *écraseur*. If the broad ligament be separated between the *écraseur* and the uterus, the operator is within the arterial arcade and no hemorrhage occurs. As soon as the uterus and adnexæ are drawn to the vulva a curved forceps is placed on each ligament, the remainder

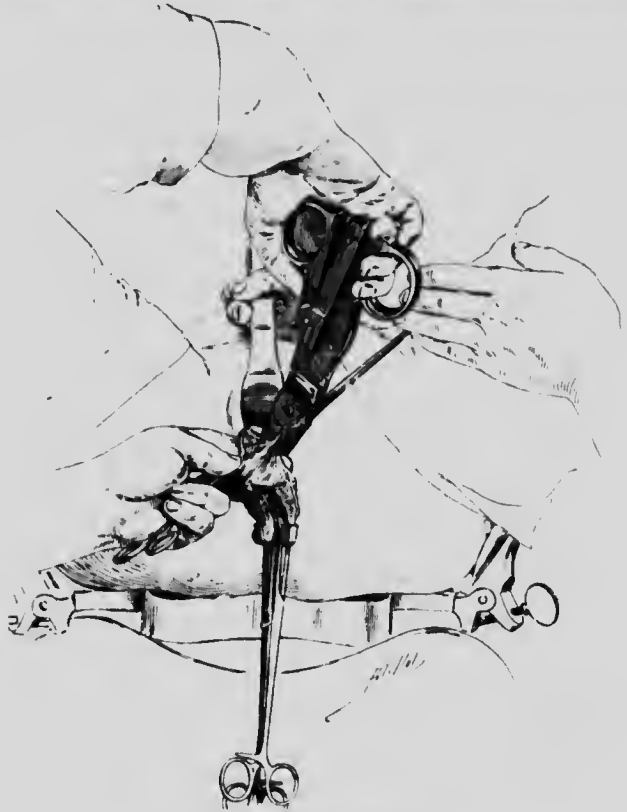


FIG. 836.—THE SAME.

The fundus of the uterus is luxated out of the vulva. Crushing the upper edge of the broad ligament on the left side.

is crushed, and the forceps are clamped on and the ligatures are passed. The *écraseur* also may be applied at the end of the operation in one single movement from above downwards for either ligament. Cicatrization is more rapid, for the elimination of the thinned pedicles is rapid.

#### Vaginal Hysterectomy in Large Adherent Suppurating Pyosalpinx.

Microbial infection of the cervix and cavity of the uterus gives rise to very various disorders: Peri-uterine simple lymphangitis with inflammatory

exudation, adhesions, the formation of serous intraperitoneal cysts, obliteration of the Fallopian tubes, which become secondarily affected with hydro- or hæmosalpinx. At times the lesions are localized to the tube only: at others to the tube and ovary.

The history of interventions for peri-uterine inflammatory lesions will be discussed later under laparotomy.

With the exception of simple hydrosalpinx and small ovarian or ligamentary cysts, peri-uterine lesions of an inflammatory nature, which we can unite under the general term perimetritis, generally cause interstitial and intrapelvic lesions at the same time. These lesions may follow a very varying course.

I have frequently performed total hysterectomy in women complaining of persistent hæmorrhages years after the onset of inflammatory symptoms, who have never suffered pain.



FIG. 837.—DOUBLE PURULENT SALPINGITIS.

The right is encysted in the pouch of Douglas, and the left has undergone abdominal evolution.

Refractory hæmorrhage is one of the symptoms of bilateral disease of the adnexæ.

Examination of the adnexæ can be performed with ease by posterior colpotomy.

These patients are generally suffering from bilateral affections of the adnexæ—*i.e.*, from far more extensive lesions than the symptoms seem to indicate.

I have noticed that the adnexal pouches can only be recognized easily when they are hard and tense. When they are slack and floating they escape exploration, and at the moment of their removal the surgeon is astonished to find them much larger than he supposed. Peri-uterine inflammatory lesions are: either simple adnexal lesions, salpingitis, and

encysted ovaritis, serous, sanguine, or purulent, or intra- or subperitoneal lesions. I have already pointed out, in describing colpotomy, the possibility of opening these purulent intraligamentary collections by the posterior cul-de-sac.

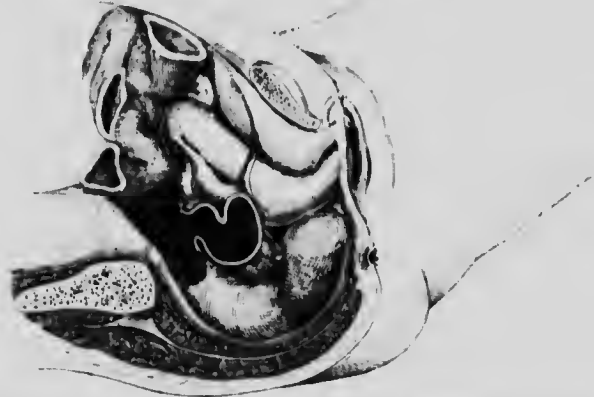


FIG. 838. RIGHT PURULENT SALPINGITIS AND PELVIC ABSCESS CAUSED BY IRRUPTION OF PUS FROM THE FIMBRIATED END OF THE SUPPURATING TUBE.



FIG. 839. INTRAPERITONEAL PURULENT COLLECTIONS IN THE NEIGHBOURHOOD OF A DOUBLE PYOSALPINX.

Encysted intraperitoneal collections sometimes form around the uterus, serous pelvic peritonitis, hæmatocele (simple retro-uterine or suppurating); while the adnexæ, which have contributed to the closing of the upper limits

of the collection. are not much altered. These lesions are generally tubal, whatever their origin (lymphatic or propagated directly from the uterine cavity). Often there is simultaneous presence of several encysted intraperitoneal collections—retro-uterine—and higher, between the tubes, fundus uteri, omentum, and intestines (Figs. 838 and 839). These purulent intraperitoneal collections may widely communicate with the open end of the tube (Fig. 848) in such a way that the abscess wall, partly tubal, partly pelvic, cannot be completely removed. The tubal pouches, whose walls may reach 8 to



FIG. 840. HYSTERECTOMY FOR SUPPURATING ADNEXÆ. REMOVAL OF ADNEXÆ ON THE LEFT SIDE.

10 millimetres in thickness, may adhere intimately to the bladder, sigmoid, small intestine, or appendix, which I have often drawn down to the vulva.

Spontaneous opening of suppurating foci into the intestine occurs most often at the upper part of the rectum, in the sigmoid, or on the posterior aspect of the bladder.

Again, there may be a series of peritoneal collections in close juxtaposition, containing in all 1,000 to 1,500 or 2,000 grammes of pus, and complicated by vesical or intestinal fistulæ.

The various modifications of technique to be adopted in grave peri

uterine lesions will now be described. One peculiarity should be noted—that is, the small volume of the uterus and its almost entire integrity, contrasting singularly with the extent of the adnexal and peritoneal disorders.

**Operation.**—To take first the most difficult case. The uterus is absolutely immobilized in the midst of old adhesions, and on either side are found enormous collections which pass beyond the upper outlet.

The operation is carried out with the technique already described, and, thanks to certain modification of details is performed with remarkable precision and rapidity.

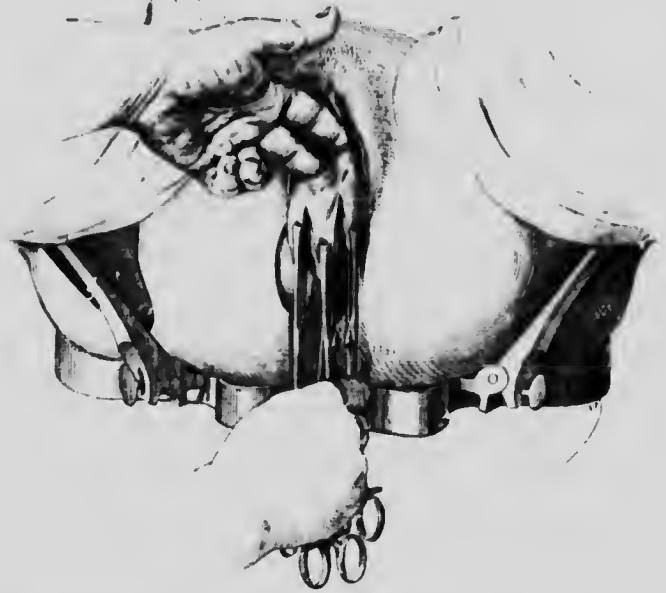


FIG. 841. THE SAME. EXTRACTION OF A LARGE PYOSALPINX WITH THICK INDURATED WALLS BY HEMISECTION IN  $\nabla$  OF ITS ANTERIOR WALL.

The cervix, seized by its commissures, is generally fixed, and it seems impossible to draw it down. It is useless to attempt exaggerated traction on the forceps, which will only tear away the vaginal cervix.

*First Stage: Opening and Exploration of the Pouch of Douglas.*—The cervix is drawn upwards as far as possible. If it is firmly fixed a third forceps is placed on the posterior lip and a No. 2 or 3 retractor is introduced behind. No. 1 is too short to stretch the posterior vaginal cul-de-sac.

The posterior vaginal cul-de-sac is incised from right to left with strong scissors, and fresh incisions are made on the posterior surface of the cervix.

until the scissors penetrate the peritoneum, if free, or into an encysted collection. As soon as a small hole is made the scissors enlarge it by division. The finger then attempts to penetrate the depths and detaches the rear of the uterus as much as possible. If the first incision be not deep enough, the retractor is replaced and the posterior surface of the uterus is followed. Often a retro-uterine collection is opened in this way. The right or left index finger is introduced into the wound along the posterior wall of the uterus, and energetically strips up, to the right and the left as far as possible and then towards the fundus, all peri-uterine adhesions until it passes the fundus. This takes about two minutes for an experienced hand. I have never perforated the intestine in performing this. A finger experienced in hysterectomy soon recognizes the topography of pelvic lesions.

If a large escape of pus occurs in the course of this operation, coming from a badly limited collection the operation is confined to the colpotomy, the parts are cleaned by compresses and plugged. No injection is made for the moment, since a peritoneal communication may exist.

The uterus is removed weeks or months later, when the purulent cavity is cicatrized or at least considerably reduced in size.

If, however, the pus comes from a collection which is small and well encysted, and which can be removed forthwith, hysterectomy is performed on the spot.

Liberation of the whole of the posterior surface as far as the fundus allows the cervix to be brought down to the vulva. Anterior and superior adhesions are rarely solid.

*Second Stage.*—The anterior vaginal cul-de-sac is incised in its turn and the bladder is detached.

*Third Stage.*—Anterior median hemisection of the cervix, opening of the anterior peritoneal cul-de-sac, and longitudinal section of the anterior wall of the uterus. When the anterior wall of the cervix is incised, two forceps are placed on the edges of the section (Fig. 806), and the two forceps which have been employed to draw the cervix downwards are removed and placed more solidly on the sides of the cervix. The surgeon draws on the upper forceps on his left, and the assistant draws on the corresponding forceps on his right (the patient's left). The anterior hemisection is prolonged on to the body of the uterus and the anterior peritoneal cul-de-sac is opened. A fifth forceps is placed on the left on the edge of the cervical section, and the intermediary forceps on this side is removed and placed on the right edge of the section.

The opened uterus is drawn down and the hemisection is prolonged as far as the fundus. The intermediary forceps on the right is detached and placed higher up on the left side. The forceps which has served for traction on this side is now placed near the fundus on the right side. The fundus now appears at the vulva, and the organ, which has been freed behind during the first stage of the operation, is now only attached by its higher connections. These adhesions are stripped away by the finger, as is shown in Fig. 760.

Often the omentum, small intestine, or appendix are brought into the vagina behind the uterus. They are detached with the finger or with



forceps. It may be necessary to ligature an epiploic fringe or perform a sero-serous suture on an intestinal adhesion, which, though imperforated, bleeds.

*Fourth Stage: Removal of Adnexæ. Clamping and Ligature of the Broad Ligaments.*—The body of the uterus is now hanging outside the vulva, and the adnexæ must be removed. In exceptional cases it may be useful to complete the hemisection of the uterus into two halves.

As a rule all that is necessary is to apply two forceps on the fundus and draw the uterus down with the left hand. If the adnexæ are voluminous and highly placed they can only be seen after introducing a long and narrow retractor (No. 3).

The volume of the adnexal pouches has already been determined by direct examination when the adhesions were removed by the posterior vaginal opening.



FIG. 842. —UTERUS AND ADNEXÆ (SALPINGITIS) REMOVED BY THE VAGINA.

This exploration is repeated in front of the uterus, and if equally accessible, those on the left side are attacked first. A guide is taken by the pedicle of the Fallopian tube, which is seized close to the uterine cornu; other ring forceps are placed from below upwards.

A compress is placed in the depths, mounted on a forceps to push back the intestine and to prevent the irruption of pus into the peritoneal cavity. The pouch is incised and evacuated. The walls are seized by the index and medius of the left hand, then between the jaws of a ring-jawed forceps, and drawn outwards. The left index and medius are introduced into the depths of the wound, the pulp side towards the adnexæ, and are used to detach the adhesions as traction draws down the parts of the pouch which are freed. They finally pass beyond the upper limits, which they detach from the pelvic walls.

If the sigmoid is adherent it can be drawn outside in order to detach it in greater security. If a perforation seems imminent a small part is left adherent.

The ovary, either sclerosed or friable, is generally removed in one piece, with the tubes and uterus. The left ligament is caught by forceps, and then cut. A ligature is placed above the forceps.

To reach the right adnexæ, as on the left side, the pedicle of the tube on this side is followed. This sure guide allows the right tube and ovary to be gradually freed from its adhesions. The same procedure for their removal is followed out as has been described for the left side.

When the Fallopian tube on one side is torn during the removal of the uterus, its upper border may be difficult to find, and the corresponding adnexæ removed with more difficulty.

In cases of this nature, where the peri-uterine tissues are friable and spongy, the adnexæ are extracted first on the opposite side. The broken tubular pedicle is then brought into view and seized; the tube and ovary



FIG. 843. —UTERINE GIGANTISM. REMOVAL BY THE VAGINA (ANTERIOR HEMISECTION).

are then removed. Unless there are special indications to the contrary, I always remove the left adnexæ first. The broad ligament on the same side is clamped and cut. A ligature is placed above the forceps, and the right adnexæ are then removed. If the left side is more difficult of access than the right, I commence by the latter. In Figs. 839 and 841 it will be noticed that in difficult cases the conservation of the uterus whole, which hangs open at the vulva, is far from being a hindrance to the removal of the adnexæ; on the contrary, it is an excellent guide to their exposure.

Should one of the pouches be so thick as to render impossible its removal entire, a V-shaped section is made of the accessible portion, and this pouch is removed by inversion.

Removal of the uterus and large adnexal pouches is so easy by this method that the operation rarely lasts for more than eight to ten minutes.

Laparotomy in inflammatory lesions of the uterus and its adnexæ should be reserved to extraction of adnexal tumours reaching or passing the umbilicus whose evolution is strictly abdominal.

#### Hysterectomy for Uterine Gigantism.

It may occur that the uterus after aconchement does not involute in a normal manner, and remains about the same size as three or four weeks after delivery. Its parenchyma becomes firm and hard.

The fundus is easily found above the pubis. The cavity of the uterus, large and gaping, is the seat of serous or sero-sanguineous discharge, which is almost constant. The patient does not suffer, but may lose a large amount of dark blood and rapidly become anæmic. The mucous membrane instead of becoming fungous and hypertrophic, becomes thin and smooth. In obstinate cases a hysterectomy is performed.



FIG. 844. UTERUS AND ADNEXÆ REMOVED BY THE VAGINA (SALPINGITIS AND SMALL SERBULOUS FIBROMA).

**Operation.**—This is carried out in the usual manner, with this exception, that the anterior median hemisection beginning at the cervix is continued in **V** on the body of the uterus. This renders inversion of the fundus more easy. Peri-uterine adhesions are rare. The adnexæ are removed after the uterus.

#### Electro-Coagulation for Cancer of the Uterus.

Cancer of the uterus, whatever be the seat and variety, should never be attacked by the cutting instrument. The sole method which can give a favourable result is that of electro-coagulation.

#### Cancer of the Cervix.

Cancer of the cervix commences generally in the vaginal portion. This is of particular importance from the point of view of operation. Epithelioma of the vaginal cul-de-sac can be destroyed by electro-coagulation if taken in time.

We cannot be too emphatic in advising surgeons to abstain from all local treatment in doubtful cases of metritis of the cervix, when the cervix, ulcerated, presents a certain degree of induration. These cases should be examined without delay by a competent authority who will decide on the advisability of electro-coagulation. A biopsy is always performed in doubtful cases.

**Operation—Preliminary Exploration.**—The patient is anesthetized and the vagina is washed with soap and water. All that is friable is then removed by the enrette.



FIG. 845. UTERINE GIGANTISM. VAGINAL HYSTERECTOMY. ANTERIOR HEMISECTION OF THE CERVIX. MORSELLING IN V OF THE FUNDUS.

The uterine cavity is then explored, for it is necessary to appreciate the extreme limits of the cancerous degeneration.

The suspected zone is immediately submitted to electro-coagulation, and it is sought to produce a destruction of tissue sufficient to prevent a recurrence. The wall of the vagina can easily be protected by the wooden speculum. If there be a risk of perforating the bladder it is filled with cold sterilized water, in which is placed a thermometer. The extent to which the mucous membrane is heated can thus be exactly appreciated.

#### Cancer of the Body.

Cancer of the body is more frequent than was thought to be the case. Early diagnosis of this condition is a delicate matter.

When a woman, even if she be still young, has durable sero-sanguineous discharge, which persists during the intervals of menstruation, and when her

general condition alters for the worse, the possibility of a cancerous degeneration of the uterine mucous membrane must not be lost sight of.

I have seen on two occasions, in women of over sixty years, grave metrorrhagia occur without apparent cause ten or twelve months after the menopause, only to cease spontaneously. But such occurrences are rare, and the appearance of senile metrorrhagia without lesion of the cervix is often a sign of cancer of the body of the uterus. When the sanguineous and sero-sanguineous discharge persists and the uterus increases in size, the diagnosis of cancer is almost certain.



FIG. 846. VAGINAL HYSTERECTOMY FOR CANCER OF THE CERVIX.

It should not be forgotten, to appreciate the value of this symptom that this discharge is not necessarily foetid. Very often, especially in patients who have undergone no intra-uterine treatment which could infect the mucous membrane by putrefying bacteria, the discharge is odourless.

It may be observed that a foetid discharge often accompanies cases of simple fibroma of the uterine cavity.

I may also call to mind a number of cases of partial epitheliomatous degeneration of the uterine mucosa supervening in cases of multiple fibro-

mata which were only discovered in examination of the piece after hysterectomy.

I have published good results in the past from early hysterectomy for cancer of the body. Cases operated on have been followed during several years. Some of the cases were operated on under unfavourable conditions, but they have remained without any recurrence. One in particular, who was very cachectic at the moment of her operation, suffered from pelvic pain and bilateral sciatica, without any fresh invasion of the broad ligaments. She has survived rather more than six years. Such a survival is rare after hysterectomy for cancer of the body of the uterus. This disease, as cancer of the cervix, should be treated by electro-coagulation.

**Operation—Preliminary Exploration.**—The cavity of the uterus is explored with the curette and the suspected tissue is removed. Electro-coagulation is then proceeded with, using the electrode in a to-and-fro movement. Care is taken not to pass too far beyond the limits of the degenerated portion.

#### **intra-uterine Cancer (Ulcerating Form ; Total Cancer of the Uterus).**

When the uterus is the seat of an ulcerating cancer the organ is reduced to a small friable shell. Sometimes the cavity is small and the body is augmented in volume, the walls being degenerated and friable.

The condition of the uterus is revealed by exploration with the curette. Electro-coagulation must be performed with great prudence, in order that the external wall of the uterus be not pierced. Infection of the pelvic cavity is especially to be feared, since the patient is always feeble and cachectic and has no physical resistance.

The danger of death from peritoneal infection is more imminent when the base of the pelvis or the broad ligaments are occupied by cancerous masses which slough after the operation.

A first séance of electro-coagulation is performed with great prudence. The temperature of the uterine cavity is watched with care. It should not rise higher than 62°.

The extra heating of any single point is avoided by incessantly moving the electrode. As soon as a little vapour appears the thermometer is introduced. The operation is repeated two or three times if necessary. When the uterus is completely disinfected, abdominal hysterectomy is performed.

#### **Hysterectomy for Fibroma.**

We have already seen, in discussing the simple enucleation of fibromata of the uterus (submucous or interstitial), that this operation is rarely performed now, and that it should be confined in young women to cases of solitary submucous fibromata. It can be performed also in elderly diabetic subjects, where a total hysterectomy is too grave an operation, the submucous tumour suspected of being the principal cause of the metrorrhagia alone being removed.

In every other circumstance it is preferable to perform a total hysterectomy.

The size of uterine fibromata which allow vaginal hysterectomy to be performed varies according to the skill of the operator and the fact whether the patient is a virgin or has borne children. In principle a fibroma contained in the pelvis can always be removed by the vagina.

When the diameter of the tumour exceeds that of the upper outlet the possibility of vaginal extraction becomes subordinated to certain conditions which can only be appreciated under chloroform at the time of operation. In border-line cases everything should be prepared for either the vaginal operation or laparotomy, a decision being taken at the final examination.

The technique of the operation will vary according to the size of the tumour, and also if it be solitary or multiple.

When the principal mass is 10 to 12 millimetres in diameter the presence of subperitoneal tumours will greatly complicate the intervention. These tumours are apt to be caught above the pubis during extraction.

#### Hysterectomy for Single Fibroma.

When the vagina is wide a uterus can be extracted weighing 2,000 to 2,200 grammes, having a diameter of 16 centimetres.

Such a mass is far too great to engage in the pelvic orifice unless subject to morselling.

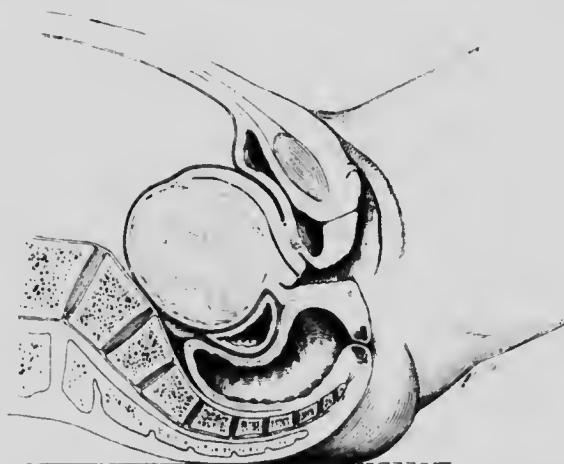


FIG. 847. INTERSTITIAL FIBROMA OF THE POSTERIOR UTERINE WALL IMPACTED IN THE PELVIC CAVITY.

**Operation—First Stage.**—The pouch of Douglas is incised and explored, the bladder is stripped up, and hemisection of the cervix is performed (Fig. 806 *et seq.*).

*Second Stage.*—The bladder being protected by a retractor, the lower part of the fibroma is exposed. The largest possible cutting-tube is used to perforate it either in one or in several directions. The cylinders thus cut out are removed by gouge forceps.

