

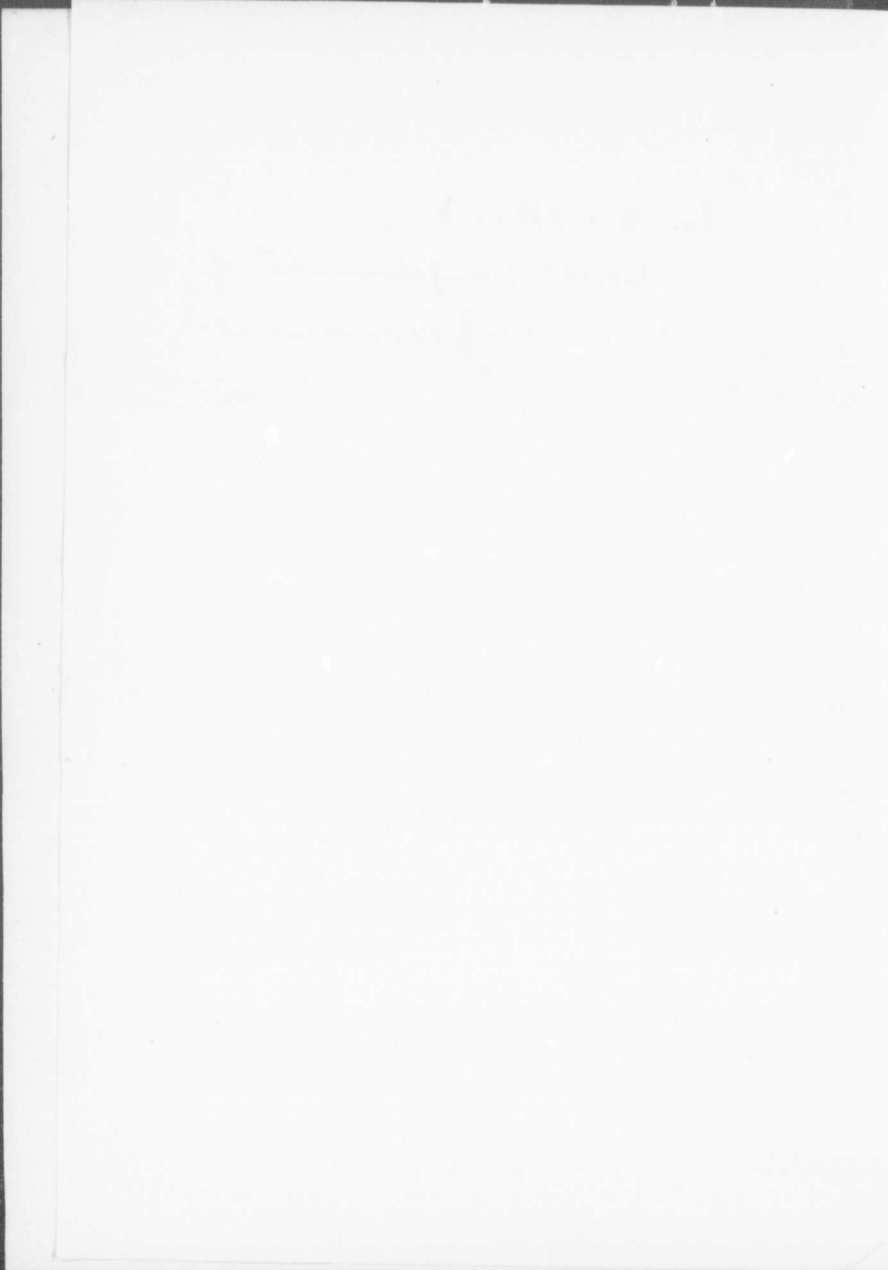


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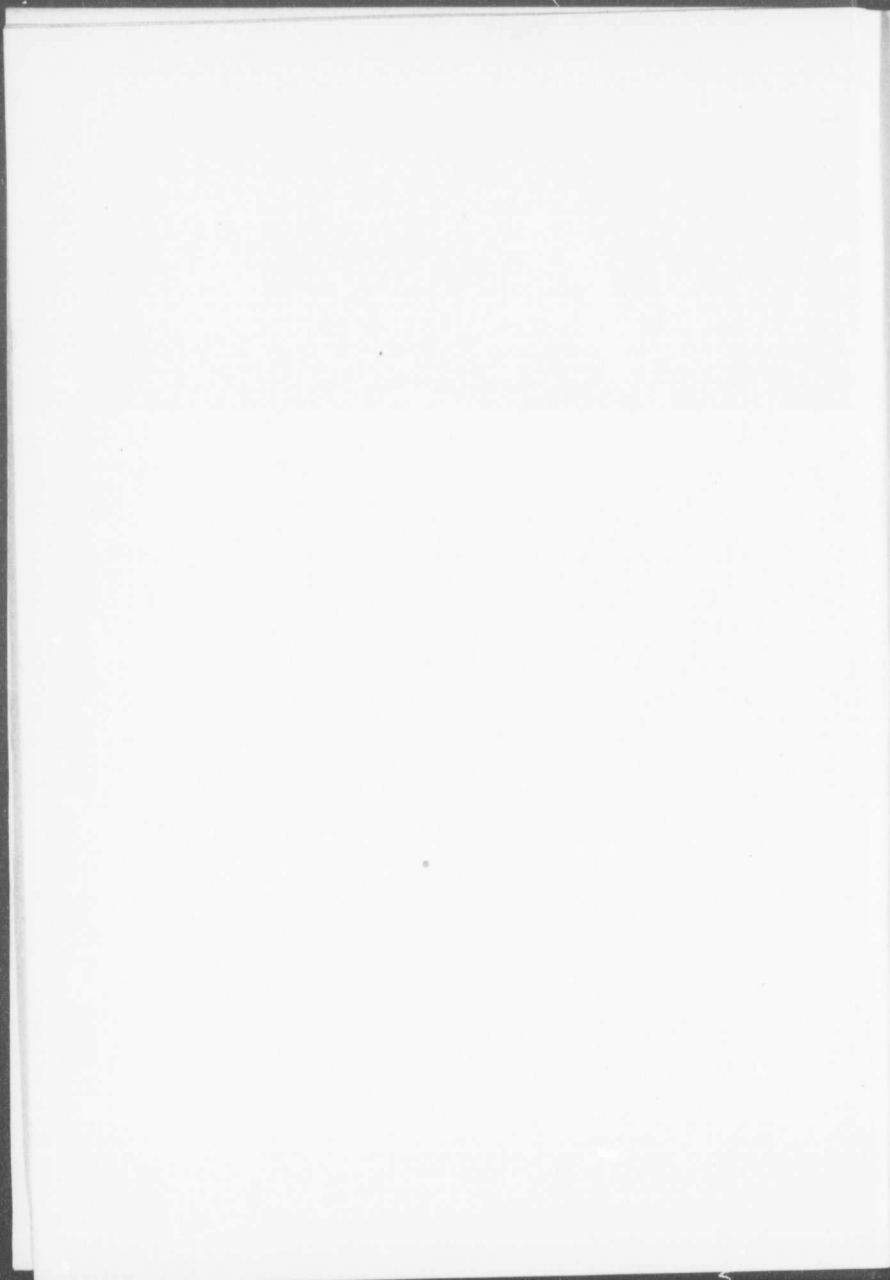
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## PROSTATIC HYPERTROPHY: ITS DIAGNOSIS

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**B**Y the term "prostatic hypertrophy" is understood a non-inflammatory enlargement of the prostate gland, which is more or less uniform in size. The time of life at which this enlargement usually makes its appearance is from fifty to seventy years of age; and the most serious complication, in fact, the condition which causes practically all the symptoms, is a marked impairment of the function of the bladder.

It is not a true hypertrophy, because even in the earliest stages the microscopical structure of the gland is altered. Nor is it a tumor, but rather an adenomatous growth of the fibrous variety, which spreads upward under the mucous membrane until it reaches the bladder. Two definite and distinct types of enlargement occur. In the one—a pseudo adenomatous gland—there is a marked increase in the glandular elements, while in the other there is a conspicuous increase in the stroma of the organ. These two conditions may occur independently of each other, or they may co-exist in the same organ.

The hypertrophied prostate sometimes reaches an enormous size. Any gland weighing over six drachms may be considered abnormally large, though not necessarily causing any symptoms whatever. A gland as small as eight, or even six drachms may be the cause of retention of several ounces of urine, while one weighing even many times as much may be productive of but very mild symptoms. The size and weight of the organ depends materially on the amount of fibrous tissue present. The more fibrous tissue the greater the weight, though the size may not necessarily be correspondingly increased.

The greatest enlargement invariably takes place in the antero-posterior direction, and while neither lateral lobe is found to be constantly larger than the other, yet it is uncommon to find them of equal size. Even in the cases of greatest hypertrophy there is but seldom any enlargement of the so-called middle lobe; when such a projection does occur, it will usually be found to have its attachment to one or other of the two lateral lobes.

Next in importance to the size and weight of an enlarged prostate is a consideration of the density. The greater the amount of fibrous tissue present the greater will be the density—so much so that, in some instances, the gland will appear to have almost the consistency of leather. From this extreme it will vary all the way to the softness of a

sponge. The two extremes may be classified as the fibrous and adenomatous classes, while between these will be found cases with all degrees of hardness. The rate of growth is a variable quantity. The entire gland may increase symmetrically in size, or one individual part may become enormously hypertrophied entirely at the expense of another. The adenomatous form increases most rapidly, while the fibrous—though slower in growth—yet produces symptoms of a serious nature at a much earlier period in the disease than the adenomatous variety.

Section of the enlarged prostate shows microscopically but an unorganized mass of glandular tissue without ducts and without arrangement. This may occur in either lobe singly, but more commonly it is found in both combined. Apart from this it may sometimes have its origin in one of the detached glands in the sub-mucous layer of the urethra. From whatever may be the original focus, it spreads along the line of least resistance, which is upwards toward the bladder.

The physical appearance of the hypertrophied prostate will depend entirely on the relative amount of fibrous and glandular tissue. Where the glandular tissue predominates, the growth is likely to be rapid and may attain an enormous size. In consistence it is likely to be soft and elastic. Should the fibrous tissue predominate, the growth will be much more slow, the gland will be hard and nodular, and the resistance to the passage of urine will be great.

Acute retention of urine is, in most instances, due to congestion of the mucous membrane around the neck of the bladder. This only occurs when other conditions than simple fibro-adenoma are present. In these cases the enlargement is complicated by venous congestion and septic inflammation of the bladder, which extends into the urethra and which is co-existent with thickening of the urethral mucous membrane, with thrombosis, and many times with extravasation of blood.

Prostatic tumors, so-called, so long erroneously believed to be analogous with uterine fibroids, are caused by one part increasing in size more rapidly than those around it. They vary greatly in size, and on a small scale are present in nearly every case of hypertrophy. They may occur in any portion of the gland, and may be isolated or grouped together in bunches. These adenomatous masses appear to be constantly under pressure, as shown by the fact that, when cut across, they protrude beyond the level of the surrounding surface.

The walls of the blood-vessels traversing the prostate are invariably altered as a result of the glandular hypertrophy, the main change being a fibrous thickening of the intima and the media. This change in the blood-vessels has frequently been noted also in the kidney.