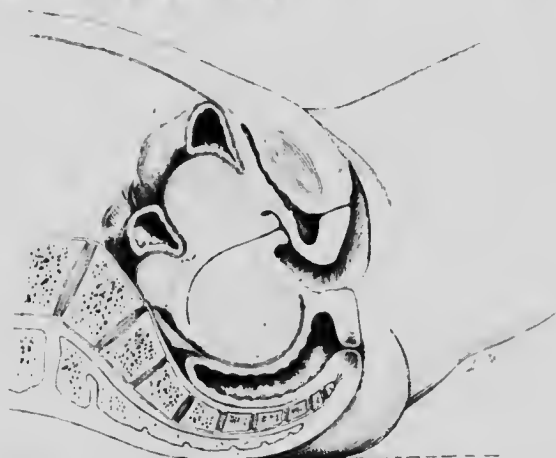


FIG. 848.—INTERSTITIAL FIBROMYOMATA OF ANTERIOR AND POSTERIOR WALLS.

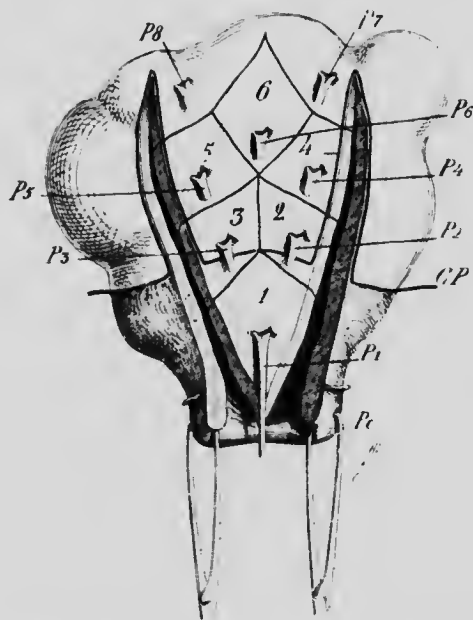


FIG. 849.—HYSTERECTOMY FOR INTERSTITIAL AND MULTIPLE FIBROMYOMATA. PLAN OF LOZENGE-SHAPED MORCELLING OF THE ANTERIOR WALL.



*Third Stage.*—The median uterine V incision is prolonged on the body of the organ. It is then drawn up and forwards. The anterior edge of the orifice which has been dug in the fibroma is seized in toothed forceps, a retractor is placed between the fibroma, and its uterine shell and another V is shaped out from the anterior surface of the tumour. A first then a second, lozenge-shaped mass, as large as possible, are removed with scissors and Museux's forceps.

The tumour comes forward. The central V of the anterior uterine wall can be drawn to the vulva, owing to the diminution in size of the anterior part of the fibroma. The branches of the central V are prolonged on either side, and the anterior peritoneal cul-de-sac is incised as soon as it appears on the surface of the uterus.

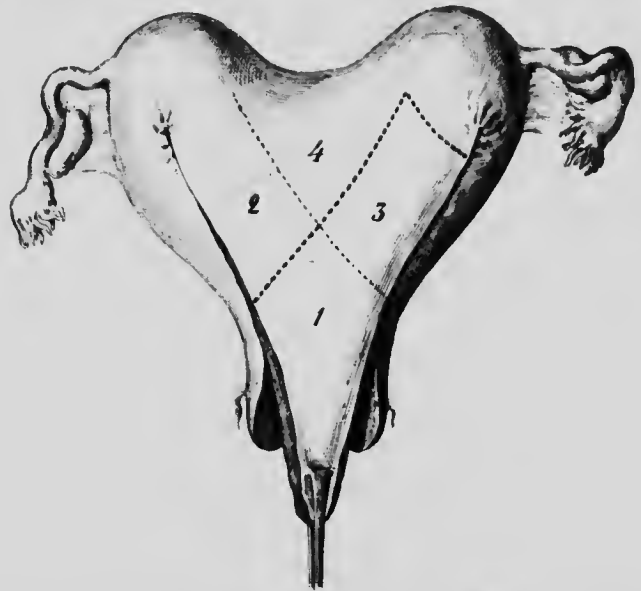


FIG. 850. INTRA-UTERINE MYOMA. PLAN OF LOZENGE-SHAPED REMOVAL OF THE ANTERIOR WALL.

If the tumour be of very great dimensions the anterior surface of the uterine shell is now abandoned. The right or left edge of the orifice cut in the fibroma is now seized and, twisting the tumour to the right or to the left, another V is shaped out point downwards, and another lozenge-shaped mass removed. The branches of this V are prolonged towards the meridian of the tumour and several masses are resected. The same manoeuvre is carried out behind, towards the pouch of Douglas. The forceps now seize the equator of the tumour. The retractor is removed for the moment, and the left index finger passes between the tumour and the uterine shell and attempts to detach it from its cellular compartment. To accomplish this

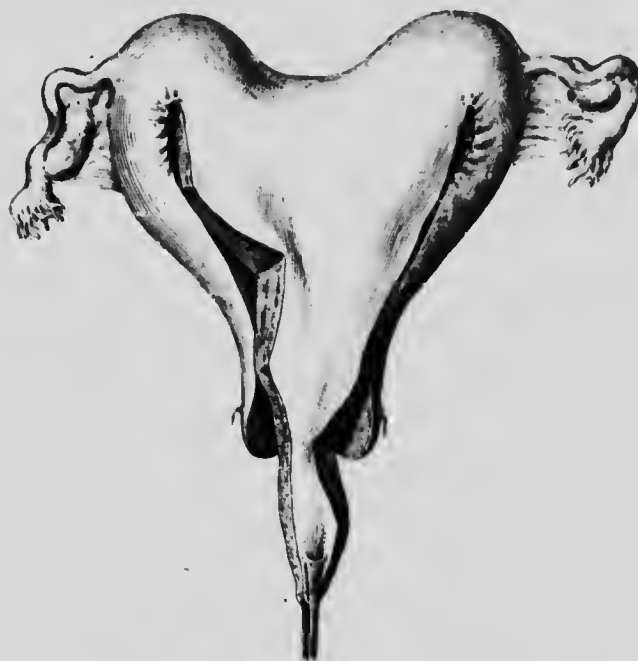


FIG. 851.—VAGINAL HYSTERECTOMY. MORSELLING IN STAGES.

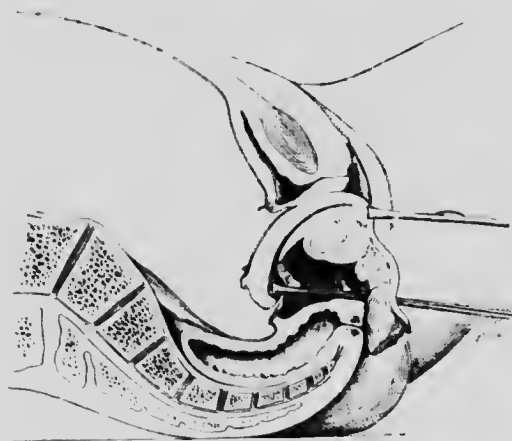


FIG. 852.—MORSELLING IN V LUXATION OF THE FUNDUS.

and allow the fundus to be reached the anterior median  $\nabla$  is strongly pulled downwards.



FIG. 853. -MORSELLING OF A LARGE FIBROMA ABOVE CYLINDER OF TISSUE REMOVED BY CUTTING-TIRE.



FIG. 854. -SPIROID MORSELLING.

As soon as the tumour is seized in the neighbourhood of its transverse diameter it can be pushed either forwards or sideways. Suddenly a final



FIG. 855. -THE SAME. RECONSTRUCTION AFTER REMOVAL.

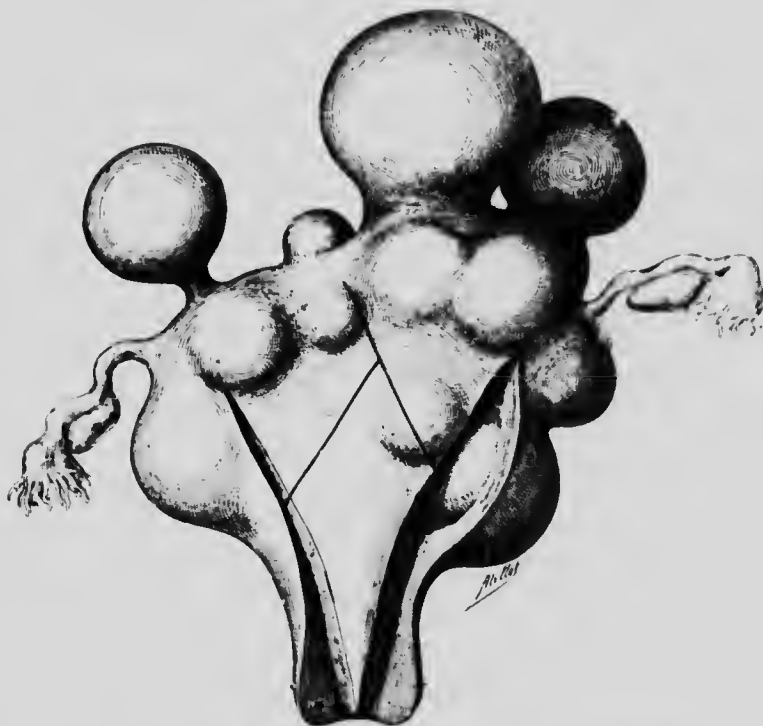


FIG. 856. -MULTIPLE FIBROMA, INTERSTITIAL AND SUBPERITONEAL.

pull, either by gonge forceps or helicoid hook, extracts the upper part of tumour, turned inside out and fragmented.

This voluminous mass often weighs 600 to 800 grammes. All that remains to be removed is the uterine shell.

When the tumour is removed the anterior retractor is replaced. The **V** is prolonged on the uterine wall, and the fundus of the organ is brought to the vulva after lozenge-shaped resection of its anterior surface.

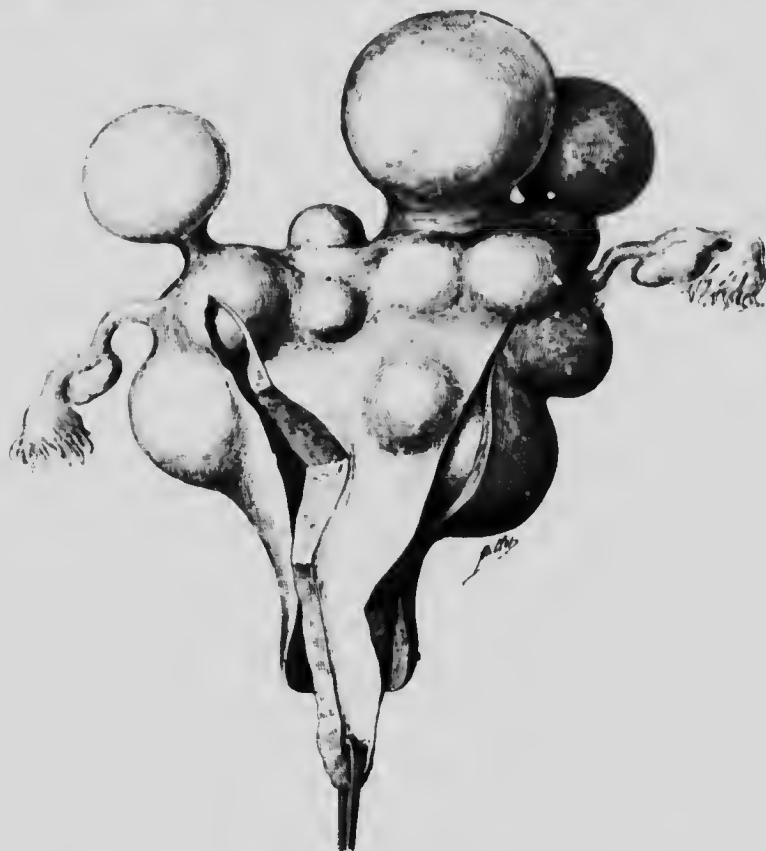


FIG. 857. —MORSELLING IN STAGES OF THE ANTERIOR UTERINE WALL.

In certain cases, instead of removing the central **V** by successive lozenge-shaped masses (Fig. 856), deep incisions are made on the right or left alternatively, as in Fig. 857.

*Fourth Stage.*—Removal of the adnexæ, clamping and ligature of the broad ligaments (see Hysterectomy for Salpingitis).

When the uterus is of medium size the shell is extracted at the same time as the upper pole of the fibroma. The operation for a tumour of

2 kilogrammes lasts from twenty to thirty minutes with a vagina of ordinary calibre. If the vagina and vulva are wide the time occupied by the operation is reduced to twelve to fifteen minutes.

**Contractility of the Uterus during the Operation.**

It is not devoid of interest to draw attention to the contractility of the fibromatous uterus.

If in the course of the operation several interstitial fibromata are removed, they cannot be placed in position when the parts are examined after

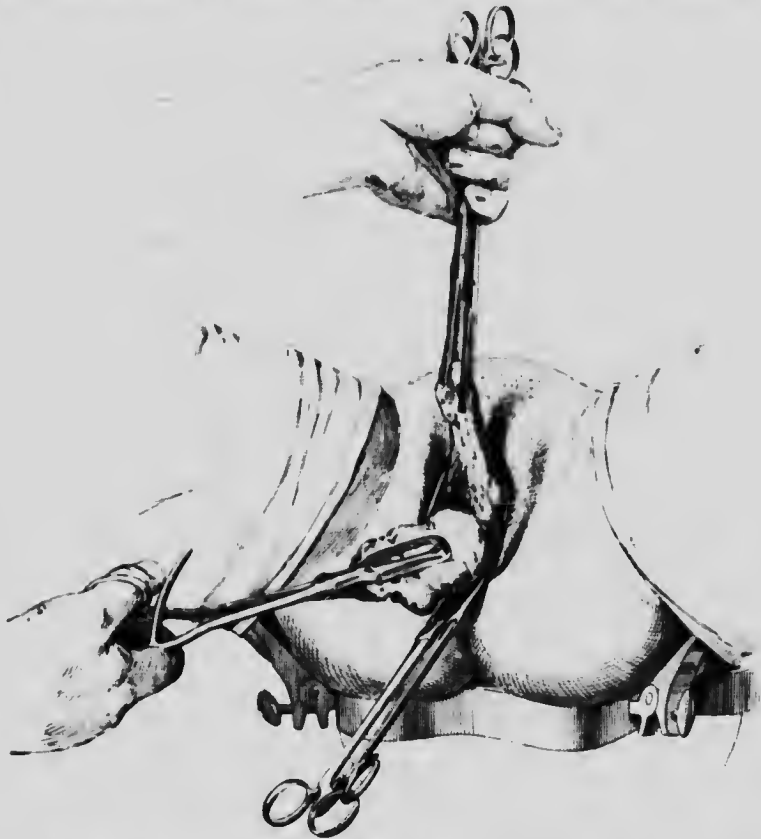


FIG. 858. VAGINAL HYSTERECTOMY FOR FIBROMA. TRACTION ON THE CENTRAL V AND REMOVAL OF INTERSTITIAL TUMOUR WITH THE GOUGE FORCEPS.

the operation. The uterus retracts, in fact, when relieved of the presence of a large fibroma, just as it retracts after delivery. This power of retraction is manifested even when completely detached, and when, after abdominal hysterectomy, a large interstitial fibroid is removed from its cavity.

**Hysterectomy for Multiple Interstitial Fibromata complicated by Subperitoneal Pedunculated or Sessile Fibromata.**

Removal by the vagina of a large fibromatous uterus is particularly difficult when the uterus is studded with a number of small fibromata. Their number may attain twenty, twenty-five or even thirty. The smallest are the size of a small nut, and the largest about that of a mandarin orange. The cavity is narrow, long, and deformed.

**Operation—First Stage.**—When the pouch of Douglas is opened and the bladder is detached the anterior wall is incised either in a **V** or **Y** shaped incision until the growth is reached.

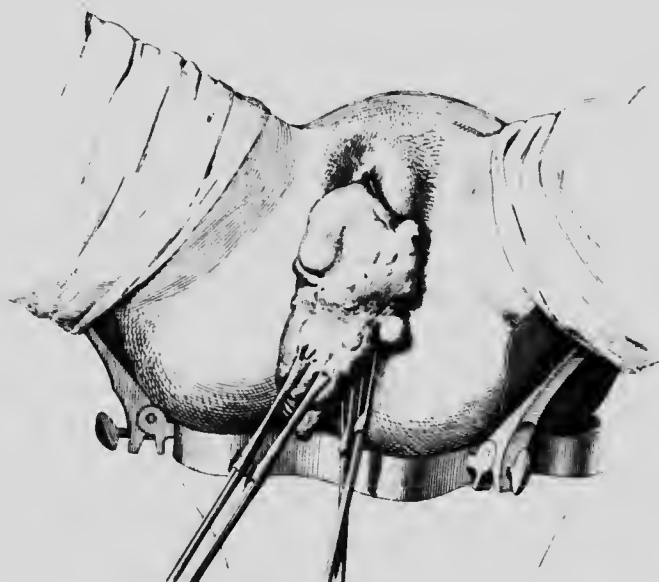


FIG. 859. THE SAME.

The median **V** is strongly pulled down to help the extraction of a subperitoneal fibroid.

**Second and Third Stages.**—The first fibromata usually make their appearance as soon as the median **V** appears at the vulva. The fibromatous mass is pierced by the cutting-tube, the median **V** is followed up as high as possible, and the small interstitial fibromata are successively torn away with a toothed forceps, gonge forceps, or helicoidal hook.

Fig. 849 shows the extraction with the gonge forceps of an interstitial fibroma below the median **V**. The position of the two posterior forceps shows that the uterus being pulled forwards has made the cervix rise.

The anterior cul-de-sac must be incised. The median **V** can now be drawn to the vulva, since the interstitial fibromata are removed. The

anterior retractor is removed, the index and medius distend the vaginal breach. The median **V** is again drawn down, and fresh lateral sections in the body of the uterus allow the anterior cul-de-sac to be opened. The uterus is often held up by a subperitoneal fibroma, which hitches on the pubis. When the finger feels one of these subperitoneal fibromas it depresses

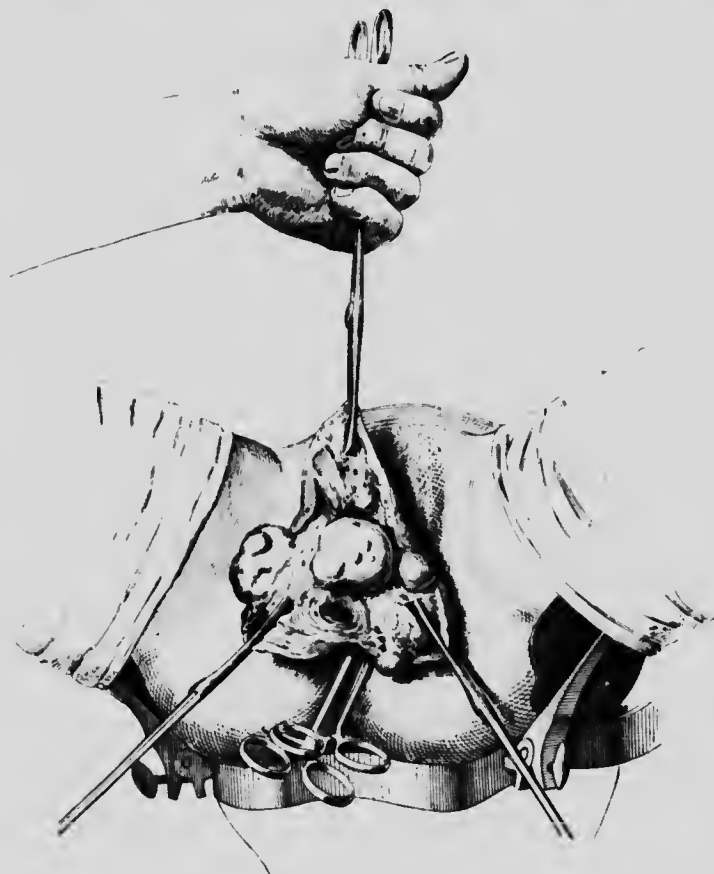


FIG. 860. THE SAME.

The anterior **V** is now dragged above the pubis and bilateral traction brings part of the uterus out of the vulva.

it and helps it down. Traction on the central **V**, helped by direct pressure exercised by the index, causes the mass to appear suddenly at the vulva.

Two converging sections detach the greater part of the tumour, which can hang in front of the anus (Fig. 861). Museux's forceps are placed on an upper **V**, and when other centrally placed fibromata are extracted the remainder of the tumour and the fundus can be removed. Often several



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subperitoneal fibromata are attached to the fundus. The finger feels for them. If a pedunculated fibroma laterally placed offers the chief opposition, a **V** is cut on the corresponding cornu of the uterus.

Tractions on this new **V**, aided by intrapelvic manœuvres of the fingers, depress the upper part and guide it to the vulva.

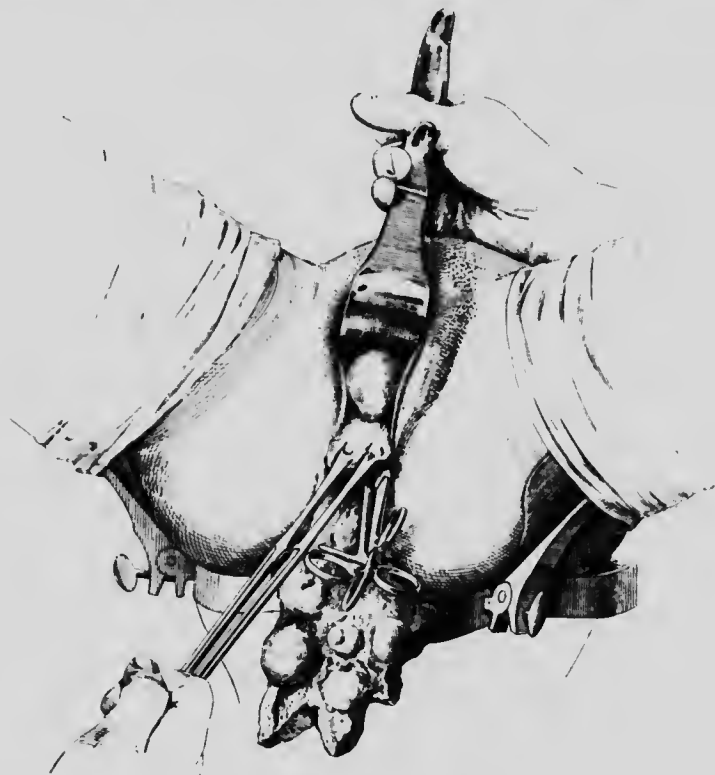


FIG. 861. THE SAME.

A portion of the tumour is already removed and the left broad ligament is clamped. Traction on an upper **V** and luxation of a final subserous fibroma.

The median **V** is again brought down. Two fresh incisions allow forceps to be placed on other parts of the uterine shell. This turns outwards gradually, and final traction on the central mass brings the fundus of the organ to the vulva.

The adnexa are now removed. They are often altered and of large size.

These operations, very difficult when the tumour weighs 800 to 1,200 or 1,800 grammes, generally take but twenty to thirty minutes. If they appear to require a longer time I counsel laparotomy.

It may be that an operation commenced by the vagina presents insur-

mountable difficulties. In such a case the vaginal route should be abandoned, and no time lost in placing the patient in Trendelenburg's position in order to complete the operation by laparotomy.