The urethra is always affected in enlargement of the prostate, and its length is probably always increased. In the lower part of the pros-



tatic urethra, the shape is influenced by the enlargement of the two lateral lobes; by them it is compressed from one side to the other, which frequently compress it so tightly as to present great difficulty in passing a catheter. Any increase in the upper part of the lobes has but very little effect on the urethra, as the bulging is invariably upward.

The frequency with which the different portions of the prostate are affected would be very difficult indeed to determine, as specimens kept for museum purposes are invariably retained because there is something unusual about them. It will be found, however, that in the majority of cases all parts of the gland are affected more or less.

The changes in the bladder due to enlargement of the prostate are vitally important. In all cases where the symptoms are at all severe, a post-prostatic pouch is formed. This is the result of a combination, the elevation of the urethral orifice and the depression of the vesical floor. There is no doubt but this pouch is a much more frequent cause of residual urine than the blocking of the urethra by a pedunculated middle lobe. In voiding urine the floor of the bladder is the last part to be emptied, and as the urethral orifice is elevated beyond its normal position, considerable strain is exercised to effect its complete evacuation. As the floor is the weakest part of the viscus, it naturally becomes more depressed with each effort to empty itself, until finally this pouch is formed and sometimes attains a very considerable size.

The effect on the bladder walls is more or less constant. First, on account of the increased work thrown on them in their efforts to empty the viscus, the muscular layer becomes hypertrophied; this, in turn, is followed by dilatation and atony. If by this time the obstruction to the urinary flow is not relieved, chronic retention is liable to occur, and, as the viscal walls continue to dilate, the amount of residual urine becomes in some instances enormous. This is the one extreme. The other is when the walls do not dilate at all, but instead become thickened and corrugated, sometimes contracting so much as to allow of only an ounce or two of urine in the bladder at a time.

Cystitis is an almost invariable accompaniment in all cases of long-standing prostatic hypertrophy. Catarrh of the bladder is a frequent diagnosis, and this is emphasized by the presence of a thick, stringy mucous, which is evacuated with the urine. The mucous membrane is congested and not infrequently ulcerated. Cystoscopic examination shows the veins standing out prominently on the surface, and as a result of their turgidity, hematuria frequently develops directly the urinary presence is relieved.

If prostatic hypertrophy with residual urine has remained for any considerable length of time, the kidneys and ureters cannot escape involvement. In the normal condition the ureters pass obliquely through

the bladder wall, traversing from one-quarter to one-third of an inch through the vesical coats. This acts as a valve and allows the urine to pass into the bladder in spurts or dribblets. When, on the other hand, residual urine is present, it distends the bladder walls and thus compresses the valve openings, consequently making it very difficult for the urine to be expelled from the ureter. When in cases of extreme distention the wall is over-stretched, the valve disappears altogether, and the ureter becomes constantly continuous with the bladder. These are the cases in which dilatation of the ureter supervenes from constant back pressure of the residual urine.

This condition carried further, results in urine being dammed back into the pelvis of the kidney, which alone may be the cause of renal circulatory changes, and of even fibrous overgrowth in the kidney. Should any infection occur when the orifices of the ureters are patent, pyonephrosis is liable to become a speedy complication.

In the urine the effects of prostatic enlargement are marked. It becomes rapidly alkaline, and is a not infrequent cause of cystitis. Another result of its alkalinity is the formation of oxalate of lime calculi, a condition which is present in as many as one in five prostatic cases. On the development of chronic cystitis the usual characteristic symptoms appear—ammoniacal decomposition, pus, blood, shreds of mucus, and even the colon bacillus, staphylococci or streptococci.

A not infrequent accompaniment of prostatic hypertrophy is hemorrhoids, and sometimes even prolapse of the rectum. The hemorrhoids especially are in many cases directly due to the enlargement. Venous engorgement around the neck of the bladder, when chronic or even frequently occurring, soon leads to a varicose condition in the prostatic plexus. This causes the blood to regurgitate through the communicating branches, and since no relief to the venous obstruction can be obtained, hemorrhoids develop.