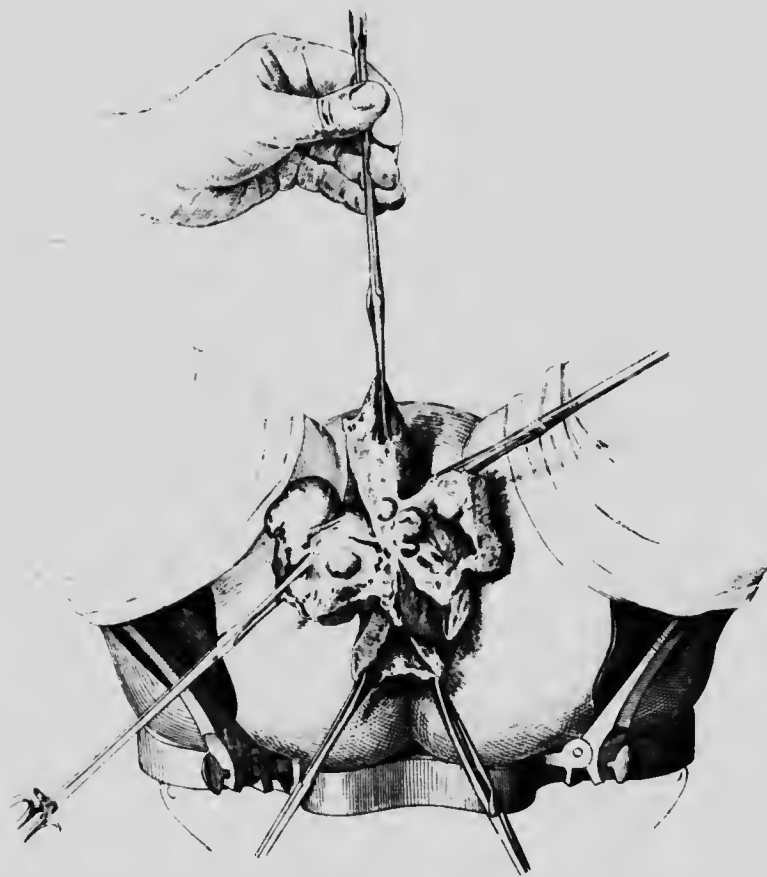


FIG. 862.—THE SAME.

The lozenge-shaped morselling has been followed up to the fundus of the organ, everything being cut away which hangs at the vulva. Traction on the median and lateral V's draws down the remainder of the uterus, which appears inside-out at the vulva.

SPECIAL MANŒUVRES APPLICABLE TO CERTAIN CASES.

1. *Difficulty in opening Douglas's Pouch.*

This may occur when an interstitial fibroma near the cervix has pushed the pouch of Douglas very high. This may not be opened until the end of the operation, when the broad ligaments are being dealt with.

*2. Premature Section of the Broad Ligaments.*

In cases where the broad ligaments are inserted below the equator of the tumour the operation will be much simplified by early section of the broad ligaments. If the finger can pass above the upper border of the left ligament at the first exploration through the anterior peritoneal opening, the



FIG. 863. THE SAME.

The uterus is drawn down. It is allowed to hang at the tourette while a large salpingitis is extracted.

ligament on this side is divided below a forceps applied either from above downwards or from below upwards, and the morselling is continued on the left side and anterior surface of the uterus, until the fundus and right cornu are extracted.

The largest cornu is usually the last to be extracted.

### 3. *Interstitial Fibromata of the Posterior Wall of the Cervix.*

If a very voluminous fibroma be developed in this region it may render the uterus very difficult to tip forwards. As soon as the incision in the



FIG. 864. ANOTHER CASE.  
The same stage as Fig. 862.

posterior cul-de-sac is made the tumour is perforated with the cutting-tube. Median section of the posterior wall may be necessary to reach these tumours. The posterior tumour is removed as quickly as possible. The bladder is then detached and the operation proceeds as already described.

### 4. *Rupture of a Pedicle of One or Several Subperitoneal Fibromata.*

This has happened to the author on several occasions. The tumour which becomes free in the peritoneum is extracted after removal of the uterus

and its adnexæ. The detached fibroma may be so large that it must be cut into morsels.

The tumour can always be found by bimanual examination. It is felt for with the finger, brought into view between two retractors, seized, and extracted.



FIG. 865. INTERSTITIAL FIBROMATA REMOVED BY VAGINAL HYSTERECTOMY. In the centre: Uterus, cervix, and posterior walls, with the adnexa. Below: Two cylinders cut with the cutting-tube. Around: Fragments of the fibromata.

5. *Adhesion of the Omentum to a Mass High Up and Degenerated.*

A graver complication is the incarceration of one of these pedunculated tumours in the midst of omental adhesions. I have met with this complication on one occasion only. The patient was very fat, the upper

mass of growth, freed, was in the neighbourhood of the stomach. A laparotomy was performed at once. The lobe adhering to the omentum was sarcomatous, and had detached itself from the rest of the uterus, which was itself degenerated.



FIG. 866.—MULTIPLE INTERSTITIAL FIBROMATA REMOVED BY HYSTERECTOMY.

**Hysterectomy for Uterine Prolapse.**

Vaginal hysterectomy is the best method of curing obstinate uterine prolapse.

Removal of the uterus in such cases answers as far as the principal indication is concerned, but it does not remedy the condition of the vulva. Hysterectomy for prolapse should be completed by complete repair of the perineum and resection of all that is exuberant of the vaginal mucosa.

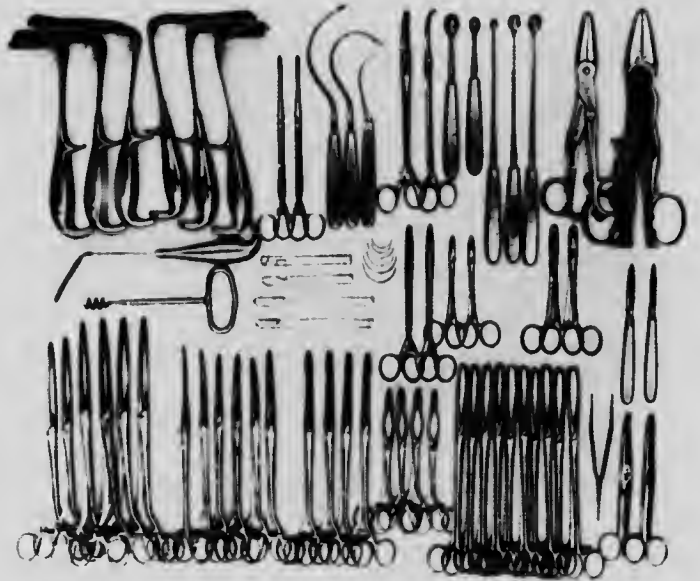


FIG. 867. INSTRUMENTS FOR VAGINAL HYSTERECTOMY IN CASES OF PROLAPSE.

- 2 pairs of straight scissors, 1 toothed forceps, 10 MICHX'S forceps, 4 oval forceps, 4 eccentric forceps, 6 long curved and 4 elastic jawed forceps, 2 reinforcing forceps, 2 bistouries, 2 short-nosed artery forceps, 2 straight and 2 eccentric needle-holders, open-eyed needles, 4 glass drains, 1 helicoid hook, 1 oblique retractor, 2 écraseurs, 5 curettes, 2 vein forceps, 3 large curved needles for ligaments, 2 bullet forceps, and 6 vaginal retractors.

The author combines the removal of the uterus with anterior colporrhaphy and colpoperineorrhaphy.

Removal of the uterus in prolapse is not so easy an operation as would first appear to be the case. The isolation of the bladder may present great difficulty by reason of the hypertrophied and indurated tissue which surround it. The thickness of the herniated vaginal mucosa is often considerable, and contains cicatrices and ulcerations. The submucous tissue is also thickened.



FIG. 868. PROLAPUS OF THE CERVIX OUTSIDE THE VULVA.

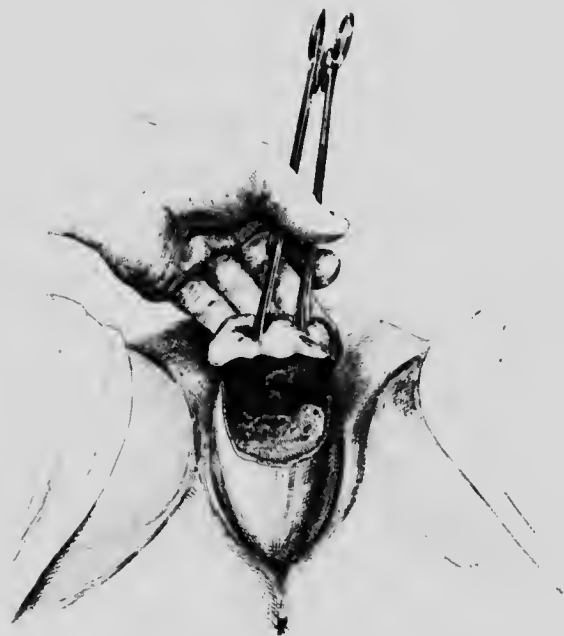


FIG. 869. THE SAME. HYSTERECTOMY.

The cervix is drawn upwards. Section of the posterior vaginal cul-de-sac.



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and becomes transformed like the vaginal mucous membrane, which takes upon itself a cutaneous aspect.

Since the lower limit of the bladder is very hard to determine, even with the catheter, I now perform this operation by reversing the uterus by the



FIG. 870. THE SAME. MEDIAN INCISION OF THE CERVIX (POSTERIOR) AND OPENING OF THE PERITONEUM.

ponch of Douglas. Although the cervix and base of the bladder are surrounded by an cedematous and resistant mass of tissue, the posterior peritoneal cul-de-sac is easily accessible and is opened with the first cuts of the



FIG. 871. THE SAME. LONGITUDINAL INCISION OF THE POSTERIOR UTERINE WALL AND OPENING OF DOUGLAS'S POUCH.

scissors. The uterus is turned backwards and the bladder is isolated last. The broad ligaments are ligatured, the peritoneum is closed by suture, and at the same sitting anterior colporrhaphy and colpoperineorrhaphy are performed.

**Operation—First Stage.**—The cervix is drawn upwards and forwards, and the mucosa of the posterior vaginal cul-de-sac is cut transversely by strong scissors.



FIG. 872.—THE SAME. LUXATION OF THE FUNDUS.

A median incision is made dividing the posterior wall of the cervix as far as the peritoneum. The orifice in the serous membrane is enlarged by the fingers and the fundus, which now becomes visible, is drawn outside.

**Second Stage.**—The posterior hemisection is prolonged on the fundus uteri, then on to its anterior wall as far as the vaginal portion of the cervix. The bladder becomes detached little by little.

The uterus is separated into two halves, and is in complete retroversion.

Section of the mucous membrane of the anterior vaginal cul-de-sac is then completed on either side and the cervix is torn from its ligamentary



FIG. 873.—THE SAME. MEDIAN HEMISECTION OF THE BODY.

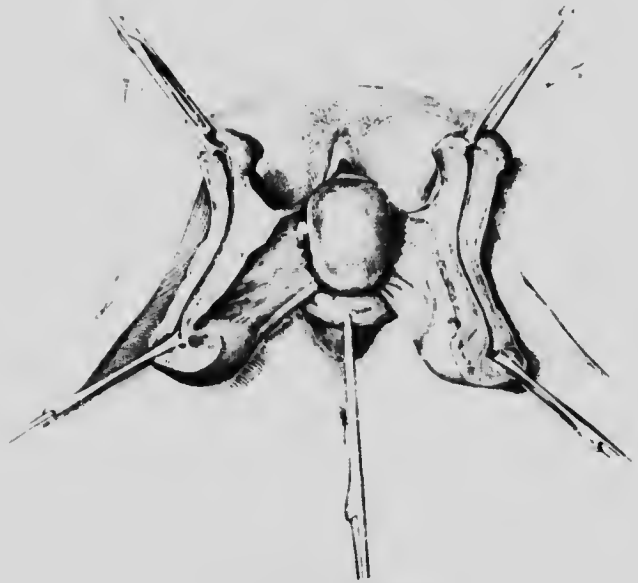


FIG. 874.—THE SAME.

The two halves of the uterus are outside the vulva. The bladder bulges between the broad ligaments.

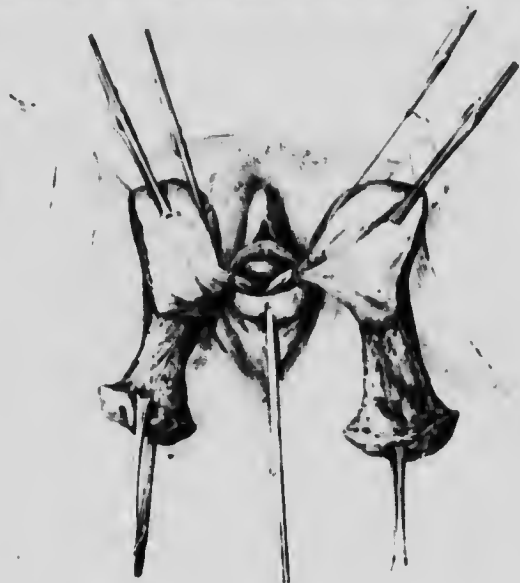


FIG. 875. THE SAME.

Rotation of each half of the uterus 180 degrees on its axis, in order to "pedicelize" the broad ligaments. Ligature of the broad ligaments between the uterus and the adnexa. The bladder has been pushed upwards.

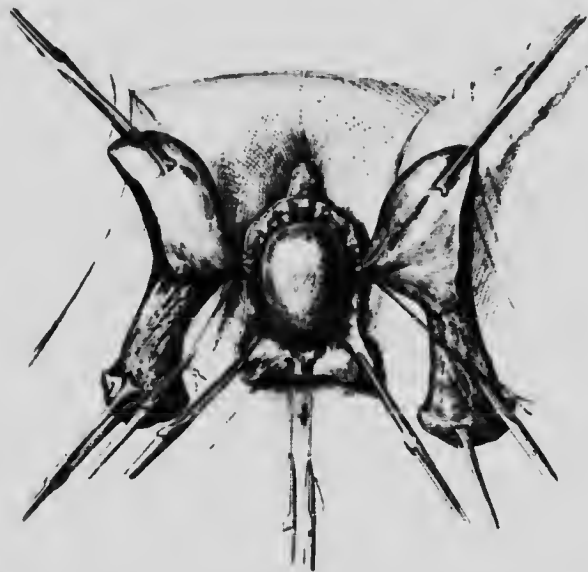


FIG. 876. —THE SAME. PURSE-STRING SUTURE TO CLOSE THE PERITONEUM.

connections as far as possible on either side. Sometimes the uterus does not bleed; at others, when very congested, there is considerable oozing. Several forceps are applied to the bleeding-points.

*Third Stage.*—Each half of the uterus is now twisted 180 degrees. The broad ligaments become two cords about the size of the little finger. They are crushed with the *écraseur*. A ligature is applied above the adnexae. In an old woman the operation can be simplified by leaving the adnexae. The broad ligament is first ligatured *en masse*; the ligature is then passed



FIG. 877 THE SAME. RESECTION AND SUTURE OF THE VAGINAL WALLS (ANTERIOR COLPORECTOMY).

The two uterine pedicles are seen.

twice by transfixion, then tied below the first ligature. Another ligature is then applied. The pedicles are thus strangled circularly and in two halves. The transfixion fixes the ligatures. The ends of the ligatures are held in forceps.

*Fourth Stage.*—The two halves of the uterus hang at the vulva; the bladder is pushed back into the depths by a compress held in a forceps, and the anterior and posterior peritoneal flaps are brought into evidence. Toilet of the peritoneum. A silk thread is now passed around the gaping orifice

disposed as a purse-string, which takes in the ligamentary pedicles on each side just above the ligatures (Fig. 876).

It is useful while doing this to draw laterally on the two halves of the uterus. This brings the peritonemum well into view. When the suture is in place, progressive traction is made on its ends and the line of peritoneal union is carefully puckered together. The bladder, which bulges again when the compress holding it is removed, is pushed back. The two halves of the uterus are cut away below the ligatures, and the peritoneal suture is tightened and tied. The lateral and median ligatures are left long and the peritoneal suture is cut short.



FIG. 878. COLPOPERINEORRHAPHY. OUTLINE OF INCISIONS.

*Fifth Stage: Anterior Colporrhaphy.*—The anterior wall of the vagina, which is detached from the bladder, is isolated by the fingers as far as the vulva. It is resected so as to form a wide oval gap. Suture is applied from behind forwards with catgut No. 2.

*Sixth Stage: Colpoperineorrhaphy.*—The index and medius are introduced into the anus. The anterior vaginal wall is reduced and colpoperineorrhaphy is performed by the method already described.

This triple operation gives perfect results. It is inoffensive and can be performed up to the age of seventy years.

### ABDOMINAL OPERATIONS.

Laparotomy is applicable to uterine and peri-uterine lesions whose evolution is distinctly abdominal.

#### Hernia of the Ovary.

Hernia of the ovary in the inguinal canal is fairly frequent. It gives rise to reflex peritoneal symptoms which may be mistaken for strangulation. Since an ovarian hernia may be accompanied by hernia of the intestine an operation should be performed without delay.

**Operation.**—The inguinal tumour is exposed by an incision parallel to Ponpart's ligament. The sac is found and incised. If the ovary be found polycystic and almost unrecognizable, the hernial pedicle should be examined before ligature, as an intestinal loop may be included. When the hernia is mixed, the intestine is reduced and the ovary is removed below a ligature. If the ovary alone be present, it is removed; the sac and the inguinal ring are closed.

#### History of Peri-uterine Inflammations.

Astruc's and Lieuland's researches (1770 and 1776) on the propagation of inflammation of the uterus to the tubes and ovaries is about contemporary with the description of phlebitis by Hunter (1773). The discovery of lymphangitis by Assalun (1787) and Soemmering (1795) are of importance, as they were the first to apply to pathology Anselli's (1622) discovery of the lymphatics.

Gase (1802) and Laënnec (1804) seem to have been ignorant of previous work on inflammation of the tubes. They confined their studies to puerperal peritonitis. Breschet (1818-19) drew attention to phlebitis, translating Hodgson's work.\*

Davis (1823), Guthrie (1826), and Lee (1829), showed that phlegmasia alba dolens was but crural phlebitis originating in the uterine venous sinus.

Allard (1824), Andral (1824-1826), Gendrin (1829), Cruveilhier, and Velpeau (1830-1836) in turn gave a good description of lymphangitis.

Nonat in 1832 demonstrated the presence of pus in the uterine lymphatics after accouchement. Velpeau and Duplay confirmed this in 1836. In 1834 and 1836 Cruveilhier and Duplay made a statistical survey of the literature relative to phlebitis, and demonstrated its importance in purulent affections. Both of these authors had studied phlebitis and purulent lymphangitis and remarked on the greater frequency of the latter. Chassaignac.

\* In the days of Ambroise Paré it was believed that the accidents following bleeding in the arm were caused by pricking a nerve or tendon. This was the explanation given by Paré of the disastrous bleeding of Charles IX, by Portal. Hunter (1773) was the first to demonstrate an inflammation of the internal membrane of the veins, and Breschet invented the name phlebitis.

writing in 1859, stated that Cruveilhier, during two years at the maternity hospital, found only seven or eight clear cases of uterine phlebitis against 100 lymphangites in the post-mortem room. Bouchut (1844) and Virchow (1854) made a step backwards in considering that the clots of phlegmasia were primitive and in subordinating to these thromboses the alterations in the vascular walls. Baudelocque demonstrated in 1830 that sterility followed non-fatal cases of puerperal pelvic peritonitis. "It may be conceived," he says, "that newly formed membranes make the tubes and ovaries contract vicious relations, causing them to become separated the one from the other, close the openings of the tubes, and become an insurmountable obstacle to fecundation."

Walter ("De morbis Peritonii") had already remarked the frequency of pelvic adhesions. He attributed the sterility of prostitutes to the inflammation of the peritoneum surrounding the ovary and obstruction in the tubes.

Mercier (1838) made the same observations, and insisted on the gonorrhœal origin of pelvic inflammation.

Grisolle (1838) and Bourdon (1841) studied "abscess of the iliac fossa" and "fluctuating tumours of the true pelvis," without mentioning adnexal lesions.

The first clinical interpretation of inflammatory indurations of the true pelvis in the woman is that of Lisfranc (1843), who believed them to be due to the engorging of the uterus. Lisfranc mentions suppurating collections of the ovary. He describes their spontaneous opening on the surface, and directs, in cases where the tumour seems adherent to the parietal peritoneum, exploratory puncture or even direct incision and the passage of a seton.

Nonat (1850), Valleix (1853), and Gallard (1855), localized the indurations of Lisfranc to the peri-uterine cellular tissue. This theory had many adepts. But Bernutz and Goupil (1857) performed autopsies on two cases who had long been under Nonat's care. By a minute dissection they showed that the intraperitoneal lesions, and the indurated masses, perceptible during life, were constituted by false intraperitoneal membranes enclosed in an indurated mass of pelvic viscera.

These authors certainly observed lesions of the adnexæ. Pozzi is mistaken in writing in his "Traité de Gynécologie" (second edition, p. 674). "Bernutz and Goupil, in a remarkable description of clinical phenomena which we now apply to inflammation of the tubes, attributed them without exception to inflammation of the pelvic peritoneum." A study of their book (1862, pp. 20, 28 *et seq.*) will show that they describe with the greatest care in their autopsy reports of pelvic peritonitis, lesion of the adnexæ, and particularly the condition of the tubes, whose fimbriated ends were distended with greenish pus. They have carefully described the condition, too, of the mucosa, and publish (p. 19) an excellent drawing.

Since Bernutz and Goupil's first memoir in 1857, Aran (1858) observed that the pus and false membranes of pelvic peritonitis were massed together always in close relation with the inflamed adnexæ. He insists on the frequency of phlegmasic alteration of the tubes and ovaries.



Chassaignac, in his masterly treatise in 1859, described the suppurations of the ovary and tubes in all their varieties. He mentions the formation of parietal adhesions, the opening of foci into the uterus, bladder, vagina, intestine, peritoneum, and the ensuing accidents. He counselled the incision of foci when they pointed, and the employment of Y-shaped drains, etc.

Soreday (1860) attaches great importance to ovaritis. Amongst more recent work we may cite Letemurrier (1872) and Lorain in 1873, who relates cases of rapid death in women suffering from peri-uterine inflammation, after uterine catheterism, removal of polypi, etc.

The rôle played by the lymphatics in the pathology of peri-uterine lesions was brought to light by Lucas Champoumière in 1870, both in puerperal and extrapuerperal conditions. He described the arrangement of the deep and superficial lymphatics of the uterus and its adnexæ, and showed that they had often been mistaken for veins when these had been thought to be the predominant causes of peri-uterine inflammations. He demonstrated the presence, on the sides of the uterus, of a lymphatic ganglion, and described others, disseminated as far as the pelvic walls.

Porrier (1889) studied with care the lymphatics of the female generative organs.

The rôle of the lymphatics is certainly predominant.

1. **Phlegmon of the Broad Ligament.**—This is the consequence of an infection of the lymphatics (the juxta-pubian adenophlegmon of Guérin).

2. **Ovaritis, Salpingitis, Pelvic Peritonitis.**—The pathology of salpingitis and suppurating ovaritis has given rise to much controversy. Does infection occur by degrees and continuity from the uterine mucosa to the tubal mucosa, or is the infection always by the lymphatics?

The two may occur separately; they usually occur together. It is difficult to conceive an infection of the mucosa without infection of the numerous and ramifying lymphatics.

#### Laparotomy and Hysterectomy applied to the Treatment of Peri-uterine Inflammations.

If the simple palliative operations be eliminated, such as the direct incision of suppurating pelvic tumours and Lisfranc's seton or Chassaignac's drain, surgical treatment of peri-uterine lesions dates from about the past forty years.

Ovariectomy was practised for the first time successfully by Macdowell in Kentucky in 1809. This operation was soon popularized for cysts and other new growths. Hegar (July 27, 1872) and Battey (August 27, 1872) removed the first normal ovaries. Their desire was to obtain an artificial menopause and to cure dysmenorrhœa and ovarian neuralgia. Hegar lost his patient. He performed a second operation in 1876 long after Battey had popularized his method.

Unilateral removal of the ovary performed in 1872 (February 11) by Lawson Tait in order to remedy pelvic pain, complicated by nervous reflexes, was performed for what was evidently a small dermoid. "The tumour

which was non-adherent, large as a pigeon's egg, contained a thick and grumous matter." Lawson Tait performed, August 1, 1872, his first ovariectomy for fibromyoma. He repeated it once in 1873, twice in 1879, 15 in 1880, 50 in 1883, and 265 in 1891. These operations were not published at the time when, in 1876, Treuholme and Hegar removed the ovaries for metrorrhagia due to fibroma.

No one but Lawson Tait insisted on the importance of removing both tubes and ovaries. He had noticed the possible persistence of metrorrhagia after bilateral removal of the ovaries, and was the first to show, by removing at the same time the tubes in all his operations, the importance of the latter with regard to the menstrual function. Lawson Tait, therefore, is the surgeon who has had the greatest influence in extending and vulgarizing the indications for tubo ovarian castration by laparotomy.

Hegar was more reserved, and while admitting the possibility of durable results where the lesions were of minor significance, he tried to restrict the indications for operation to cases where there was "grave alteration of tubes or ovaries, which might be dangerous to life and capable of causing death in a short space of time, or capable of causing a long infirmity removing health and the possibility of enjoying life." A better formula would be difficult to find.

Lawson Tait did not at first remove adherent pelvic pouches, and in his first six operations of laparotomy for pelvic suppuration (1878-1883) one of these is a simple opening of an abscess through a median incision. The pouch was adherent to the abdominal wall. In the five other cases the pouch was stitched to the wall and drained in this manner.

The removal of the ovaries by laparotomy was performed for the first time in Paris by Péan in 1882, who performed three operations in 1883 and three in 1884. In one case he removed but one ovary. The other was removed by Spencer Wells six months afterwards.

Lucas Champonnière, to whose service the author had the honour of being attached as intern in 1882, had at this epoch performed ovariectomy on several women for hysterical symptoms. He considered the operation on normal ovaries more grave than in the case of cystic ovaries.

In 1885 Péan on three occasions removed the adnexæ by laparotomy. During the following year he saw one of his patients on whom he had performed double ovariectomy in 1882. This patient suffered from attacks of pain which were even worse than before her operation. The uterus remained painful and inflamed, and retained in retroversion by pelvic adhesions. He removed the uterus by vaginal hysterectomy.

Péan performed double ovariectomy for primitive peri-uterine suppurations (ovaritis, salpingitis) in 1888. He repeated this operation several times during that year.

At this time removal of the adnexæ was seldom performed in France, Péan only performing eighteen in six years, while in 1887 the Société de Chirurgie mentions only five operations performed by Bonilly, Terrellon, Pozzi, and Rontier.

Lawson Tait then had the reputation in France of being able to cure

suppurating peritonitis by laparotomy. I was soon able to explain his operative success when I was able to appreciate the great difference in gravity between pelvic peritonitis and general peritonitis. My bacterial researches made at that time showed me that many pelvic suppurations were non-virulent.

At the Fifth French Surgical Congress, in an important discussion on pelvic suppurations, with the exception of two communications by Segond and myself, nothing but laparotomy was discussed. Sir Spencer Wells, Lawson Tait, Jacobs, Le Dentu, Rontier, Richelot, etc., only mentioned laparotomy.

Segond gave comparative results of 48 operations, including 30 hysterectomies. My own communication comprised 56 operations, including 4 cases of subperitoneal incision, 32 laparotomies, and 20 vaginal hysterectomies. These communications soon led others to follow, including Jacobs, Rouppart, Richelot, Bouilly, and Lucas-Champagnière.

**Etiology.**—Peri-uterine inflammations generally originate in spontaneous or traumatic inflammation of the vagino-uterine mucosa. Gonorrhœal and post-puerperal streptococcal infections are amongst the most common. In these cases suppuration of the uterine cavity is for a long time the sole manifestation of infection. It is generally complicated by lymphangitis.

When the inflammation is traumatic, whether caused by catheterization, the removal of a small polypus, etc., lymphangitis is the primordial phenomenon.

**Pathological Anatomy.**—Phlegmon of the broad ligament and the different varieties of salpingitis, ovaritis, and pelvic peritonitis, are well described in the textbooks.

I will point out certain anatomical peculiarities which I have observed in the course of a long series of operations.

#### 1. INTEGRITY OF THE ADNEXÆ IN PHLEGMON OF THE BROAD LIGAMENT.

The divers clinical forms of phlegmon of the broad ligament are admitted by all classical authors. The question most discussed is the relation which exists between inflammation of this ligament on the one hand, and that of the tubes and ovaries on the other.

My observations have convinced me that phlegmon of the broad ligament may occur *without* lesion of the adnexæ.

#### 2. PURULENT TUBO-PELVIC CYSTS.

In some purulent salpingites the abdominal end of the tube does not completely close, and the fimbriated ends of the dilated tube come into contact with the pelvic peritoneum, to which they adhere closely. Abscess is produced, and the serous membrane which closes the end of the tube contributes to form a certain amount of the wall of the pouch. I have found these tubo-peritoneal collections in a certain number of laparotomies. In

these cases, in enucleating the tube, it must be detached from its adhesions and the purulent cyst is ruptured. If the pus is virulent, this affects the prognosis.

### 3. PELVIC SYMPHYSIS.

It is by no means rare, in cases of long-standing inflammation, to find a veritable pelvic symphysis. When the abdomen is opened, the sub-umbilical region is found to be invaded by the adhesions, and it is only after detaching the omentum, several loops of the small intestine, and the sigmoid, that the bladder is reached. Behind this is found the uterus and its adnexæ deformed and almost unrecognizable. The volume of inflammatory tubo-ovarian cysts is very inconstant: their contents may vary from a few grammes to a litre and more. More than 300 grammes is rare except in tuberculosis. Besides these pouches, other intraperitoneal foci are found encysted in the midst of adhesions.

### 4. INTRALIGAMENTARY SALPINGITIS.

In 1892 I described a variety of hæmorrhagic or purulent salpingitis which was then but little known. In one of the first laparotomies I performed when trying to enucleate two large salpingites, I saw that it was impossible to detach the indurated pouches by attacking them from behind and insinuating the index finger between the cysts and the serous membrane.

A closer examination revealed the fact that the serous membrane covered the tubo-ovarian pouches, and passed above them just as if they were cysts of the broad ligament. An incision of the serosa at the most prominent part of the left tumour allowed it to be drawn from its sub-peritoneal compartment without further difficulty. The same was done on the opposite side, and when toilet of the peritoneum was finished, the flaps of the broad ligaments were united by a continuous suture.

The pouches having been removed whole, it was possible to examine them in detail after removal. They were formed by the dilated adnexæ, especially the Fallopian tube, whose uterine pedicle could be followed. The tube, on becoming enlarged, became covered with peritoneum, covering the broad ligament, thus resembling a cyst of the broad ligament.

**Diagnosis.**—The clinical signs of pelvic lesions are very variable. Rupture of a tubal pregnancy causes a violent pain and a peritoneal facies. But the temperature does not rise. Aseptic pelvic peritonitis occurs after torsion of the pedicle of a small ovarian cyst.

The change in aspect, vomiting, fever, delirium, shivering, and the pathognomonic signs of pus formation, enable a distinction to be formed between pelvic suppuration and pelvic peritonitis, which is non-microbial and relatively benign. In subacute cases microbial infection and suppurations are revealed by nightly rise of temperature.

The special aspect of the patient, the course, and the long-standing history, the evening rise of temperature, and night pain, are certain signs of the presence of pus.

What is the seat of the lesion? Exploration alone will clear up this

point. Phlegmon of the broad ligament has an acute evolution as a rule. It occupies the most external region, in contact with the pelvic wall. Very soon it invades the iliac fossa, and moves towards the crural arch.

The indurated peri-uterine masses which have already been noticed have a much less acute course. The temperature rarely reaches higher than 38°. Cure is generally rapid after inguino-subperitoneal incision followed by drainage and plugging.

Small lesions of the adnexæ are difficult to reach when the patient is obese. This was the case in my first total ovariectomy. The abdominal walls were very thick, the temperature was 40°, the abdomen was distended and painful, and it was with great difficulty that two small painful tumours were felt at a high level. The case was one of bilateral suppurating ovaritis. A vaginal hysterectomy was performed.

Chronic salpingitis is often accompanied by intraperitoneal lesions. The uterus is surrounded by a mass of inflammatory tissue, and around it is felt either in one cul-de-sac or over the whole pelvic floor a hard, painful, pasty tumour, either crescent formed or in a complete ring.

The situation and dimension of purulent collections are variable, and often the purulent focus is small, although it may be situated in the midst of an inflammatory mass. It may occupy the tube, the ovary, or be encysted in the centre of peritoneal adhesions. There may be several collections present in the same patient. The important point is to ascertain if the lesions are bilateral.

A difficult point of diagnosis is to ascertain if a fistulous communication exists between the purulent foci and the bladder or rectum. These fistule may be momentary or they may give rise to a very small flow of pus, and the surgeon may not always be present when this occurs. This complication exposes the patient to the risk of an irruption of urine or faecal matter into the peritoneum during the operation.

### Operative Indications.

#### EXTRAPERITONEAL OPERATION.

##### *Simple Abdominal Incision of Peri-uterine suppurating Foci.*

The inguinal or inguino-subperitoneal incision allows an abscess in the upper third of the broad ligament to be opened. Large tubal collections adhering to the antero-lateral abdominal wall can also be opened in this manner.

##### *Iliac Incision.*

This is the best way for evacuation of purulent collections of the broad ligament. This operation should be performed if the abscess advances towards the skin as soon as deep fluctuation is observed.

**Operation.**—The skin and aponeurosis of the great oblique are incised above the crural arch, the subjacent muscular fibres are retracted, and the fascia iliaca is separated from the deep and indurated tissues. As soon as the inflammatory mass is found it is perforated with blunt scissors, which

are drawn out open as soon as the pus appears. This enlarges the opening without hæmorrhage. The pouch is explored with the finger and cleaned out with sterile compresses. It is plugged with damp tampons. These are left in place two to three days. Irrigation with antiseptics is then instituted.

*Iliac Incision of Intraperitoneal encysted and Adherent Foci.*

I have made this incision on various occasions in order to open, not only abscess of the broad ligament, but purulent intraperitoneal gynæcological collections which were encysted and bulging in the iliac fossa, latero-uterine encysted abscess, large salpingitis adherent to the anterior abdominal wall, and suppurating dermoid cysts of the ovary.

In patients who are feeble, where the tumour is lateral and large, when operation must be performed in the acute stage, the iliac incision is preferable. These patients have generally a temperature of  $39.5^{\circ}$  to  $40^{\circ}$  for several days, vomiting, rapid pulse, small and compressible. Action must be taken quickly, and the less dangerous operation is chosen—that of simple incision of the focus.

If the tumour is lateral, the iliac route is taken. The skin and aponeurosis are incised as above, the fascia transversalis is divided, and the finger is introduced outside the peritoneum in contact with the fascia iliaca. The tumour is recognized, and the peritoneum is incised at the most accessible point. Adhesions as a rule exist between the pouch and the parietal peritoneum. The pouch is widely opened, evacuated, and tamponed. All immediate injections are contra-indicated, as there may be a small tear in the peritoneum. Injections are commenced on the sixth day.

A definite cure may result from simple incision of these purulent foci. Any further lesion is dealt with as soon as opportunity arises.

**MEDIAN INCISION OF THE LINEA ALBA.**

The suprapubic incision is indicated when the purulent focus presents above the bladder. By this incision extraperitoneal retro-pubic phlegmon and certain intraperitoneal encysted collections of uterine or peri-uterine origin can be evacuated. Toilet of the pouch is made, the wound is plugged, and the upper part of the incision is sutured. When the wound is cicatrized a further intervention may become necessary if a simple or pyostercoral fistula persist. This is a frequent complication in these cases of extensive encysted peritoneal suppurations whose origin is often obscure, such as suppurating peri-uterine hæmatoecle, appendicitis, etc.

**Simple Evacuation of Peri-uterine Collections by Colpotomy.**

Colpotomy can be performed with or without division of adhesions. Puncture and incision of Douglas's pouch belongs to the pre-antiseptic epoch of gynæcology. Before the days of antiseptics puncture was less dangerous than incision. To-day colpotomy is an inoffensive operation, and is all that is required in many cases to bring about a cure.

### PERITONEAL ROUTE.

#### Removal of the Uterine Adnexæ by Laparotomy.

When a patient is the subject of massive pelvic lesions, which consist for the greater part of indurated masses, radical intervention is necessary, and a choice must be made between two procedures—laparotomy and vaginal hysterectomy.

I consider that vaginal hysterectomy is the preferable operation to laparotomy when the lesions are limited to the pouch of Douglas. The removal of the uterus and its adnexæ by the vagina is a radical cure.

Laparotomy is indicated when the lesion is unilateral; it is also the method of choice when pelvic peritonitis has developed upwards, and when there are numerous adhesions of the omentum and small intestine. Whenever the lesions are accentuated it is indispensable to remove the uterus after the adnexæ.

Before describing the removal of the uterine adnexæ by laparotomy, it is of use to decide whether bilateral removal of the ovaries and tubes really causes grave disorders in the patient. I am not of the opinion that this is the case. I have never observed them, and I am convinced that the symptoms of the so-called anticipated menopause are caused by defective and incomplete operations.

This was discussed in 1903 at the Surgical Congress of Madrid. Professor Trent held that "surgeons, by curing their patients of diseases which could be cured by medical means, gave them by operation an incurable and graver malady—anticipated or precocious menopause." I vehemently protested against this doctrine. "I can easily demonstrate," was my answer, "that the removal of the uterus and its adnexæ, when profoundly diseased, cures the patients without causing them any further trouble. The accidents quoted by the Professor occur after badly performed operations, when the surgeon has left in the abdomen fragments of the uterus or the adnexæ." The following observations were then given:

Total vaginal castration was performed in two cases aged seventeen years, one for double pelvic suppuration following several curettings for dangerous hæmorrhages. Vasular villosities were present in the uterus. The other was for pelvic peritonitis by rupture of an extra-uterine pregnancy. Both cases were perfectly well after operation, and had never suffered from so-called symptoms of anticipated menopause.

But I have observed these phenomena in a woman of forty years, except that the menstrual periods had not ceased. My surgical chief had diagnosed purulent salpingitis opening into the intestine. Having discovered an obdistant appendicitis, I made a median laparotomy in order to verify the condition of the uterus and its adnexæ. They were healthy. I removed the appendix, which was calculous though free from adhesions. This patient

after her operation presented all the signs of the menopause with the exception of the periods, signs attributed in usual to the removal of the uterus and its adnexa.

A few years afterwards the same patient, suffering from a grave metritis,



FIG. 879. INSTRUMENTS FOR REMOVAL OF THE ADNEXA, OVIARTOTOMY, AND REMOVAL OF RETROPERITONEAL TUMOURS.

- 2 bistouries; 2 pairs of straight scissors; 6 Doyen's artery forceps, 6 Champounière's forceps, 4 oval-jawed forceps, 6 Doyen's oblique toothed forceps, 6 long curved forceps, 2 dissecting forceps; 3 curettes; 2 Doyen's vein forceps; 2 eccentric and 6 small needle-holders; open-eyed needles, including intestinal needles; 6 glass drains (2 for the peritonem).
- 2 Doyen's éraseurs; 4 bullet forceps, 4 elastic forceps (Doyen); 2 Doyen's mounted needles for the peritonem, 2 curved needles, 2 blunt needles for pedicles; Mitchell's clips with forceps; 2 Doyen's retractors with interfemoral fixing apparatus; 4 eccentric-jawed forceps; oblique retractor; 30 small and 4 large Doyen's hook forceps, straight and curved.



desired the removal of uterus and ovaries. This I performed at her express desire. The neuropathic symptoms abated after this second operation to almost entire extinction, and the patient's condition improved in a remarkable manner.

In many cases the symptoms of the so-called anticipated menopause are psychic. They can often be provoked by suggestion.

I will now attempt to show that the symptoms of anticipated menopause may also be excited by nervous reflexes caused by the enclosure of ovarian fragments in the cicatrices of an incomplete operation.

I have collected twenty observations on women, incompletely operated on either by laparotomy or the vaginal operation, suffering from painful and nervous symptoms who were forced to live the life of invalids on couches. These cases belonged to several groups: (1) Removal of a fibromatous uterus with the adnexæ conserved on one or both sides; (2) removal of the adnexæ by laparotomy; (3) bilateral removal of the adnexæ by the vagina, conserving the uterus; (4) incomplete vaginal hysterectomy, leaving the adnexæ.

These patients, who were great sufferers (several amongst them being bed-ridden), were cured by completing their operation. In several I removed by the vagina the uterus and adnexæ, which another surgeon had not dared to remove by laparotomy, owing to their adhesions. In other more complicated cases, where an incomplete vaginal hysterectomy had been performed, I was obliged to perform laparotomy in order to remove cystic adnexal tumours whose volume ranged from that of a nut to that of a small orange, which had developed from a small fragment of ovary left behind in the abdomen.

These patients presented very various symptoms: frequent congestive attacks in the breasts, flushings of the face, general nervous troubles, psychic and sensory troubles, in one case even amaurosis. Those who retained the uterus and one ovary had their periods: those in whom the uterus had been removed and fragments of the ovaries left had each month painful peritoneal phenomena caused by the rupture of the Graafian follicle into the peritoneal cavity.

I kept these cases under observation after I had operated on them. They are all in perfect health.

These observations demonstrate that removal of the uterus and ovaries when attacked by chronic lesions, is followed by complete cure if properly carried out. Surgical intervention does not occasion the appearance of serious disorders unless it is carried out by a bad technique, and when it is incomplete. The indications for operation are very precise in a well-established diagnosis. It would be criminal to remove the uterus and ovaries from healthy young women. When the uterus and ovaries are deeply altered they should be removed totally. The graver the lesion, the more favourable will be the result of the operation.

When in a laparotomy it is found that the adnexæ on one side are diseased, the adnexæ on the other side should not be spared, unless absolutely healthy and when the uterus is free from any grave lesion. Otherwise the

adnexæ on either side must be removed, and if metritis be present the uterus, too, must be removed. Whenever the uterus is removed the adnexæ should be removed also, for their presence generally causes painful phenomena and reflex nervous troubles.

**Removal of the Adnexæ.**

**OVARIOTOMY; TUHO-OVARIAN CASTRATION.**

*Preparation of the Patient.*—The patient is shaved, and the skin is prepared in the usual way. On the operating table the legs are fixed, flexed on the leg-rests at a right angle, as for abdominal hysterectomy. The head of the patient is towards the light.

The incision of the abdomen is made with the patient in the horizontal position. If the position of Trendelenburg be adopted for this incision in a case of peri-uterine suppuration, the peritoneum may become contaminated by the early rupture of a purulent collection and the pus may flow as far as the cavity of the diaphragm.



FIG. 880.—LAPAROTOMY FOR BILATERAL SALPINGITIS. CLAMPING AND PEDICELLIZATION OF THE ADNEXÆ.

**Operation—First Stage.**—The skin is incised from the pubis to the umbilicus, the linea alba and pyramidal muscles are incised as far as the umbilicus.

The aseptic towels being in position, the peritoneum is opened in the upper part of the wound in order to avoid wounding the bladder. The section of the peritoneum is extended to the pubis. The edges of the serosa

are caught with hooked forceps, and a large compress is introduced into the abdomen.

*Second Stage.*—Exploration and removal of adnexa. If the tumour is not brought into view on section of the peritoneum, the left index and



FIG. 881. DOYEN'S LIGATURE FOR THE PELVIC.



FIG. 882.—DIFFERENT STAGES OF THE LIGATURE.  
1, circular; 2, first transfixion; 3, second transfixion; 4, complete.

FIG. 883. THE SAME.  
No. 4 enlarged.

medius, then the hand, are introduced into the wound and explore the pelvic cavity.

The more accessible tumour is immediately recognized, detached from

its adhesions, and brought outside. A ringed forceps holds the adnexæ outside the abdomen.

*Third Stage.*—Ligature of the pedicle. The pedicle is ligatured *en masse* after crushing with the *écraseur*. The thread is passed by transfixion below the first ligature, and again tied. This assures the fixation of the ligature.

The adnexæ are detached with the thermo-cautery. The table is now turned 20 degrees backwards. The pedicle is examined, and a circular



FIG. 884. —DOUBLE TUBERCULOUS SALPINGITIS.

safety ligature is placed in position. The pedicle is reduced, still held in forceps in order that it can be easily found when the toilet of the peritoneum is being carried out.

The adnexæ on the other side are extracted and resected in their turn.

*Fourth Stage.*—Toilet of peritoneum and suture. Careful toilet of Douglas's pouch, the vesico-uterine pouch, and the iliac fossæ. No trace of liquid or blood must be left. The abdomen is then closed

*Fifth Stage.*—Closure of abdomen. A final compress is disposed horizontally under the edges of the wound.

The linea alba and the peritoneum are united by a continuous catgut



FIG. 885. LEFT: PURULENT SALPINGITIS REMOVED BY LAPAROTOMY. RIGHT: LARGE TUBERCULOUS SALPINGITIS REMOVED BY LAPAROTOMY. ( $\frac{2}{3}$  REDUCTION.)

suture, with alternating deep and superficial spirals. The serous membrane is pushed beneath the aponeurosis in order to obtain exact union of the edges of the latter.

The skin is united with clips. Dressing: a compress over the suture covered by Vigier's plaster and a body bandage.

*Complications.*—Rupture of purulent pouches. If care be taken, on opening the peritoneal cavity, to protect the upper parts of the peritoneum by large sterilized compresses, and if the patient be kept in the horizontal position, the pus flows out without contaminating the upper peritoneum.

The detachment of the pouch is difficult when it is ruptured and ragged. The important point is to find, either in the pouch of Douglas or close to the uterus, the cellular division which separates it from the parietal peritoneum. When the finger can penetrate between the peritoneum and the adnexal pouch adhering to it the separation is soon accomplished. The removal of the adnexæ must be complete.

The tuberculous nature of a lesion calls for no modification of the operative technique. Parietal tubercles which cannot be removed are frequently reabsorbed after removal of the adnexæ. Treatment by phymalose should immediately be instituted, as already described.

#### Intraligamentary Salpingitis.

These salpingites (first described by the author in 1892) develop, like cysts of the broad ligament, by penetrating the thickness of the ligament. It is impossible to isolate them in the ordinary way, as no interstice allows the tips of the fingers to get below them. Careful examination of their surface shows that the parietal peritoneum covers these tumours entirely.



FIG. 886. INTRALIGAMENTARY SALPINGITIS.

As soon as the serous covering is incised the tumour becomes immediately accessible, and it can be rapidly extracted by decortication.

The pedicle is ligatured and the broad ligament is united by a continuous suture. Removal of the adnexæ on the other side is performed in the ordinary way if their disposition be normal.

**Pelvic Hæmorrhage.**

When the pouches are very adherent and their isolation causes much bleeding, their extraction should be made quickly without heeding the hæmorrhage. The pelvic cavity is immediately plugged with large aseptic compresses. The tubo-ovarian pedicles are ligatured, and the adnexæ on the opposite side are ligatured in their turn.

The uterus is raised by a ring-jawed forceps. The deep compresses are removed, and toilet is made of the pouch of Douglas, which is full of clots. The pelvis is plugged with dry compresses.