The etiology of prostatic hypertrophy is as yet but little known, though several conditions are believed to be instrumental in its causation; among the more important of these may be considered *age* and *previous diseases*. While heretofore it has been universally believed that the prostate gave no appreciable trouble under fifty years of age, yet it has of late been abundantly proven that this is not necessarily the case. While it is extremely rare to find acute symptoms in one under this age, there are on record instances of operation at forty-nine, at forty-eight, at forty-one, and one at thirty-six. The age at which the prostate commences to enlarge, and the age at which it commences to produce symptoms may be separated by many years. McGuire believed that in most cases of enlargement, the beginning preceded the

age of fifty by many years, but that the symptoms did not appear until sterile changes commenced to occur in the urinary tract as well as the rest of the body.

In a careful history of all prostatitis, some evidence of previous disease is almost invariably obtainable, and the most prevalent of all is inflammation. Inflammatory changes may be due to several causes, but the most common is gonorrhoea. A venereal history is readily obtainable in at least a majority of cases coming to operation, and in many of the others it is not positively denied. Inflammatory changes other than venereal, however, play an important part in the etiology of prostatic enlargement. Repeated attacks of congestion in the prostate itself—or even in the prostatic urethra—in conjunction with catarrhal exudation so prevalent in this region, may be sufficient cause in many cases.

In many cases of prostatic enlargement a stricture is present, and by some authors is thought to be a predisposing cause. In any case, inflammatory changes, be they due to whatever cause they may, are considered as of primary importance in its etiology.

**Symptoms and Diagnosis**—The majority of patients with hypertrophy of the prostate gland present no symptoms whatever of their malady. These men may even live to advanced old age without ever suffering the slightest inconvenience or presenting the faintest symptom which would call their attention to the fact that all was not right with the urinary tract. In these cases there is no pain because of the extremely slow stretching in malignant disease, or even inflammatory hypertrophy. In these cases the obstruction is not so great, but it may be overcome by compensation in the bladder. In fact, the growth may be so situated as to cause no obstruction at all. On account of the absence of straining there is no congestion of the mucous membrane around the neck of the bladder, and consequently no irritability of the bladder itself. Deaver is authority for the statement that only about one person in every seven who has an enlarged prostate suffers from it to an appreciable extent, and even among this number there are many who are unaware of their condition—so insidiously do the symptoms develop—until acute retention of urine reveals the fact that the cause lies in an enlargement of the prostate. In some of these cases, too, the attention of the patient may be first arrested by dribbling of urine, wetting the clothes by day and the bed-clothes by night; when examination will reveal the fact that this is not incontinence, but rather an overflow, and the cause an hypertrophied prostate gland. In others, the symptoms, while mild, and causing but the slightest inconvenience, may yet be present from the first; and thus the patient may, from the very commencement of the disease, be aware that all is not right, and

may even have serious forebodings for the future. Be this as it may, the fact remains that it is only the minority of patients so afflicted who present symptoms of so serious a nature as to compel them to apply for relief.

Of this very small minority who present symptoms from the commencement of the disease, some suffer from mechanical obstruction at the neck of the bladder due to the growth in the glandular substance, or in some cases it may be simply an alteration in the shape of the gland, but sufficient to cause swelling of the mucous membrane, and consequent hyperæsthesia resulting from the inflamed mucous membrane thus produced; and yet again others may be the victim of a combination of the former two conditions.

In all cases the first symptom to be observed by the patient is some change in the urinary function, usually an increased frequency of urination.

This frequency is present throughout the entire twenty-four hours, and the attention of the patient is first called to it by having to arise once or more during the night—a condition which heretofore, has been entirely foreign to him. Having thus had his attention drawn to this increased frequency at night, he soon discovers that the same condition holds good during the day; and if he is a comparatively young man, he will almost invariably seek advice from his medical adviser, but if he is somewhat advanced in years, he will usually accept it as a sign of advanced old age, and accept silently what appears to him as the inevitable, because the idea is very prevalent among the entire laity that such is the case in all old men.