The intestinal and omental adhesions are now carefully examined, and the compresses are removed.

Generally all bleeding is now stopped. Fresh compresses are placed behind the uterus and above the parietal incision. The abdomen is then closed.

If at the last moment blood be perceived in the depths, the patient is placed in Trendelenburg's position, the superior peritoneum being protected by three large compresses fixed by ring forceps.

The blood comes either from the walls of the pelvis or, which is more frequent, from a tear on the posterior surface of the broad ligaments. The vessels which bleed are clamped and tied, or a fine silk continuous suture is passed which sutures the peritoneum at the bleeding-point.

I attach great importance in all abdominal operations to the careful repair of all serous tears. As soon as the hæmostasis is finished, the patient is replaced in the horizontal position and the abdomen is closed.

**Extensive Serous Denudation of the Pelvis.**

One of the gravest complications which can occur in the course of tubo-ovarian castration by laparotomy is the tearing away with the tubal pouches of the majority of the pelvic peritoneum. A general oozing hæmorrhage is immediately produced.

The bleeding must be stopped by the usual methods, plugging application of hot compresses and hot air. Any important vessel is ligatured.

As soon as the peritoneal toilet is made, the congested and oozing aspect of the pelvic walls, stripped of their serous covering, contrasts sharply with the peritoneum of the flanks and iliac fossæ. Often there is a general oozing from the surface which resists all attempts at hæmostasis. Closure of the abdomen is dangerous, and the pelvic cavity must be isolated from the rest of the abdomen.

Some surgeons drain by the vagina or plug the true pelvis through the end of the abdominal incision. This method is defective.

The best method is to turn the uterus backwards and close the upper strait transversely by a fine continuous silk suture. This suture begins above the right adnexal pedicle unites the right latero-rectal fold to the broad ligament, the rectum to the fundus of the uterus, and so on ending at the sigmoid and right adnexal pedicle. Before closing the peritoneum in the upper strait it is prudent to open the posterior vaginal cul-de-sac and to

place therein a compress and glass drains. This technique is of great value where the extent of the pelvic tears would seem to indicate a grave prognosis. Pelvic disorders repair admirably when the upper peritoneum is unaffected. Suture of the fundus of the uterus to the upper outlet does not present an obstacle to vaginal hysterectomy, should this operation become necessary later on.

#### Wounds and Fistulæ of the Intestine and Bladder.

If a wound of the intestine be accidentally produced, or if a fistulous salpingitis has to be detached from intestine or bladder, the orifice must be closed by the technique already described: purse-string suture and superficial continuous suture.

#### Subumbilical Peritonization.

Where the disorders are still more extensive, Douglas's pouch is plugged and drained, and the peritoneum is closed between the umbilicus and the pubis. On the right the antero-external wall of the cæcum is united to the parietal peritoneum. The mesenteries are sutured in the centre, and on the left the sigmoid is united to the parietal peritoneum. The pelvis is plugged by the lower part of the incision, and the abdomen above the compress is closed by No. 10 silk.

#### Ovariectomy.

**History.**—Ovariectomy was the first conquest in abdominal surgery. Schorkopf (1685) states that an ovarian cyst can be cured by removal. Hunter proposed to puncture the sac and draw it out through an opening of 2 inches.

Houston (1801), making an incision of 5 inches in an ovarian tumour which he could not evacuate by puncture, drew the cyst outwards and sutured the wound. The patient recovered and survived sixteen years.

Macdowel of Kentucky, a pupil of John Bell of Edinburgh, obtained (1809) eight cures out of thirteen operations. He reduced the pedicle.

Nathan Smith (1822) and W. L. Altec (1833) also performed this operation, and Altec began in 1844 his remarkable series which in 1871 reached the No. 246. The success of Baker Brown and Spencer Wells (1858) caused the popularization of ovariectomy in Europe. Péan's successes in Paris proved the possibility of the operation.

The extraperitoneal method of treating the pedicle was at first generally employed, especially in pre-antiseptic days, since suppuration of the ligature was the usual cause of post-operative peritonitis.

#### ABDOMINAL HYSTERECTOMY.

The history of abdominal hysterectomy is more recent. The early ovariectomists—Lizars (1825), Dieffenback (1826), and Altec (1849-1851)—met with solid tumours of the uterus instead of cysts. They closed the abdomen.



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Granville (1837) tried without success to remove a pedunculated subserous tumour. Altee succeeded in 1844. The first cure from a partial



FIG. 887. OVARIOFOMY. INCISION.

amputation of the uterus by laparotomy is attributed to Burnham (1853), but he thought he was dealing with a cyst.

Kinball successfully attempted the same operation in 1855.



FIG. 888. THE SAME.

The peritoneum is opened. Introduction of two compresses between the cyst and the parietal peritoneum.

The names of Péan and Koeberlé are closely connected with the history of supravaginal amputation of the uterus with extraperitoneal treatment



FIG. 880. THE SAME. INCISION AND EVACUATION OF A UNILOCULAR CYST.



FIG. 890. THE SAME.  
The cyst is drawn out of the abdomen.

of the pedicle. These two surgeons, who employed the metal ligature with Cintrat's *serre-nœud* and steel pins, established the operation on a true scientific basis.

Porro applied supracerical amputation to obstetrics, and on May 21, 1876, deliberately employed it instead of Caesarian section. He saved both mother and child.

The temporary elastic ligature employed for the first time by Kléberg of Odessa (1875) was proposed by Martin (1878) at the congress at Cassel. Hegar substituted the elastic ligature for the iron ligature for hæmostasis of the pedicle in 1879. The reduction of the cervical stump was proposed by Schroeder at the Cassel Congress in 1878, and later in 1880 by Spencer Wells, who had no knowledge of Schroeder's operations. Czerny (1879) and Kaltenbach (1881) attempted the hidden elastic ligature.

The accidents observed after reduction of the pedicle by the one or the other method led Memert of Odessa (1885) to open the pouch of Douglas to pass the pedicle by the vagina. His only operation was a failure.



FIG. 891. REMOVAL OF TWO MEDIUM-SIZED OVARIAN CYSTS. CRUSHING THE PEDICLE ON THE RIGHT.

Woeller and Von Hacker proposed, for greater security, to treat the pedicle by Schroeder's method, and instead of reducing it, to attach it by suture to the abdominal wall, the part being tamponed with iodoform gauze or drained.

Saenger (1886) proposed to isolate the pedicle by suturing the parietal peritoneum above it. Saenger at the same time successfully employed Caesarian section in difficult labour. The success he obtained by his method of sero-serous suture of the uterus permitted surgeons from that date to choose between Porro's and Saenger's operations.

From the intraperitoneal treatment of the pedicle to the total extirpation of the uterus by laparotomy was but a step.

Total abdominal hysterectomy, proposed in 1830 by Delpech, was designed anew in 1878 by Freund for the removal of a cancerous uterus.

Freund's operations gave deplorable results, and in spite of the attempt

of Rypier, Schroeder, and MacCormac, the method fell into complete discredit. Hegar and Kaltenbach reported 119 cases, with a mortality of 85 (72 per cent.).

Some surgeons attempted total removal of the uterus by the combined method (abdominal and vaginal) in certain well-defined cases, such as the co-existence of a gravid uterus with cervical cancer. Supravaginal amputation of the cervix was performed, and the stump, held by an elastic ligature, was removed by the vagina (Péan, Doyen, Lister, and Bonilly). None of the cases I attempted was successful. Freund's operation was useless for cancer but should be performed in the case of large fibromata.



FIG. 892. LIGATURE OF THE CYST PEDICLE ON THE RIGHT SIDE.

Martin, who preferred, when possible, the enucleation of intestinal myomata, decided in 1889, in cases where myomectomy was impossible, total hysterectomy by combined vaginal and abdominal routes.

**OPERATIVE TECHNIQUE—Ovariectomy.**—The operation calls for rigorous observation of the laws of asepsis, and, at the same time, a considerable manual dexterity. Before the abdomen is opened it is impossible to foresee the presence of adhesions to the anterior abdominal wall, omentum, intestine, liver, or even the spleen.

**Operation.**—The patient is in the horizontal position, the legs are flexed on the thighs and turned towards the light.

At first I was in the habit of aspirating the cyst contents into a 20-litre bottle, using a water-pump aspirator. This I have abandoned, and open the cyst directly.

**First Stage.**—The abdominal wall is incised above the pubis to a distance of 8 to 10 centimetres. This incision suffices if the cyst be unilocular and non-adherent.

The skin should be divided with a light hand, as it may be found, in

cases where the abdomen is distended and the linea alba very thin, that the cyst is pierced by the bistoury causing the contents to flow into the peritoneal cavity. Aseptic towels are arranged, fixed to the edges of the skin, and the peritoneum is widely incised. If the peritoneum be recognized with difficulty it should be opened high up to avoid any damage to the bladder. As soon as a smooth surface free from adhesions is met with, the serous cavity is opened.

When the anterior adhesions are very extensive the cyst wall is recognized by its fibrous aspect. If it should be incised there is no inconvenience, for the adhesions protect the peritoneal cavity and the contents flow outside.



FIG. 893. THE SAME. CRUSHING THE CYST PEDICLE ON THE LEFT SIDE.

A very common error for beginners is to strip away the fascia transversalis from the peritoneum, which they take for the cyst wall. This can be avoided by incising the linea alba high enough not to wound the bladder, and by following the section until the cyst wall comes into view.

*Second Stage.*—As soon as the cyst wall is recognized, and if there are no anterior adhesions, two large sterile compresses are placed in the lower part of the incision between the cyst wall and the parietal peritoneum. The operating table is tipped forwards, and the pouch is widely opened with the bistoury. A large jet of fluid is projected. The wall of the cyst is seized in forceps and drawn out of the abdomen. Not a drop of liquid penetrates the peritoneum with this technique.

#### UNILOCULAR NON-ADHERENT CYST.

If the cyst be unilocular the pouch comes out immediately. A large compress is plunged into the abdomen to hold the intestines, and fixed with a hook forceps. The pedicle is crushed and ligatured circularly, then

by transfexion (p. 726). The pedicle is then divided with the thermo-cautery, the stump is seized in forceps, and a circular security ligature is applied.

If a cyst or salpingitis exist on the opposite side it is now extirpated. The operating table is restored to the horizontal.



FIG. 894. SMALL OVARIAN CYST WITH TWISTED PEDICLE.

#### MULTILOCULAR NON-ADHERENT CYST.

In the case of a multilocular cyst it may be necessary, in order to extract it, to evacuate several pouches. This should be done through the first, which is widely opened. When the tumour is formed of hundreds of small cysts each the size of a nut or small pea, it must be treated as a solid tumour, and the incision is continued towards the umbilicus. The linea alba is divided by the scissors, guided by the left index. The intestines are protected by a compress introduced below the parietal peritoneum and fixed with a hooked forceps. When the umbilicus is reached it can be incised or passed on one side. I always incise it and finally remove it. A small hernia may be present. The sac should be removed when the abdomen is closed.

#### TORSION OF THE PEDICLE.

This is a fairly frequent complication of small ovarian cysts without adhesions. The torsion of the pedicle produces the symptoms of acute peritonitis. The symptoms generally abate, and exploration confirms the diagnosis. Torsion of the pedicle is followed by hæmorrhage into the interior of the cyst and a rise of tension. Necrobiosis of the tumour occurs and peritonitic symptoms are observed which are more or less intense.



As soon as the abdomen is opened the wall of the cyst appears brownish or violet in colour: it is adherent to the abdominal wall. The adhesions, which are recent, are detached without difficulty after the contents of the pouch have been evacuated.

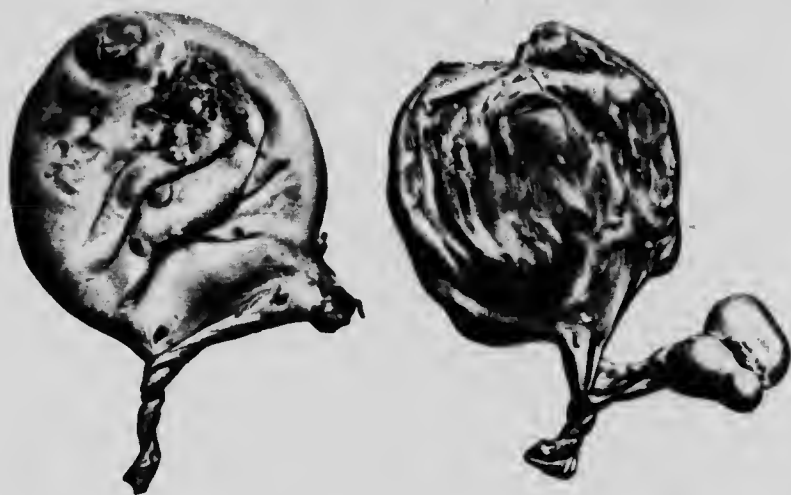


FIG. 895. OVARIAN CYSTS WITH TWISTED PEDICLES.

In the second the Fallopian tube is rolled round the pedicle, which is itself twisted on its axis.

#### ADHERENT CYSTS AND CYSTS WITH VEGETATIONS.

The adhesions may be of very great variety. From the loose adhesions to the omentum, intestine, and abdominal wall, to fibrous and vascular adhesions (old cysts) in the walls of which are depressions of intestinal loops, every variety and localization may occur.

Extracystic vegetations are sometimes benign, but they often graft like malignant neoplasms on the peritonem, both parietal and visceral.

Adhesions to the anterior abdominal wall are easily detached; if they bleed, large compresses are placed under the wall. The intestinal and epiploic recent adhesions are treated by division by means of a compress. When bleeding is not immediately arrested the suspected point is wrapped in a compress and fixed thereto with a ring-jawed forceps. It can again be examined at the end of the operation. If a certain amount of oozing be still present, a sero-serous suture is applied with No. 1 silk and intestinal needles. Intestinal surfaces which bleed and are devoid of serosa are treated in this manner.



Very vascular adhesions are clamped with forceps close to the cyst; a ligature is passed above the forceps, and the adhesion is severed between the ligature and the forceps. The thread is then passed through the pedicle and again tied as a security knot.

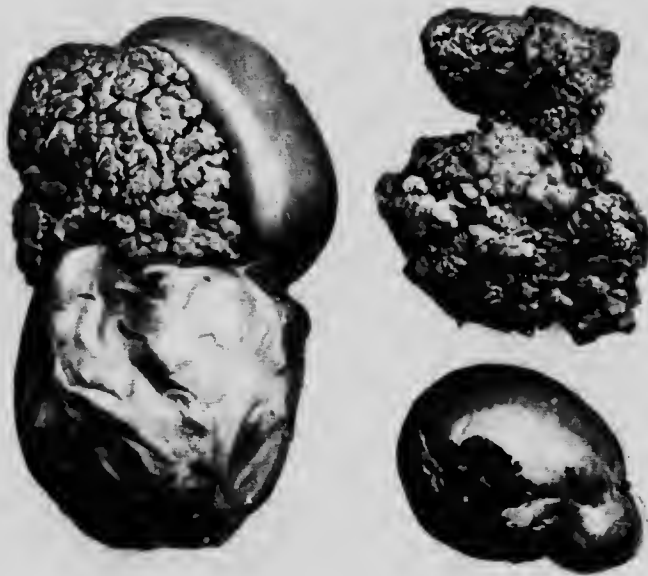


FIG. 896. — SMALL OVARIAN CYSTS WITH INTRAPERITONEAL VEGETATIONS.  
Culture of peritoneal grafts of these vegetations grew *Micrococcus neoformans*.

Old intestinal adhesions are dissected with the thermo- or galvanocautery, care being taken to encroach a little on the wall of the cyst. A fine silk continuous suture is applied to the bleeding surface.

#### WOUND OF THE INTESTINE.

In some cases which are exceptional, the intestine is dragged on, thinned and altered. A narrowing of its calibre may be feared. Invagination is performed or, better, the adherent loop is resected by the technique already described, and the tube is re-established by a lateral anastomosis.

#### MARSUPIALIZATION OF THE POUCH.

When the cyst wall adheres so intimately to the peritoneum and viscera as to render its evacuation impossible it is treated by marsupialization—

that is, its walls are sutured to the lower commissure of the abdominal incision, and its cavity is treated by antiseptic plugging. Before marsupializing the cyst the cyst wall is partially resected as far as the adhesions permit. It is sutured at separate points with silk sutures to the lower commissure and to the edges of the peritoneo-parietal incision. A final silk suture traverses the whole abdominal wall, including the skin, and closes the orifice in the cyst above. The suture is continued as far as the upper part of the wound, as in ordinary cases.

#### PREMATURE SECTION OF THE UTERINE PEDICLE IN THE CASE OF EXTENSIVE ADHESIONS IN THE UPPER PART.

When the tumour, free from pelvic adhesions, is very adherent in the upper peritoneal regions the uterine pedicle is crushed and tied. To do this it is brought outside and held up on the finger. It is divided after a strong curved forceps has been placed on the cyst side of the pedicle. The lower part of the tumour is extracted and the upper adhesions, which have now become accessible, are detached from behind forwards and from below upwards.

#### EXAGGERATED WIDTH OF PEDICLE. TORSION.

Some cysts have a very wide pedicle. The majority of surgeons treat such pedicles by chain ligature. This is a defective method. The *céraseur* is the best instrument for dealing with such cases. They are twisted through an angle of 180 degrees, crushed and ligatured at the most favourable point. A first knot is made and the ligature is passed twice through the pedicle below the first knot. Each time the ligature is knotted.

As soon as the cyst is detached the ligatures are examined and a security ligature is placed on the stump. The author's new pedicle forceps are of great use in these cases (see Vol. I. p. 189, Figs. 205, 206).

#### RUPTURE OF A CYST INTO THE PERITONEAL CAVITY.

This may occur in a multilocular cyst with very thin walls. It is of minor importance if the field of operation has been well protected by large sterile compresses.

If the colloid liquid has penetrated far, its viscosity demands a free lavage with warm sterile water to insure an adequate peritoneal toilet. Two or three litres of isotonic solution are poured into the abdomen and the intestines are well washed. The table is tipped forwards and the liquid is pushed out of the abdomen by pressing on the flanks.

A second or third lavage gives almost pure water.

As soon as the lavage of the peritoneum is finished the uterus is seized with a ringed forceps, and toilet is made of the pouch of Douglas, where a large compress is placed mounted on forceps. The iliac fossae and the flanks are sponged in their turn. A large compress is placed on either side and the suture of the abdominal wall is commenced.

The two lateral compresses are removed; they are replaced by small compresses which are also attached to forceps; they are placed below the line of union. They are removed as the suture progresses. The compress on the pouch of Douglas is removed when the suture is three parts finished.

SUPPURATION OF THE CYST.

Suppuration of the cyst is a more serious complication, for it causes grave signs of septicæmia. The infection of the cyst contents is often caused by contact with a suppurating salpingitis. The patient has high oscillating temperature. A capillary puncture reveals the presence of pus, and a bacteriological analysis is made. As soon as the cyst wall is exposed it is evacuated, great care being taken to cover the peritoneum and wound by compresses. It is well to use a wide trocar connecting with an evacuating pump.

CHANGE OF THE PATIENT'S POSITION DURING THE OPERATION.

Ovariectomy is generally commenced in the horizontal position, the legs being turned towards the light. As the cyst is evacuated the table is tilted forwards. This precaution helps to protect the peritoneum if the cyst contents are purulent. When the cyst is empty and removed the condition



FIG. 897. POSITION OF THE PATIENT FOR EVACUATION OF ASCITIC FLUID.

of the pelvis may render it necessary to place the patient in Trendelenburg's position, with the head towards the light.

In removal of the inflamed adnexæ or tubo-ovarian castration the best position is to place the patient horizontally with the head towards the light, the surgeon being on the patient's left. The table is tilted forwards for removal of the purulent pouches, the pelvis is plugged, and the table is

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tilted slightly backwards (20 centimetres) in order to gain access to the pelvis and carry out a careful repair.

Ovariectomy is commenced in the horizontal position, the feet of the patient being towards the light, and the surgeon stands on the patient's



FIG. 898. THE SAME. ROTATION OF THE TABLE.



FIG. 899. THE SAME. ROTATION OF THE TABLE.

right. Should it be required to finish the operation in Trendelenburg's position, the author's table allows the manoeuvre to be performed in a few seconds. It is turned and fixed in the new position, while the surgeon and his assistant hold the compresses covering the abdomen in position. The

suprapubic retractor with the thigh-fixing pieces is then applied, and the operation continues under the best possible conditions.

*Third, Fourth and Fifth Stages.*—As for tubo-ovarian castration.



FIG. 900.—THE SAME. TILTING THE TABLE BACKWARDS.



FIG. 901.—THE SAME.  
The patient is in Trendelenburg's position.

#### DERMOID CYSTS OF THE OVARY.

These tumours call for no special modification in the technique of the operation. Rupture into the peritoneum must be avoided, for the special cyst contents renders the toilet of the peritoneum almost impossible.



FIG. 902.—THE SAME. REMOVAL OF THE TUMOUR.

When the small whitish tumour has a pasty consistence the diagnosis is made as soon as the abdomen is opened.

The cyst is removed entire by a wide incision. If they are evacuated the greatest care must be taken not to contaminate the peritoneum.

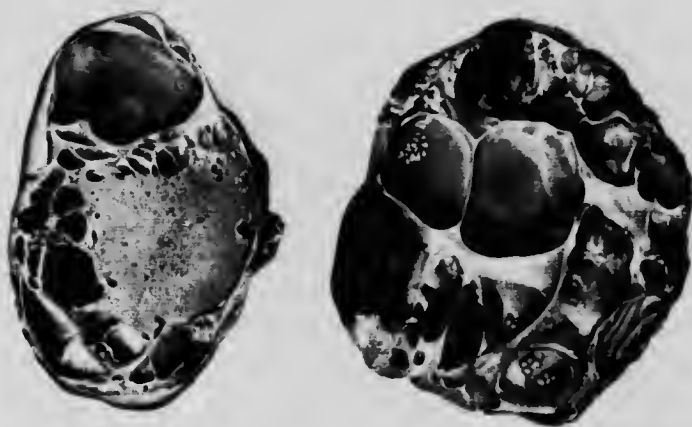


FIG. 903.—MULTILOCULAR CYSTS WITH INTRACYSTIC VEGETATIONS.

## POLYCYSTIC TUMOURS OF THE OVARY.

Large tumours of the ovary may be composed of so great a number of small cysts that the volume of the tumour cannot be reduced by evacuation of their contents. As soon as this is observed to be the case the incision is prolonged and the tumour is removed as if it were a solid tumour.

## FIBROMA OF THE OVARY.

True fibroma of the ovary is not very rare. I have removed a certain number, two of which were complicated by torsion of their pedicle. As a rule the neoplasm develops at the expense of the entire organ.

Fibroma of the ovary is frequently accompanied by ascites. The liquid is not reproduced after their removal. The tumours are often calcified.

I have observed one very rare case of pedunculated fibroma of the ovary

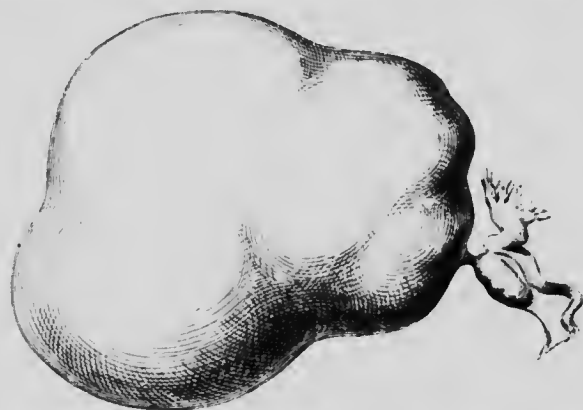


FIG. 904.—PEDUNCULATED FIBROMA OF THE OVARY. ( $\frac{1}{3}$  SIZE.)

developed at the free extremity, with which it had no connection but a narrow pedicle (Fig. 904). It was removed with tube and ovary, showing the curious disposition of the tumour.

Removal of the fibromata of the ovary requires an incision equal to their smallest diameter. Extraction is facilitated by the use of a helicoidal hook, by which they can be seized in the depths. By this means they can be extracted through quite a small incision.

## CYSTS AND FIBROMATA OF THE BROAD LIGAMENTS.

Cysts developed in the interior of the broad ligament are lateral as long as they are of small diameter. They become median or nearly so later. They never have adhesions either to the parietal peritoneum or the intestine, for they are covered by the parietal peritoneum. When the abdomen is opened the serous membrane is seen as a transparent envelope covering

them. It may be that the ligamentary origin of the cyst is not perceived until the pedicle is reached. When the cyst is very voluminous its upper pole has distended the serosa, which becomes part of the cyst wall. The lower pole alone is intraligamentary, and the peculiarity is only observed when the pedicle is being dealt with. It is then seen that the lower pole of the tumour is covered by a serous envelope which is loose and vascular, and that it extends between the layers of the broad ligament, which it separates as far as the side of the uterus. The uterus is often pushed to the opposite side by the cyst, on the anterior surface of which is found the ureter of that side.

The serosa is incised where there are no appreciable vessels, and the cyst is enucleated by decortication. Hæmostasis is then performed of the vascular pedicle and the vessels which bleed. The breach in the broad ligament is then repaired by continuous suture or purse-string suture.

Dermoid cysts are sometimes found in the broad ligament. They must be enucleated with care after incision of their peritoneal covering. Rupture into the peritoneal cavity must be avoided.

#### COMPLEMENTARY HYSTERECTOMY.

The necessary damage caused by the removal of certain tumours of the broad ligaments, where the uterus is, as it were, spread out on the surface of the neoplasm, may call for the immediate removal of the organ. If this is found to be the case at the beginning of the operation, hysterectomy is immediately performed. If it be not found necessary until after the removal of an adnexal or intraligamentary tumour, the uterus is removed at a second stage of the operation (see Total Hysterectomy and Fig. 905).

#### WOUND OF THE URETER IN THE COURSE OF THE OPERATION.<sup>1</sup>

In 1889 I was called upon to remedy the accidental section of the left ureter which had occurred during the removal of a large cyst of the broad ligament, which had displaced the ureter. I fixed the central end on a gum-elastic catheter by a silk thread, and drew it out of the lateral abdominal wall by a small orifice. The mucosa of the ureter was sutured to the skin, and the catheter conducted the urine into an appropriate vessel. The patient recovered, but spontaneous closing of the orifice called for removal of the kidney after five weeks. This was successful. This was one of the first attempts to create a urtero-cutaneous fistula in order to remedy an operative wound of the ureter occurring during laparotomy.

#### COLLOIDAL TUMOURS OF THE PERITONEAL CAVITY.

I have observed in several women intraperitoneal colloid or myxomatous tumours whose ovarian origin was not evident.

These tumours in young women are remarkable for their rapid growth. Their limits are irregular. When the abdomen is opened gelatinous masses





FIG. 905. LARGE INTRALIGAMENTARY CYST. DECORTICATION OF THE CYST AFTER INCISION OF THE PERITONEUM.



FIG. 906. THE SAME.  
The cyst is drawn out of the abdomen.

are found which are more or less transparent and, at times, encysted. The colloid masses are extirpated as completely as possible, and the field of operation is washed with isotonic solution. Antineoplastic vaccination is instituted and the patient is kept under observation.

The adnexal origin of these tumours is doubtful, for I have observed very analogous cases in men.

#### REMOVAL OF RETROPERITONEAL TUMOURS.

##### *Lipomata, Myxomata, and Sarcomata.*

In women of certain age large solid tumours are sometimes met with which simulate tumours of the broad ligament, and which are situated higher in the retroperitoneal cellular tissue. These tumours have been wrongly called tumours of the mesentery, because they burrow into it during their development. They often form in the region of the adipose

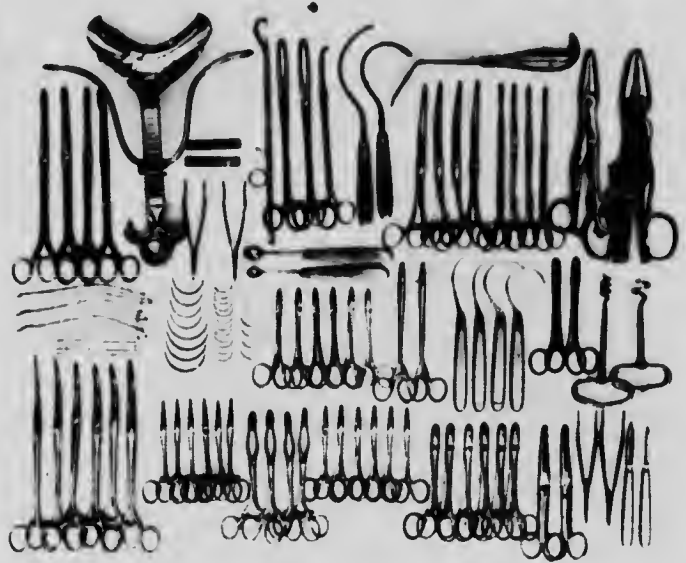


FIG. 907. INSTRUMENTS FOR TOTAL ABDOMINAL HYSTERECTOMY.

- 2 bistouries; 2 Doyen's oblique toothed dissecting forceps, 2 pairs strong scissors; 6 Doyen's forceps; 6 Champoumière's forceps, 4 oval-jawed forceps, 6 oblique toothed forceps, 6 long curved forceps.  
 2 helicoidal hooks; 2 Doyen's vein forceps; 4 mounted Doyen needles; 2 eccentric needle-holders; 6 small Doyen's needle-holders; needles; glass drains (3 Doyen's drains for Douglas's pouch).  
 2 éraseurs; 4 bullet forceps, 4 elastic forceps for the intestine (Doyen); 1 oblique retractor; 2 blunt needles for pedicles; 1 curved forceps for ligatures; 2 Museux's forceps; 1 Doyen's blunt hook for the cervix; metal clips and forceps; 2 Doyen's abdominal retractors with thigh fixing; 4 Doyen's eccentric oval-jawed forceps.  
 For other instruments see Fig. 269.

capsule of the kidney. They are often lipomata or myxomata, and may weigh as much as 25 to 30 kilogrammes; often they are sarcomata.

When the abdomen is opened the seat of the tumour is evident, with its mesenteric envelope.

When removal seems possible the peritoneum is incised, and the tumour removed by subcapsular decortication as quickly as possible to avoid extensive loss of blood.

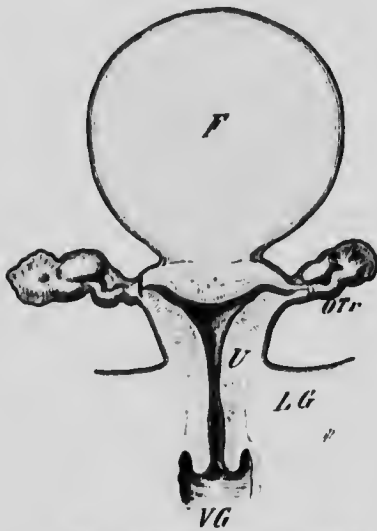


FIG. 908. SUBPERITONEAL FIBROMA OF THE FUNDUS.

The uterine cavity is normal; the adnexa occupy their usual situation.

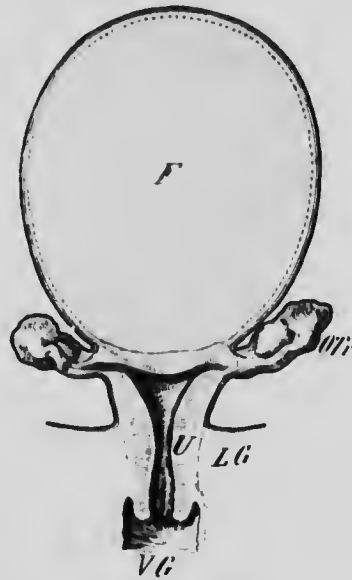


FIG. 909. SESSILE SUBPERITONEAL FIBROMA.

The uterine cavity is normal. The ovaries are situated at the lower limit of the tumour.

The vast cellular compartment is plugged with a large packet of compresses, and hæmostasis is proceeded with methodically. The peritoneum is closed and the seat of the tumour is drained by a lateral incision.

These operations are very serious and stirring. They can give good results only when the tumour is benign and when the patient can withstand the great shock. The surgeon, too, has need of all his qualities of speed, presence of mind, and dexterity, and appreciation of the patient's physical resistance. The slightest hesitation may be fatal, and the rapidity of the operation is the best condition of its safety.

OPERATIONS ON THE UTERUS.

**Hysteropexy.**

Abdominal hysteropexy is an exceptional operation. This operation, which has already been described, should not be performed except as a complement to other interventions such as tubo-ovarian enstration or ovariectomy, when a retroversion exists at the same time or a prolapse, and



FIG. 910. FIRST LIGATURE OF THE PEDICLE.



FIG. 911. HOLLOWING OUT WITH THE CAUTERY, LEAVING A SEROUS COLLARETTE.



FIG. 912. DEFINITIVE LIGATURE OF PEDICLE.

it is wished to avoid a later intervention by the vagina. I am less in favour of this operation, since I have had to remove by the vagina several uteri which had been sutured several months before in the neighbourhood of the umbilicus, because they caused painful phenomena which resisted all palliative means. In these cases the uterus was extremely difficult to draw

down, owing to the solidity of the parieto-uterine sutures, which had to be drawn to the fundus of the vagina in order to directly sever the silk. I can

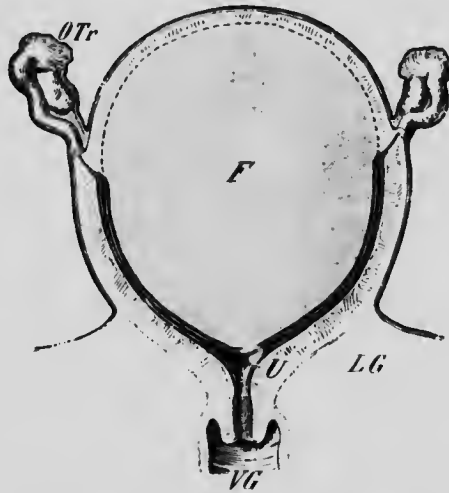


FIG. 913. UTERINE FIBROMA BULGING BOTH INTO THE CAVITY AND UNDER THE PERITONEUM.

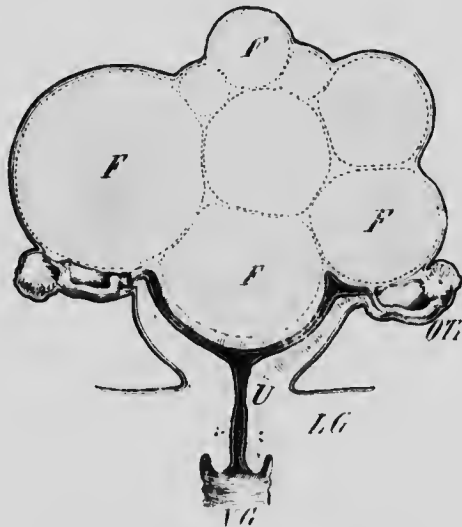


FIG. 914. MULTIPLE UTERINE FIBROMATA.

only quote one observation in favour of abdominal hysteropexy. I performed the operation on a woman for painful retroversion without removal

of the adnexæ. This woman is in perfect health, but has never become pregnant. I could have obtained the same result by combining vaginal replacement with Alexander's operation, which has already been described.

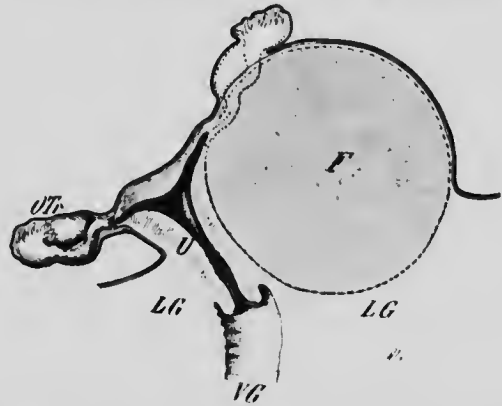


FIG. 915. FIBROMA DEVELOPED IN THE MOST SUPERFICIAL LAYERS OF THE LEFT LATERAL WALL OF THE UTERUS AND IN THE BROAD LIGAMENT.

The tumour is covered by pelvic peritoneum and the right ovary.

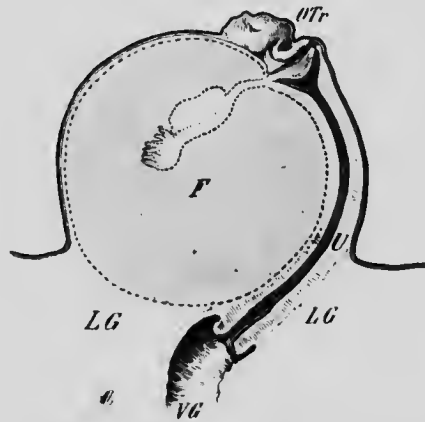


FIG. 916. FIBROMA DEVELOPED IN THE RIGHT LATERAL AND POSTERIOR WALL AND BULGING INTO THE BROAD LIGAMENT.

The cervix is pushed to the right. The whole uterus is elongated on the antero-internal side of the tumour. The cervix, very stretched, is normal in diameter. This patient suffered from grave hæmorrhages.

#### Removal of Subperitoneal Pedunculated Fibromata.

Some pedunculated fibromata of the fundus of the uterus of large volume can be removed by myomectomy without removal of the uterus. Total

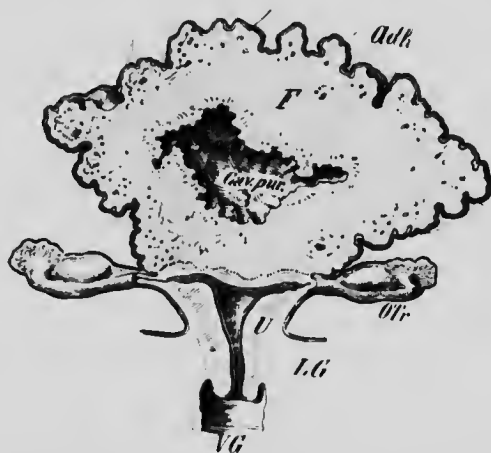


FIG. 917.—SUBPERITONEAL FIBROMA OF THE FUNDS WITH ROUGH IRREGULAR SURFACE.

The centre was occupied by a purulent ramifying cavity. The surface adhered to the omentum and intestines, owing to repeated attacks of peritonitis.

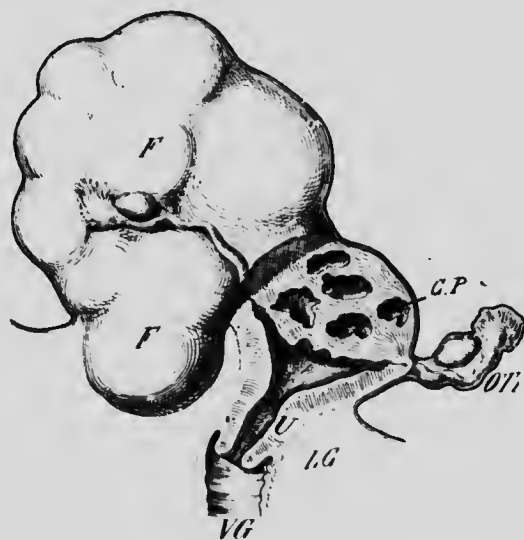


FIG. 918. MULTILOCULAR PURULENT CYST OF THE BROAD LIGAMENT ADHERENT TO THE UTERUS, WHOSE TISSUE IS PERMEATED WITH LARGE PURULENT FOCI.

The left adnexæ are stretched on the tumour. Right salpingo-ovaritis.

hysterectomy is useless if the tumour is distinctly pedunculated and if the body of the uterus is normal or hardly increased in size. In such a case the operative indication is for the simple removal of the tumour.

The delicate part of the operation is the treatment of the uterine pedicle. For this I have designed the following method:

The pedicle is ligatured with a strong silk ligature and the tumour is detached. The uterine stump is then hollowed out as deeply as possible with the thermo- or galvano-cautery, taking care to pass beyond the point tied by the ligature. The voluminous pedicle is thus reduced almost to its serous envelope. A new ligature is applied and the first ligature is removed.

A very small pedicle is thus obtained (Fig. 910), which does not bleed and is easily absorbed. The exuberant portion is resected 12 or 15 millimetres from the ligature and the pedicle is reduced.

If other fibromyomata develop later total hysterectomy is performed.

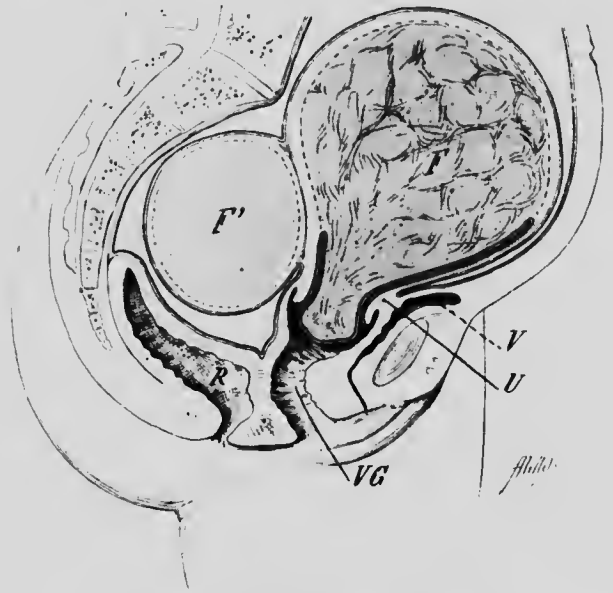


FIG. 919.—DOUBLE UTERINE FIBROMA.

The anterior tumour, myomatous and areolar, pushed through the cervix into the vagina. It gave rise to hæmorrhages and intermittent discharges of pus. It was covered at the fundus with uterine tissue. The posterior fibroma, hard as wood was subperitoneal.

#### Abdominal Myomectomy.

The removal of sessile subperitoneal fibromata is accomplished after incision of the uterine or serous covering to the tumour. As soon as the tumour is enucleated the seat is plugged and a sero-serous suture is made with No. 3 silk.



Martin performed a number of these operations with success. I have performed it rarely, as I prefer total abdominal hysterectomy, which is always followed by a durable cure.

**Total Abdominal Hysterectomy.**

My procedure for total abdominal hysterectomy with subserous decortication of the uterus was designed in 1891, presented at the Gynæcological Congress of Brussels in 1892, and modified in 1894. The discovery of this procedure has been the origin of so great an improvement in the results of the operation that the mortality has fallen from 30 and 40 per 100 (Péan, Terrier) to below 5 per 100.

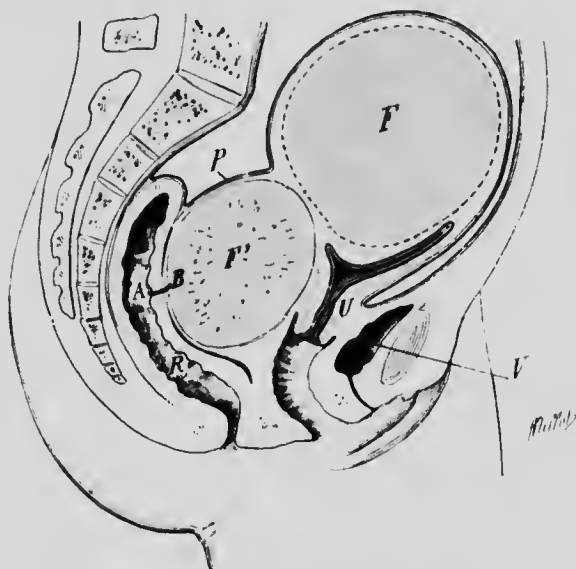


FIG. 920.—DOUBLE UTERINE FIBROMA.

The posterior developing below the peritoneum towards the rectovaginal septum had contracted adhesions with the rectum, which was torn during enucleation. Cure without fistula.

In my first operations the uterus was circumscribed by a peritoneal racket-shaped incision; it was then detached from its pelvic connections from above downwards. This subserous decortication of the lower segment varied, following the insertion of the broad ligaments into the uterus and according to the laxity or non-laxity of its peritoneal covering. The posterior vaginal cul-de-sac was opened as far as possible at the beginning of the operation on a long curved forceps introduced by the vagina, and the racket-shaped incision started from the vaginal opening. The broad ligament on the left side, held in the fingers of an assistant, was detached

from the uterus above downwards with scissors or bistoury and immediately ligatured. As soon as it was detached from the left side the cervix was seized, drawn into the wound, and the uterus was brought over to the right side. The right ligament was, in its turn, detached, ligatured, and divided.

The patient was in the dorsal decubitus as for ovariectomy, and the tumour was extracted with the cervix in from six to ten minutes.

I pointed out in my first memoir that where the pouch of Douglas is not accessible and the tumour is adherent behind, it should be detached progressively, bleeding being stopped progressively. The posterior vaginal



FIG. 921. - LATERAL UTERINE FIBROMA PEDICULATED AND DEVELOPED IN THE LEFT BROAD LIGAMENT. THE ADNEXA COVER THE TUMOUR.

cul-de-sac need not be opened until later. It is, therefore, wrong to attribute to an American the detachment of the uterus by turning from one side to the other with progressive ligature of the vessels.

The originality of my method was characterized by three particulars:

1. Enough peritoneum was spared around the vaginal orifice, after the serous decortication of the inferior segment of the uterus, to entirely close the pelvic cavity.

2. No preventive hamostasis; the broad ligaments were detached before they were ligatured, and the open vessels were only clamped after their section.

3. This procedure was employed not only to remove every variety of uterine or ligamentary fibroma, but also for total abdominal castration in complicated cases of peri-uterine suppuration.

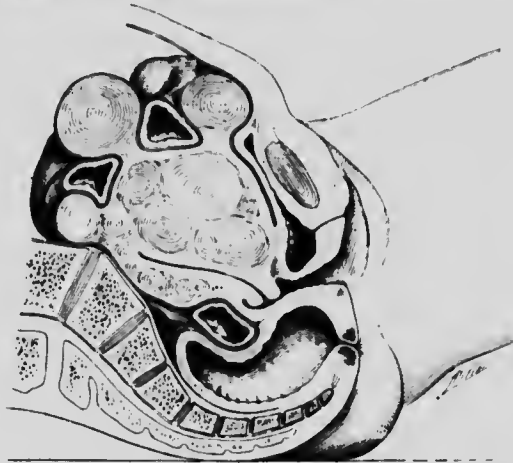


FIG. 922. MULTIPLE INTERSTITIAL AND SUBSEROUS FIBROMATA (FROM NATURE).



FIG. 923. LARGE FIBROMA OF THE POSTERIOR WALL OF THE BODY AND RETROCERVICAL SUBSEROUS FIBROMA IN THE POUCH OF DOUGLAS (FROM NATURE).

The technique was modified in 1894. From this date abdominal hysterectomy was performed in Trendelenburg's position.

The absolute innovation in the procedure is the treatment of the serosa, in order to allow the peritoneum to be closed and the extraperitoneal treatment of the adnexal pedicles.