*Frequency of Urination* may, therefore, be considered as the first definite symptom of prostatic hypertrophy, and may be present as the result of either one of three causes:

- 1 Because the mechanical irritation around the neck of the bladder produces a congestion of the mucous membrane, and by thus rendering the bladder much more sensitive to the presence of urine, demands more frequent emptying.
- 2 Prostatic hypertrophy is frequently the cause of changes in the quality of the urine, making it much more irritating, and the consequent increased demand for its expulsion.
- 3 It is a well-known fact that residual urine always lessens the capacity of the bladder, hence of necessity it must be more frequently emptied.

This increased frequency of micturition begins very early in the disease, usually before there is really any residual urine, and at this stage is consequently not due to this cause as is usually taught, but rather to the increased irritability of the mucous membrane at the neck

of the bladder due to its congested condition. This congestion may not be limited to the neck of the bladder, but may continue throughout the first portion of the urethra. With the exception of this part of the bladder, the rest of the viscus is comparatively insensitive, and the stimuli which excite micturition are believed to originate in this portion.

Marked frequency of urination in the early stages of the disease would therefore indicate the presence in the neck of the bladder of the projecting growth, and until such times as the whole of the lower mucous membrane becomes involved in the congestion so certain to follow in these cases, the increased frequency would be due entirely to this cause. As soon, however, as the congestion commences to spread wide in the mucous membrane, urination is instigated by the merest contact of the urine with the congested part, and the frequency may become so marked as to be almost incessant, and may represent a more or less continuous dribbling. The pain in these cases is extreme, and the suffering almost incessant.

In some instances a minute ulcer is present between the congested folds of mucous membrane, and its presence almost invariably causes the most intense suffering known to patients who are the victims of prostatic enlargement. This ulcer may be the means of exposing some nerve endings, and consequently as fast as the urine is secreted it finds its way to this part, the merest contact with which causes an intense desire to urinate. As there are only a few drops to be ejected this act becomes almost continuous, the pain and tenesmus on the completion of each urination, but a few minutes apart, being worse if possible than at its commencement. These are the cases which rapidly wear out the strength of the patient, and unless relief is early obtained, are liable to terminate fatally from pure exhaustion.

An unimportant factor in causing frequency of micturition is the fact that in many cases of prostatic enlargement, the actual quantity of urine secreted in the twenty-four hours is larger than usual, this increase being due to renal degeneration. This has, however, but a remote bearing on the causation of such frequency.

The belief in the common fallacy that urination occurs more frequently at night than during the day, is founded only on the fact that the risings at night are the more easily impressed upon the mind of the patient. So long as there is no difficulty in starting the stream, or no pain occasioned thereby, the act of micturition in the day-time passes unnoticed, but when one has to rise from his sleep for the same purpose there is a distinct tendency to impress the act upon his mind, and it is only the nocturnal urinations which he remembers. Careful inquiry will, however, usually elicit the fact that the daily urinations have been much more frequent than he really realized.

The time when urination is most frequent is in the early hours of the morning. Sleep may possibly be a strong factor in producing this apparent phenomenon. The bladder is usually emptied the last thing before retiring, and the patient at once passes into a refreshing sleep. The pain and distention does not become enough to waken him until he has slept for some hours, and consequently on awakening, his bladder is fuller than usual on account of the length of time which has passed since the last urination. By this time the distention has become great enough to waken him; the elapsed interval is much greater than during the day, and in consequence the bladder is stretched much beyond its accustomed point. This, by rendering the muscular coat tired, is the cause of the more frequent risings between this time and morning. Had the first interval not been so long, the succeeding ones would be somewhat longer.