The operation will be described as performed in simple and typical cases. The modifications of technique adopted for special cases will then be indicated.

**Total Extirpation of the Uterus by the Method of Subperitoneal Decortication (Doyen).**

TECHNIQUE. CANCER OF THE UTERUS.

I have completely abandoned the extirpation of the cancerous uterus either by the vaginal or the abdominal operation. The operation is generally followed by an early recurrence. Cancer of the uterus should be exclusively treated by electro-coagulation, which is performed by the vaginæ. This should be performed as early as possible in the disease.



FIG. 924.— INTERSTITIAL FIBROMA OF THE FUNDUS WITH SUBMUCOUS EVOLUTION.

I have cured by this method several cases of massive cancer of the cervix where the curette left but a thin shell of uterine tissue. The action of penetrating heat produced by the alternating current can destroy the whole of the cancerous uterus and even cancerous nodules in the ligaments without fatal accident. Elimination occurs by the vulva.

In one case the patient presented herself after six months, with no recurrence, but with a double vesical and rectovaginal fistula. I repaired the fistulæ by the natural route. The incision of Douglas's pouch opened directly



FIG. 925. SUBMUCOUS FIBROMA OF THE POSTERIOR WALL.

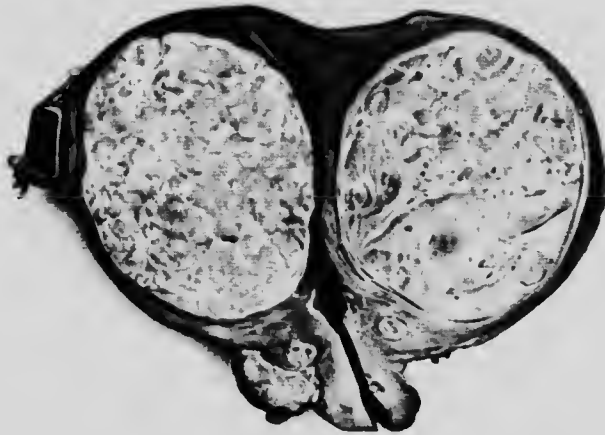


FIG. 926. INTERSTITIAL FIBROMATA OF ANTERIOR AND POSTERIOR WALLS.

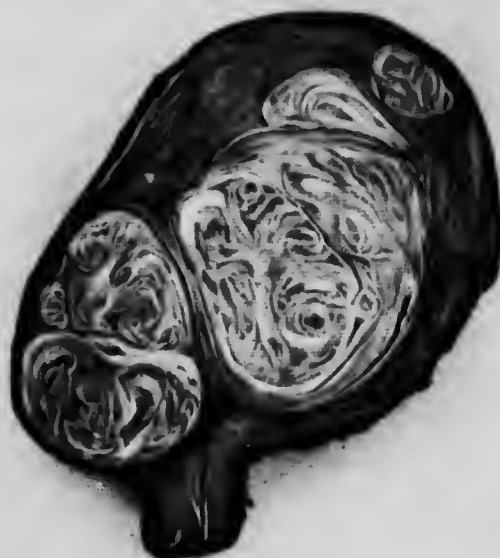


FIG. 927. INTERSTITIAL FIBROMATA WHICH DID NOT CAUSE METRORRHAGIA.



FIG. 928. INTERSTITIAL FIBROMATA WITHOUT ENLARGEMENT OF THE UTERINE CAVITY.

into the peritoneal cavity. No trace remained of the uterus. The pouch of Douglas was plugged and the fistulae were repaired as already described.

Electro-coagulation is as useless as hysterectomy if the cancer is generalized in the lumbar glands or the liver. But, as is frequent in cancer of the uterus, when the cancer is limited yet to the uterus and the parametrium, which it invades slowly, removal of the organ is illusory, while electro-coagulation gives unhopèd-for results. Indeed, as in cancer of the tongue,

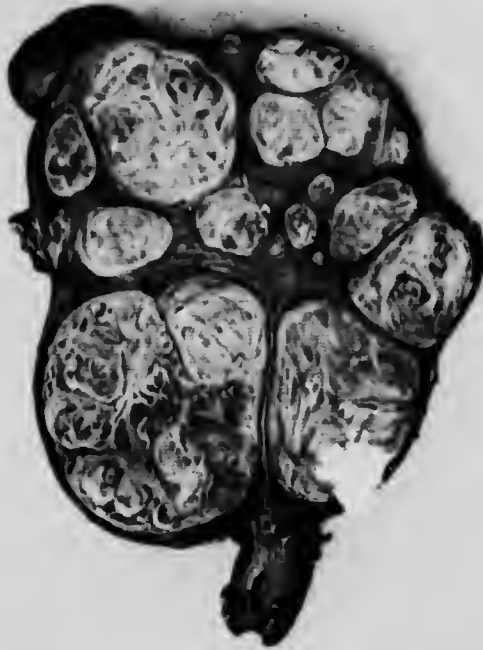


FIG. 329. INTERSTITIAL FIBROMATA.

electro-coagulation in cancer of the uterus destroys the cancer cells beyond the limits of the slough; thus even extensive cancers can be cured by this means.

It is of small account if the bladder, ureters, or the rectum are opened, when their walls are already cancerous. The operation is useful only when it passes *beyond* the limits of the lesion. No fistula is incurable in these days when its surrounding tissues are absolutely healthy.

In cancer, however grave the operation, an attempt is made to destroy the whole extent of the pathological tissues by electro-coagulation. If the

lesion be profound, two or three sittings are given with intervals of three or four weeks. Electro-coagulation is preceded on each occasion by a curetting which indicates the limits of the neoplasm. In cases where destruction of the whole extent of the tumour would seem to be impossible without exposing the patient to the gravest risk, prudence is indicated. At the same time the disease should be attacked with sufficient energy to provoke an arrest for the moment in the evolution of the tumour.

These rules for the treatment of cancer of the uterus were published in 1910 at the Third International Congress of Gynaecology and Obstetrics at Petrograd.

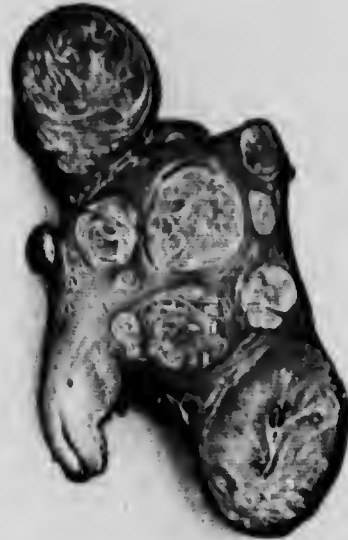


FIG. 950. MULTIPLE FIBROMATA. TWO SESSILE SUBSEROUS FIBROMATA.

Since this date I have treated a large number of cases of uterine cancer by this method. The remarkable results which I have obtained have led me to definitely condemn the bloody operation for cancer of the uterus either by the vaginal or abdominal route.

#### INFLAMMATORY LESIONS OF THE UTERUS AND ITS ADNEXÆ.

Abdominal castration is performed in chronic metritis and bilateral inflammation of the adnexæ when vaginal intervention is too difficult.

The indications for vaginal hysterectomy and laparotomy are as follows:



the surgeon should choose the simplest method—that is, the technique which, in his hands, offers the least risk to the patient.

In obese cases, where the uterus is small and immobilized by numerous pelvic adhesions, the vaginal route is the more direct. In women of normal size, on the other hand, in whom laparotomy can be performed under the



FIG. 931. CANCER OF CERVIX AND BODY AND FIBROMA OF THE ANTERIOR UTERINE WALL.

best conditions, the suprapubic route is preferable in cases where the vaginal operation would appear to be laborious and complicated.

☐ In these cases the uterus is generally of small volume and remains buried at the bottom of the pelvic cavity. It is for this reason that the operation is more complicated in fat than in thin cases.

**Operation.**—We will suppose a small uterus, very adherent, fixed in the pouch of Douglas by two purulent salpingites, adherent to the sigmoid and small intestine. The patient is placed in the horizontal position w. 1

the head towards the light and the limbs flexed to a right angle. The table is tilted backwards 15 to 20 degrees and no more, to avoid any septic fluid which might escape from the inflamed tubes flowing towards the diaphragm.

*First Stage: Incision of the Abdominal Wall.*—Median incision of skin and subcutaneous fat to within 2 or 3 centimetres of the umbilicus. Aseptic towels are immediately placed in position and fixed with hooked forceps to the edges of the skin. The linea alba is then incised for the whole length of the incision.



FIG. 932. TOTAL ABDOMINAL CASTRATION. INCISION OF THE POSTERIOR VAGINAL CUL-DE-SAC.

*Second Stage: Opening of the Peritoneum—Extraction of Uterus and Adnexæ.*—The peritoneum is widely opened. It is incised as far as the pubis, care being taken to avoid the bladder. The upper peritoneum and the flanks are immediately packed with large sterile compresses in order to push back the intestines. Hooked forceps are attached to the compresses.

A retractor with interfemoral fixation is placed above the pubis. To the umbilical end of the incision a similar retractor can be placed which is fixed by a lead weight (Fig. 234, Vol. I.). The compresses are arranged in order to completely push out of the way the small intestine, cæcum, and sigmoid. The fundus of the uterus and the adnexæ come immediately into view. The index finger is introduced between the adherent adnexæ and the parietal peritoneum, which is incised if necessary (if, for example, the salpingitis is

intraligamentary, and the adnexæ on either side are enucleated successively. Great care is taken not to tear them if they are purulent; and in every case enough aseptic compresses are arranged to absorb any septic fluid which may erupt.

The fundus of the uterus is then isolated. Into it is implanted a helicoidal hook unless its friability renders it necessary to seize it in a fenestrated Doyen's tenaculum (see Vol. I., Fig. 196). Two ring-jawed forceps are immediately applied to the adnexæ. These are drawn upwards together with the uterus by the left hand.



FIG. 933. THE SAME.

Enlarging, by divulsion of a forceps introduced by the vulva, of the vaginal orifice.

*Third Stage.*—The pouch of Douglas is brought into view and a curved forceps is passed by an assistant in the vaginal cul-de-sac. An incision is made on to the ends of the forceps with scissors, and the vaginal orifice is enlarged by divulsion. The cervix is then seized by the special hook with sliding catch or with Museux's forceps and detached on the left, on the right, and behind. A strong pull isolates the bladder. The two uterine arteries which are seen in either side are clamped, and a final pull tears the uterus from its final connections. It is rarely necessary to cut the vesico-uterine peritoneum with scissors, as it tears easily.

*Variations of the Third Stage.*—Rarely it is necessary to sever the rigid broad ligament between two forceps above the adnexæ in order to detach

the uterus by turning it from right to left. The uterus generally can be detached by direct traction (Figs. 934 and 935).

The introduction of a forceps by the vagina is not indispensable when the surgeon is familiar with the technique of the operation. All that is necessary is to pull the uterus and adnexæ strongly above the pubis as if to tear them away, and to cut the stretched tissues behind the cervix where the two retro-uterine ligaments are prominent. These two ligaments become very visible when the uterus is energetically pulled upwards. The vagina is immediately opened. The opening is enlarged by a longitudinal incision and then by divulsion.



FIG. 934. —THE SAME.

The uterus and adnexæ are drawn upwards. The cervix is detached on the right side.

**Hæmostasis.**—The two uterine arteries are clamped as soon as they are recognized, or, if they tear, as soon as they bleed. The adnexal pedicles are then divided above the ovaries, and the tubes either between two forceps or between a forceps and a ligature which is placed after crushing each pedicle.

If two or three arterioles bleed in the anterior or posterior vaginal section, which may happen if the parametrium be much inflamed, they are

clamped and ligatured. Some venous blood may also flow behind the uterine arteries from the large venous sinns of broad ligaments. The walls of the gaping orifice are caught by an eccentric-jawed forceps and tied. A mounted needle with a large curve can also be employed to take in all the lateral intermediary tissues between the posterior and anterior culs-de-sac of the vagina, first on the right side, then on the left, and a purse-string ligature can be applied.

These ligatures are left long in the vagina, where they can serve as guides should a small secondary hæmorrhage occur. The blood is stopped



FIG. 935. —THE SAME. SECTION OF THE LAST ATTACHMENTS OF THE CERVIX.  
Two forceps are placed on the uterine arteries.

by placing a Doyen's speculum in the vagina and a tight plug. The peritoneum of the pelvis must not be sutured until deep hæmostasis is perfect.

*Fourth Stage: Closure of the Peritoneum.*—Toilet is made of Douglas's pouch and a large compress is placed therein. The upper compresses and those of the flanks are changed. A long vaginal forceps is used to draw a large compress into the pouch of Douglas, and below it are placed three large glass peritoneal drains (Vol. I., p. 272).

The pelvic peritoneum is now to be closed. The suture is made transversely at the level of the upper outlet from the right adnexal pedicle to the left. No. 2 silk is used. The needle (an intestinal needle) is passed in the



FIG. 936. THE SAME. ANOTHER CASE.

The cervix is drawn upwards with Doyen's special hook. The cervix is detached from the bladder.



FIG. 937. THE SAME.

The uterus and adnexæ, detached from the right side, are pulled over to the left and a curved forceps is placed on the utero-adnexal pedicle.

peritoneum of the right adnexal pedicle above its ligature, which is excluded towards the vagina. It then passes in the serous folds behind and before it. The suture is tied and one end is cut. The suture is continued transversely, uniting the latero-vesical to the intercæco-rectal peritoneum. This can be easily raised with a dissecting forceps. The posterior surface of the bladder is united to the anterior surface of the rectum, then the left latero-vesical peritoneum to the iliac mesocolon, and the suture is terminated by a circular suture which excludes on the vaginal side the left adnexal pedicle.

This suture must be as perfect as an intestinal suture.



FIG. 938.—THE SAME. VIEW OF THE TRANSVERSE CLOSURE OF THE PERITONEUM.  
The adnexal pedicles are excluded towards the vagina.

*Fifth Stage: Toilet and Closure of the Abdomen.*—The table is straightened to the horizontal position and then slightly inclined forwards. The upper part of the pelvic suture is washed three times with Ringer's solution. The upper peritoneum is protected by compresses.

After careful sponging the wet compresses are removed and four sterile compresses are placed, one above, two laterally, and one below. The abdomen can now be closed.

The aseptic towels are removed, and towards the centre of the incision two strong silk sutures are passed from peritoneum to skin and from skin

to peritoneum. These are put on the stretch in order to avoid pinching the intestine when they are tied.

The sero-musculo-aponeurotic layers are then sutured with No. 5 catgut in the usual way.

The suture is covered with a sterile compress covered by Vigier's plaster and a body bandage.

### Fibromyoma of the Uterus.

#### LAPAROTOMY.

**Operation.**—We will take for example a solitary fibroma weighing 4 to 5 kilogrammes and mobile.

The table is tilted to 15 or 20 degrees. The head of the patient is towards the light and the legs are semiflexed on the thighs.

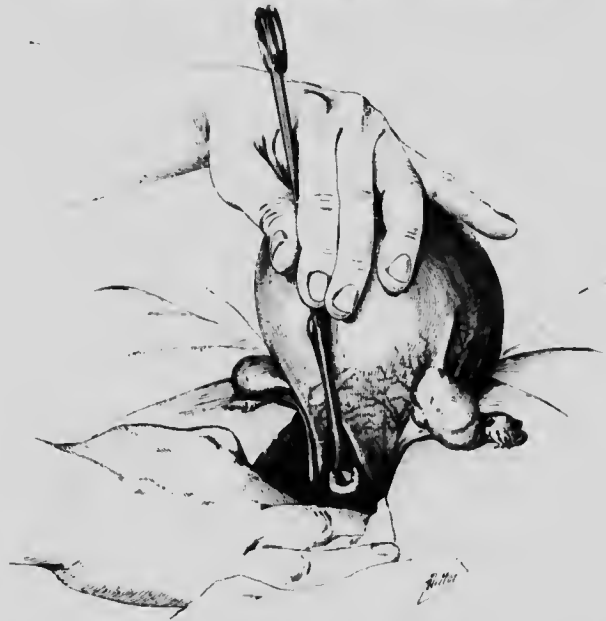


FIG. 939.—TOTAL ABDOMINAL HYSTERECTOMY FOR FIBROMYOMA.

The vagina is opened. The cervix is seized with forceps. The ends of the vaginal forceps can be seen.

*First Stage : Incision of the Abdominal Wall.*—The abdominal wall is incised from the pubis to the umbilicus as far as the volume of the tumour renders necessary. Aseptic towels are placed in position.

*Second Stage : Opening of the Peritoneum—Lifting the Tumour from the Wound.*—The peritoneum is opened near umbilicus and towards the pubis, care being taken not to wound the bladder. It is seized by six to eight



hooked forceps; a large compress is introduced above the fibroma. The fibroma is perforated by a helicoidal hook and drawn outside. If the tumour be pyriform and presents a cervical and ligamentary pedicle of sufficient length, it is immediately turned down on to the pubis.

A second corkscrew hook is implanted at a point most favourable for traction, for the first, being fixed on the anterior aspect of the tumour, is now in an unfavourable position for ulterior manœuvring.

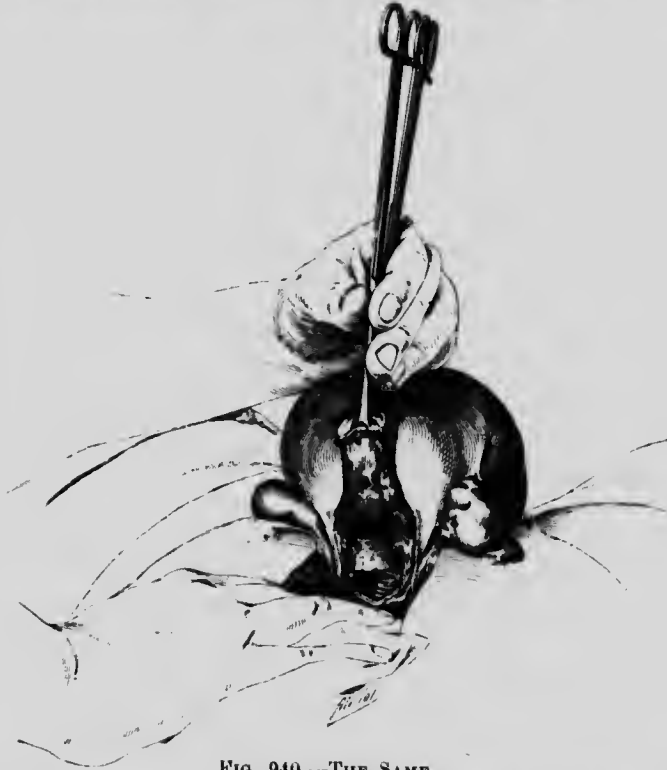


FIG. 940.—THE SAME.

The cervix, entirely detached from the vagina, is drawn upwards, and it separates from the bladder.

Two or three large compresses are placed above the upper outlet in the flanks to prevent the issue of the intestines and contamination of the peritonæum where clots or uterine mucus might penetrate.

*Third Stage: Removal of the Uterus and Adnexa—Hæmostasis.* When the uterus can be easily drawn out of the abdomen its removal is rapidly accomplished. No preventive hæmostasis is required.

A long curved forceps introduced by the vagina is pushed behind the cervix by the assistant, and made to bulge as high as possible in the posterior vaginal cul-de-sac. The pouch of Douglas is incised longitudinally either

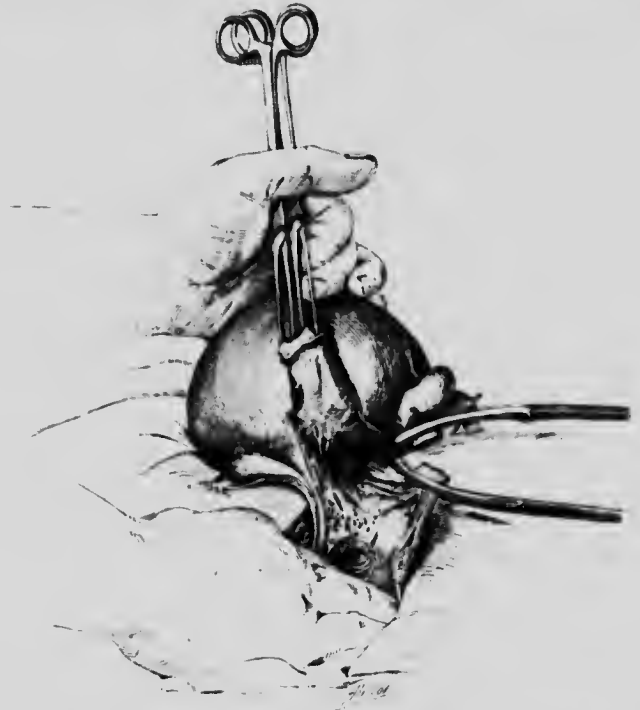


FIG. 941.—THE SAME. SECTION OF THE RIGHT ADNEXAL PEDICLE. The uterus is pulled to the left. Liberation of the bladder.



FIG. 942.—EXCESSIVE SHORTNESS OF THE ANTERIOR WING OF THE ROUND LIGAMENTS HINDERS THE ASCENSION OF THE UTERUS. SECTION OF THE BAND BETWEEN THE OVARY AND THE UTERUS.

with the bistoury or with scissors, and the forceps penetrates the abdomen, being pushed up by the assistant. The opening is enlarged by division. The surgeon introduces his finger into the opening and finds the cervix, and plunges into the wound the special blunt hook (see Vol. I., Fig. 232). This instrument seizes the cervix in a solid manner. The cervix is then drawn up and appears between the edges of the vaginal opening. The special hook is then replaced by two strong pairs of Museux's forceps. The left finger easily perceives its lateral attachments, which are stretched lightly around it.

A few cuts with the scissors divides the cervical adhesions on either side in contact with the uterine tissue, and free the cervical portion of the cervix

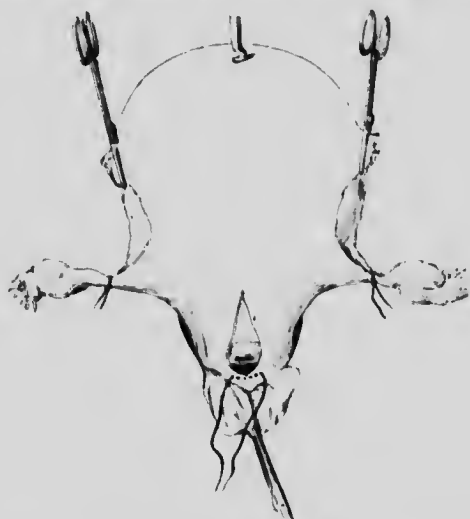


FIG. 943.—THE SAME.

The uterus can now be drawn above the pubis and the posterior vaginal cul-de-sac can be opened.

from its lateral attachments to the lower part of the broad ligament. The cervix immediately rises under the tractions, which draw it vigorously upwards.

The anterior vaginal cul-de-sac now becomes visible. The anterior lip of the cervix is drawn upwards, and the anterior vaginal cul-de-sac is divided in contact with the cervix by blunt-nosed scissors.

A stronger pull on the forceps, at the same time raising the cervix, will detach the latter entirely from the bladder.

This stage is well shown by Fig. 948.

The uterus is attached now only by its vascular lateral connections. To complete the detachment a curved forceps is introduced below the broad ligament on the right, perforate the vesico-uterine peritoneum, and finish

with the end of the forceps the detachment of the right broad ligament. This is clamped and severed between the adnexæ and the uterus. A curved forceps is placed immediately on the side of the uterus to avoid bleeding from this side. The tumour is then rapidly swung over to the left. It leaves the bladder, stripping itself off from its anterior serous envelope, which is divided if it offers resistance. It is then freed from its connections with the left broad ligament. It now adheres only to the upper border of the left ligament.



FIG. 944.—HYSTERECTOMY FOR FIBROMA. OPENING THE POSTERIOR CUL-DE-SAC ON THE ENDS OF A CURVED FORCEPS.

The left ligament is clamped; a last cut with the scissors detaches the uterus, which is given to an assistant. A few jets of blood from vaginal arteries may occur as the uterus is being extracted. Sometimes the cervix rises so quickly that the uterine arteries appear on either side. Forceps are immediately applied, then the two broad ligaments are divided below the adnexæ, and the uterus, which is only adhering by the vesical cul-de-sac, is liberated in an instant.

*Modification of the Third Stage.*—Removal of the uterus without first opening the vagina.

When the surgeon is familiar with the technique of this operation, the opening of the vagina may be neglected before detaching the first broad ligament. The right ligament is perforated and torn from the uterus, crushed and ligatured. A curved forceps is placed on the side of the uterus, and section made between the forceps and the ligature. The uterus is drawn up towards the pubis, and the peritoneum on the right side is pushed back with a compress. The uterine artery appears; this is clamped and divided close to the uterus. The posterior cul-de-sac of the vagina is then opened



FIG. 945.—THE SAME.

The vagina is open, showing the two extremities of the vaginal forceps.

with the scissors. The orifice is enlarged by divulsion, the cervix is seized, and the removal of the uterus is terminated as above.

**Hæmostasis.**—The uterine arteries are clamped as soon as they appear, or as they are cut.

The adnexal pedicles are clamped, crushed and divided. They are then ligatured. The ligature is applied circularly and tied. It then passes by transfixion below the right adnexæ; these are resected. The left pedicle is then treated in the same way. The ends of the ligature are held in a forceps.

The uterine arteries or their principal branches are ligatured separately.

The pelvic cavity is sponged; an oozing is frequently observed coming from the posterior vagino-peritoneal section where the ligamentary venous sinuses are found. The peritoneal edge of the posterior section is held up by dissecting forceps and the vaginal mucosa is seized by one or several eccentric oval forceps. Lateral sutures are applied to assure hæmostasis, each uniting the ligamentary wound into one stump. These sutures are applied *en masse* by a large curved mounted needle on which the edges of the wound are charged with a toothed dissecting forceps. The venous sinuses



FIG. 946.—CIRCULAR SECTION OF THE CERVICAL ATTACHMENTS.

and the arterioles are thus obliterated. The ends of the sutures of the pedicles are cut and the pelvic peritoneum is now closed.

*Fourth Stage: Closure of the Pelvic Peritoneum.*—Toilet is made of Douglas's pouch and a compress is placed therein fixed by a hooked forceps. The upper compresses are renewed.

The pelvic peritoneum was originally closed by a purse-string suture made at the level of the vaginal wound. This suture had certain inconveniences, and was abandoned for the closure of the peritoneum at the level of the upper outlet.

The suture is carried out in the following way: A compress is drawn into the vagina from above by a long curved forceps which is introduced through the vulva. Below it are placed three large glass drains. These drains are constructed in such a way that they cannot become blocked by an intestinal loop. This procedure of plugging and draining the pelvic cavity prevents with certainty an accumulation of serous fluid at a dependent pouch, which might become affected.



FIG. 947. -THE SAME.

The cervix, free from its lateral attachments, is drawn upwards. Exposure and clamping of the uterine arteries.

A final purse-string ligature is applied, uniting the pericecal peritoneum, the peritoneum of the right broad ligament, and the latero-vesical ligament. This suture excludes the ligature on the adnexal pedicle into the vagina. With the same ligature a transverse suture is made, uniting successively the right latero-rectal peritoneum to the retrovesical peritoneum, then the

anterior surface of the rectum to the bladder, and farther to the left the left latero-rectal peritoneum to the latero-vesical peritoneum on that side. The suture is terminated by uniting the iliac mesocolon to the upper border of the left broad ligament, burying the adnexal pedicle on the left side beneath the suture. The suture must be as perfect as an intestinal suture.

*Fifth Stage.*—Toilet of the peritoneum and closure of the abdomen. This is carried out exactly as described on p. 769.



FIG. 948.—THE SAME.

The cervix drawn upwards, is detached completely from the bladder.

#### ACCESSORY MANŒUVRES IN PARTICULAR CASES.

*Shortness of Anterior Portion of the Broad Ligaments.*—The extraction of the uterus from the abdomen may be difficult even where there are no adhesions. This is generally due to a particular disposition of the uterine insertion of the upper border of the broad ligaments. They may, for



example, instead of ending low down on the lateral aspects of the tumour, unite above it in the form of a thick fibrous and muscular band.

This uterine band is red, fleshy, very resistant, and appears to be caused by a considerable hypertrophy of the upper border and anterior wing of the broad ligaments. This disposition occurs when the fundus has not participated in the enlargement of the organ. In such cases the tumour, strongly held by bands, cannot be lifted out of the abdomen (Figs. 950-953).



FIG. 949. THE SAME. VIEW OF THE CLOSURE OF THE PERITONEUM.

The index finger exploring the uterus feels the tension of the ligamentary bands which hold the fibroma above and oppose its rising above the pubis.

The upper border of the right ligament is clamped with forceps 3 or 4 centimetres from its uterine insertion. It is then divided and detached as low as possible. A strong curved forceps is applied on the uterine side.

The left ligament is then clamped and severed in its turn if it be necessary. The tumour can then be raised with the aid of a second helicoid hook planted in the most advantageous part of the tumour. The uterus, as it is being drawn over the pubis, detaches itself for a certain extent from its

lateral connections. The anterior wall of Douglas's pouch now becomes accessible. The vagina is incised, the cervix is exposed, and the uterus is removed as described above.

From the beginning of the operation everything which opposes the ascension of the uterus is clamped and divided, and enucleation is accomplished by strong traction upwards, making use of the strong helicoidal corkscrew hooks which are firmly implanted in the fibromatous mass.



FIG. 950. -ANOTHER CASE.

The shortness of the anterior wing of the left ligament prevents the ascension of the uterus.

The cervix is often removed without having to be seized by forceps through the vaginal opening. It rises so high by the tractions exercised on the uterus that the vagina is opened by the scissors without the necessity of a curved forceps introduced by the vagina.

In abdominal hysterectomy the best means of avoiding great loss of blood to the patient is to remove the uterus quickly.

The first effect of lifting the tumour is to lengthen the uterine arteries and arrest the flow of blood. The tumour expresses the venous blood which it contains, and this blood returns into the ligamentary veins. This expression of blood contained by the tumour is very remarkable, and it is



FIG. 951.—THE SAME. SECTION OF THE LIGAMENTARY CORD ON THE LEFT SIDE.

aided by the low position of the collecting veins and by the rapidity of the extraction.

The uterus is thus detached almost empty of blood, and the loss of blood sustained by the patient is greatly inferior to that which was produced by supravaginal amputation above an elastic ligature. When the elastic ligature was used the uterus became engorged with venous blood, which escaped when the uterus was divided above the ligature.

#### REVERDIN'S ELEVATOR.

When the tumour is enormous it may be of advantage to use Reverdin's elevator (Collin). But the chain should be confided to a prudent and

experienced person, as exaggerated traction may tear away the uterus, causing almost irreparable damage to the pelvis. Traction must be progressive and moderate, carried out under the surgeon's orders (see Fig. 951).



FIG. 952.—ANOTHER CASE. SMALL INTRA-UTERINE FIBROMYOMA AND LARGE POSTERIOR SUBPERITONEAL FIBROMA.

#### WOUND OF THE UTERINE ARTERY AS THE CERVIX IS BEING ISOLATED.

As the field of operation is widely open the artery is immediately seized. The rupture of the uterine artery may also occur, although spared when the cervix is being liberated, by tearing as the uterus is being extracted, when its coats are altered and brittle, as in cases of atheromatous degeneration.

Immediate clamping with forceps presents no difficulty. In principle, every arterial jet of whatever importance is arrested as it occurs. Experience teaches that with this consideration satisfied, a quick operation is the result and the patient loses but little blood.

There is therefore an advantage in completely detaching the uterus in a few minutes, and this procedure gives far superior results to any slower procedures.

DIFFICULT ACCESS TO THE POUCH OF DOUGLAS IN CASES OF INFLAMMATORY ADHESIONS ON INCARCERATED FIBROMATA.

I pointed out these complications of abdominal hysterectomy in 1892 at the Brussels Congress, and insisted on the advantages presented by my procedure in difficult cases.



FIG. 953.—THE SAME. SECTION OF THE RIGHT LIGAMENTARY BAND, WHOSE RIGIDITY PREVENTS THE TUMOUR FROM RISING.

Obliteration of the pouch of Douglas may be caused by the co-existence of salpingitis (at times suppurating), or by the presence in the posterior cul-de-sac of one or several subserous fibromata, developed beneath the peritoneum in the thickness of the recto-vaginal septum.

These fibromata are generally situated in the posterior wall of the cervix. They call for the following modification in the operation:

As soon as the tumour is raised, it is pulled strongly upwards and forwards and the adnexal tumours are immediately enucleated. If one or several fibromata are found on the posterior part of the tumour, the serosa

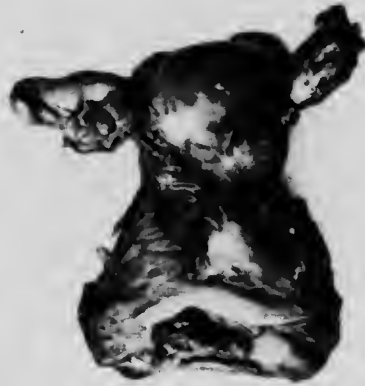


FIG. 954. MASSIVE CANCER OF THE CERVIX REMOVED WITH THE UTERUS AND ADNEXÆ BY LAPAROTOMY. ( $\frac{2}{3}$  REDUCTION.)

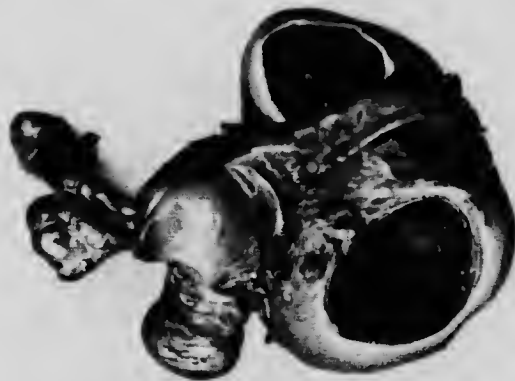


FIG. 955.—LEFT ADNEXITIS AND RIGHT LARGE INTRALIGAMENTARY SALPINGITIS. LAPAROTOMY. ( $\frac{2}{3}$  REDUCTION.)

and the uterine tissue are immediately incised at the culminating point and the tumours are rapidly extracted with the helicoid hooks. As soon as the retro-uterine tumours are removed the surgeon can reach the posterior



FIG. 956. LARGE SESSILE FIBROCYSTIC TUMOR OF THE FUNDUS REMOVED BY LAPAROTOMY. (REDUCTION.)

vaginal cul-de-sac. If this still remains inaccessible it is of small moment. The vaginal forceps is pushed no longer behind, but towards the right broad ligament, and perforates the right lateral vaginal cul-de-sac. It emerges close to the insertions of the cervix close to the lower part of the broad



FIG. 957.—FIBROMA OF THE BROAD LIGAMENT REMOVED WITH UTERUS AND ADNEXÆ (FROM NATURE).



FIG. 958 CYSTIC FIBROSARCOMA OF THE UTERUS PARTLY INCARCERATED IN THE PELVIS (FROM NATURE).



ligament. The vaginal forceps are opened out, the peritoneal vaginal orifice is enlarged, and the finger reaches the vaginal portion of the cervix.

The left index, aided by the bistoury or scissors, detaches the uterus from below upwards, as if the cervix were already free. Hemostatis is performed of the arteries which bleed, and the right broad ligament is detached, crushed, and ligatured.

The uterus is pushed to the left; the vaginal orifice is enlarged; the cervix is seized and drawn out. The vaginal mucosa of the anterior cul-de-sac is divided also laterally and behind. The cervix separates from the bladder, and the uterus is tilted towards the operator.



FIG. 959. ENORMOUS FIBROSARCOMA OF THE BROAD LIGAMENT REMOVED WITH THE UTERUS.

Two forceps mark the cervix, and another marks the Fallopian tubes.

Should it appear difficult to perforate the right lateral cul-de-sac of the vagina by a forceps introduced from the vulva, another artifice can be adopted as soon as the elevation and the consequent elongation of the cervix are sufficient. The scissors shave the posterior part of the cervix and open the vagina. The opening of the vagina is accomplished without a forceps as a guide, and with no danger of wounding the rectum.

The ends of the scissors must be turned forwards and cut little by little and from above downwards, shaving the uterine tissue. The posterior vaginal cul-de-sac is reached almost immediately. The cervix is seized by Misenx's forceps, detached completely from the vagina; the uterus is turned to the other side and the operation is terminated.

## AFTER-CARE.

This is very simple. Total abdominal hysterectomy performed in this way is almost as benign as ovariectomy. All tendency to distension must be avoided, the liberty of the abdomen must be assured, and the patient kept very quiet.

ALBUMINURIA IN WOMEN SUFFERING FROM UTERINE FIBROMYOMA.  
ITS CURE BY OPERATION.

The coincidence of albuminuria with uterine fibromata is not rare. This albuminuria, which occurs with no organic lesion of heart or kidneys is closely related to albuminuria of pregnancy.

In the first case which I treated the diagnosis of cyst or fibroma was uncertain. The patient was passing 6 grammes per litre of albumin, and the ideas then prevalent led me to fear a diminished resistance. I opened the abdomen and, finding a fibroma, I closed the wound. This I did to observe how the wound of the abdomen behaved.

I considered that a good union of the wall indicated a resistance sufficient to allow of a hysterectomy.

The hysterectomy was performed eight days later. It was followed by a rapid cure. I have operated since then (thirty years ago) on a large number of these cases.

Cicatrization occurs without exception immediately and without complications. The albumin disappears as a rule during the four or five days following the hysterectomy. The operation was generally performed by the abdomen.

Another case is worthy of mention.

A pedunculated fibroma of the fundus was entirely detached from this organ. The fibroma was fixed to the adnexæ on either side by numerous inflammatory adhesions whose vascularity sufficed for its nutrition.

The patient, very cachectic, suffered from ascites, albuminuria, and a double hydrothorax, for which *à peu* punctures had been made without giving any relief.

I removed this tumour, leaving in place the uterus and adnexæ, which were healthy. The operation was followed by the complete and final disappearance of the ascites, albuminuria, and hydrothorax.

These facts are interesting. They show in a convincing manner that, so far from being a contra indication, this variety of albuminuria is an imperious indication for removal of the tumour.

The following conclusions can be drawn:

1. Albuminuria may be the consequence of the evolution of a large uterine tumour.
2. Albuminuria may occur in the case of very mobile medium fibromata in women whose abdominal wall has been relaxed by several pregnancies. Compression of the renal veins or ureters cannot be evoked as a cause in these cases.

3. The albumin disappears after hysterectomy as it disappears in pregnant women when the uterus is evacuated.

4. The presence of 5 or 6 grammes per litre of albumin is not otherwise than a formal indication for operation in these cases.

#### OPERATIONS IN PREGNANCY.

##### Ectopic Gestation.

##### TUBAL PREGNANCY.

Operations in cases of abnormal pregnancy are frequently operations of urgency. One of my first laparotomies was made without possibility of diagnosis on a woman who arrived at the clinique after a journey of 80 kilometres in a dying state with the abdomen distended and a temperature of 40°.

The peritoneum when incised contained nearly 2 litres of coagulated blood and a fœtus of three months. The tube was removed after toilet of the peritoneum. The patient recovered after large injections of artificial serum and remaining with the head low for several days. The lower limbs were bound in elastic bandages.

Angular pregnancy of the uterine cornu is the pregnancy of which the rupture causes the greatest hæmorrhage. Repair of the uterine tear can usually be accomplished by suture. If this be impossible, total hysterectomy must be performed.

Angular pregnancy can be diagnosed in certain cases. The following case, diagnosed by Professor Pinard, was dealt with in the following way:

M. X., aged 28, pregnant three months. On bimanual examination a cystic mass, which was painless, was felt in the left lateral cul-de-sac at the insertion of the Fallopian tube.

As soon as the patient was anesthetized the abnormal shape of the gravid uterus became more perceptible. I decided to operate by the vagina.

The fœtal cyst was extracted whole by the gonge forceps together with the chorionic villi after incision of the anterior wall of the uterus.

The complete evacuation of the oval membranes was verified by a smaller gonge forceps, and the uterine wound was sutured, taking care to include the peritoneum in the first sutures. The vagina was plugged, and two forceps were left on cervical arteries which bled. This technique is interesting for its simplicity. The evolution of tubo-parietal or interstitial gestation is very grave, since their rupture produces an immediate hæmorrhage which is more rapid and abundant than that which follows a tubal pregnancy.

The operative sequelæ were excellent. The vomiting, nervous phenomena, and gastro-intestinal disorders which were intense at the moment of operation disappeared immediately.

## PERITONEAL PREGNANCY.

The rupture of a tubal fetal cyst may not be followed by such grave consequences, and the pregnancy may go on to term. The fœtus continues to develop in the peritoneal cavity and dies, when it should be expelled after making violent movements. I have operated on several of these peritoneal pregnancies three or four months after the proper date of accouchement.

The operation is very simple. The fœtus is found at once. The placenta must be removed as far as possible, as it may cause ulterior complications.

Some cases of ectopic gestation may have a similar evolution to salpingitis. The nature of the cyst may not be recognized until the operation (posterior colpotomy or vaginal hysterectomy). The operation calls for no particular description.

## HYDATIDIFORM MOLE.

Expulsion of hydatidiform moles often gives rise to hemorrhage, and these hemorrhages are the more to be feared because the cervix refuses to dilate under the influence of the soft and inconsistent mass.

The mole must be extracted by the vagina after dilatation or incision of the cervix (see Hysterotomy). The author's uterine gonge forceps are used. In one case where the patient was exsanguine and the uterus was higher than the umbilicus, the author performed abdominal hysterectomy, which was the sole means of arresting the hemorrhage.

## CÆSARIAN OPERATION.

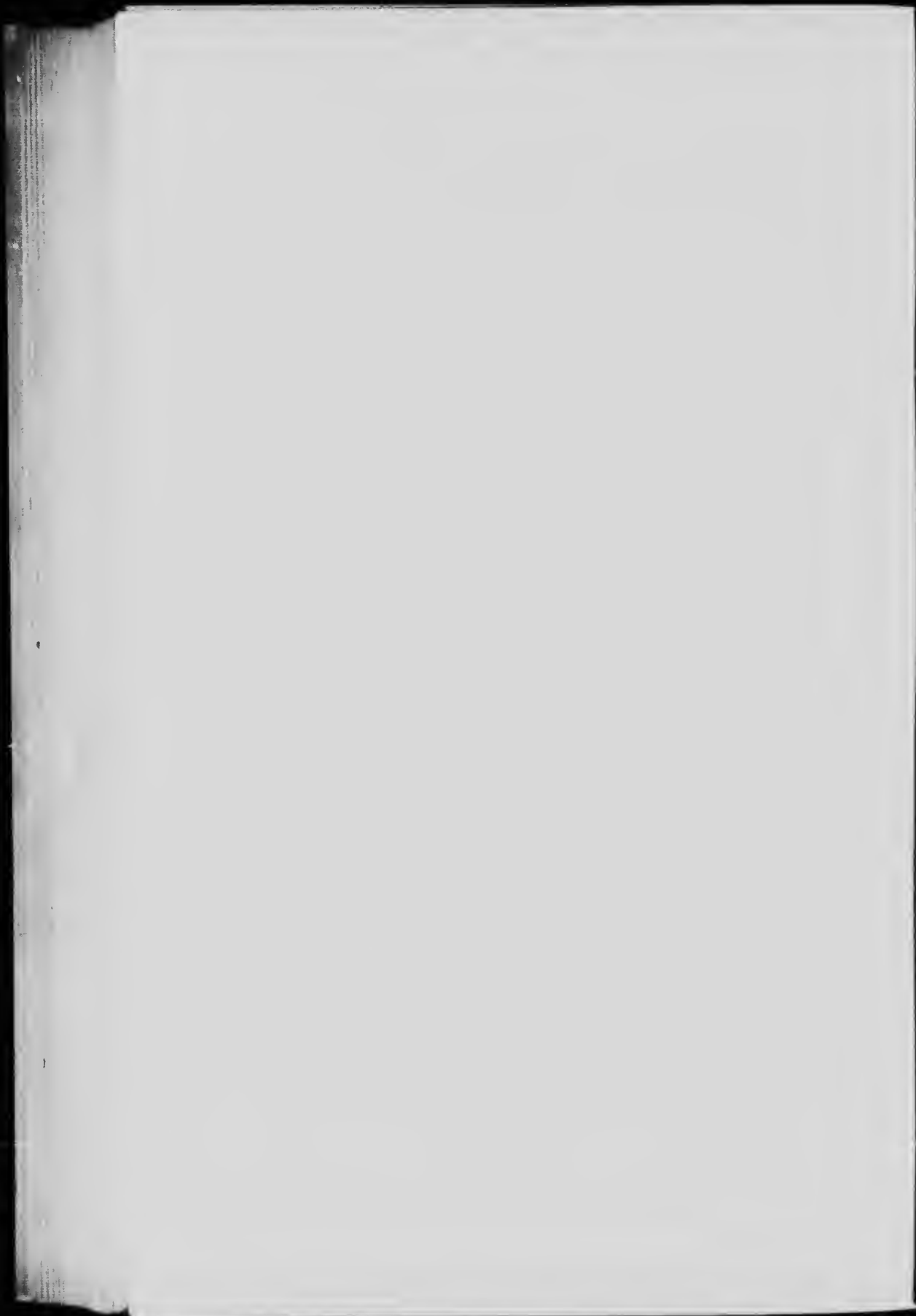
This is performed by preference before the commencement of labour. The vagina must be carefully disinfected before the operation. Immediately before the operation an injection of ergotine is given hypodermically. The extraction of the fœtus and membranes by laparotomy is a very simple manœuvre for surgeons experienced in abdominal operations. As soon as the abdomen is opened the wound is packed with compresses as for the incision of an ovarian cyst, and the uterus is incised longitudinally in the middle line as high as possible to a distance of 15 to 18 centimetres. This dimension of the uterine section corresponds to the demi-circumference of the cephalic extremity. The placenta is often reached first; it is perforated with the fingers without paying attention to the bleeding; it is torn to allow the infant to be extracted. If blood still flows the uterine cavity is tightly plugged. The membranes are extracted and the uterus is sutured with silk in two layers as an intestinal suture. Care is taken to assure a perfect union of the serosa.

The sero-serous suture of the uterine wound was designed by Saenger. If the operation be performed under satisfactory aseptic conditions intra-uterine injections are unnecessary and recovery is apyretic.

Some women have successfully undergone several Cæsarian operations, and have been thus delivered of several living infants.

If it be considered necessary to save the patient from the dangers of a fresh pregnancy, removal of the adnexæ should be performed after suture of the uterus, or, which is more desirable, double crushing of the oviducts followed by ligature in the groove formed by the *écraseur*.

*Porro's Operation.*—The supra-cervical amputation of the gravid uterus is very benign, and can be performed as a procedure of urgency when the surgeon has not at hand the necessary material for important abdominal operations.



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