In contradistinction to ordinary increased frequency must be distinguished the somewhat uncommon occurrence of intermittent micturition, or a sudden and complete stoppage without previous slackening. This condition can only occur when the prostatic outgrowth is in such a position that it can close the urethral passage like a valve. The hypertrophied portion may be confined to the prostatic urethra, or it may project into the urethra from either one or other of the prostatic lobes, but it must be in such a position so that, by a ball-valve action, it can suddenly and completely block the urethral opening. This sudden blocking of the vesical outlet is occasioned only by such an outgrowth, and in the presence of a forceful contraction of the bladder walls thus tightly forcing it into the urethra, or by the presence of a calculus. In either instance, the stream can be continued only after the straining has ceased and the obstruction is thus allowed to float backward.

*Difficulty in starting the stream, decrease in force, and dribbling at the end of micturition*, are three of the earliest symptoms to appear. The difficulty in commencing the act of micturition is due in the main to increased obstruction on the one hand, and a decided decrease in expulsive power on the other. The lack of expulsive power is occasioned by a complete alteration of the relationship of the structures forming the neck of the bladder. Instead of relaxing and becoming funnel-shaped, as in normal health, the neck of the bladder becomes rigid, the longitudinal fibres cannot contract, and as a consequence the prostatic urethra cannot dilate and form a portion of the bladder. Instead, then, of being filled with urine ready to pass away, the first portion of the urethra is contracted and has to be filled slowly by force from above. This sometimes takes considerable time, hence the delay and difficulty in starting the stream.

This delay in commencing the act of micturition is almost invari-

ably accompanied by a marked decrease in the force of the stream, and is therefore one of the earliest of the symptoms of prostatic hypertrophy. Instead of the usual curve on leaving the meatus, the stream drops vertically down, and no amount of effort is in the least effectual in making it otherwise; indeed, in some instances, straining serves only to check the stream altogether by producing contraction around the orifice. Unless complicated by stricture, the stream, when started, is of equal size to that in normal health, and yet, in spite of the fact that some residual urine always remains in the bladder, and the intervals between micturition are much shorter than normal, the fact remains that a longer time than usual is required to pass the urine.

The third of this trio of symptoms is found at the end of micturition: when the urine involuntarily dribbles away, and is the first symptom of the commencing failure of the bladder, the impaired contractility of which is always present. It is the first indication to show that the bladder has already failed to force forward into the membranous and bulbous urethra the last quantity of urine, and consequently the voluntary muscles have nothing to contract upon. The fault, therefore, does not lie with the voluntary muscles which remain unimpaired, but rather with the bladder itself.

One of the first pathological conditions produced by enlargement of the prostate, though the patient may be entirely unaware of it, is the presence in the bladder of *residual urine*. In practically all cases of prostatic enlargement, the bladder, as a result of the obstruction at its neck, early fails to completely empty itself; and, as a result, there is always a certain amount of urine remaining in the viscus—an amount greatly determined by the amount of obstruction. The amount of residual urine may vary from a few drops to many ounces; and may even vary from day to day—being influenced in a minor degree by certain emotions, such as nervousness, etc.—but withal the tendency is for the quantity to increase as time goes by, and the prostate gradually increases in size.

As has been already mentioned, the patient is rarely aware of its presence, and is very much surprised when, after (as he thinks) he has completely emptied his bladder, a catheter reveals the presence of urine still left behind. The diagnosis is thus easily made, and catheterization should invariably be carried out as a routine procedure in all cases of suspected prostatic trouble. In cases of extreme retention, however, great care should be exercised in catheterization, as, after a long period of marked retention, the sudden relief obtained by the catheter will sometimes by suddenly relieving the back pressure from the kidney, produce an acute nephritis, or even renal apoplexy. This is especially true in cases of long-standing chronic nephritis. A correct estimate of

the amount of residual urine can never be obtained by one catheterization, but can only be made after several such measurements. Various conditions are liable to vary the amount of urine thus obtained, but an average may be readily arrived at.

Residual urine sooner or later becomes contaminated, not from its mere presence in the bladder, but usually by infection from without. The use of the catheter is the most potent cause of the cystitis so certain to develop in the majority of cases of marked hypertrophy. The catheter introduces infection, the mucous membrane is congested, and consequently pus and debris are deposited within the bladder. This being heavier than the urine, it settles in the most dependent portion; in these cases the post-prostatic pouch, and cystitis is rapidly developed.

If urination was frequent before the advent of cystitis, the presence of this inflammation now makes it much more so, and the relief experienced by evacuation is much less than before contamination. Tenismus is marked, and the suffering now becomes almost intolerable. A complete urinalysis will almost invariably reveal the presence of mixed infection with mucous, pus, and blood all present.

*Retention of urine* presents itself to the patient as a symptom only when it becomes acute. This is usually caused by excessive congestion in the neck of the bladder, and the first warning a patient may have of his condition is sometimes the sudden and acute retention which follows. More often, however, he will remember that heretofore the urine had not passed naturally—that there had been delay in starting the stream, that there had been lack of force or some of the other symptoms already described. He may never have noticed them before, or, having noticed them, were banished from his mind as a matter of no importance until acute retention developed.

It is quite possible, and frequently happens, that acute retention develops without the slightest previous warning; and, after relief by catheter, months or even years may pass without recurrence, and in some instances may never appear again. Whatever may be the subsidiary cause, the immediate and direct cause of acute retention is one of three things—failure in expulsive power, increase in resistance, or a combination of both.

The most common cause of the three is *sudden increase in resistance*. The mucous membrane around the neck of the bladder is congested, and suddenly by some exciting cause it becomes much more swollen, when, by the aid of the prostatic outgrowth, it succeeds in effectually blocking the opening into the urethra. This sudden increase in resistance may be, and usually is, caused by some such inflammatory action as that produced by the irritating condition of the urine or sudden exposure to cold, though not infrequently it is depend-



ent upon some such cause as obstruction to the venous circulation in the neck of the bladder. In still other cases the first attention of the patient may be drawn to the fact that a little urine is constantly coming away, when examination will reveal the pathology of the condition to be due to prostatic enlargement, and the constant dribbling merely an overflow. In these cases there is frequently no pain because there is no cystitis, and no cystitis because a catheter has never been used. The bladder on becoming fully distended and being unable to empty itself completely, finds relief only in proportion to the amount of urine entering by the ureters. As each few drops of urine is secreted by the kidneys and finds its way to the bladder, an equal amount is forced into the urethra and thus escapes, producing as it were a continuous overflow. This condition is noticed first at night, but later as the contractility of the bladder becomes more impaired it becomes pronounced in the daytime—especially during any exertion producing contraction of the abdominal muscles.

*Incontinence of Urine*, a condition sometimes mistaken for that just described, is one of the most infrequent symptoms of enlargement of the prostate. In the presence of true incontinence, the catheter will reveal an empty bladder. When incontinence is present, its cause is likely to be found in the inability of the voluntary sphincter to contract properly, because of some minute outgrowth of the prostate, which is so placed as to keep constantly open the vesical end of the urethra.

*Haematuria* is met with in a small percentage of cases. Some of the most constant causes of blood in the urine are:

- 1 Even the most gentle ure of the catheter will in some cases produce a considerable amount of bleeding.
- 2 Varicose veins in the prostatic urethra or the neck of the bladder, and their spontaneous rupture is a not infrequent cause of the blood which is present.
- 3 Ulceration is sometimes present, and is due in part, at least, to over-active congestion, to prolonged cystitis, or to calculus. Ulceration will invariably result in at least some blood in the urine. The bleeding point may be sometimes inferred with a fair amount of accuracy by the character of the bleeding. For instance, if bloody urine is being passed, that is a more or less perfect admixture of blood and urine, the inference is that the blood is coming from some point in the prostatic urethra or the neck of the bladder. If, after great straining, only a few drops of blood appear, it is a reasonable certainty that there has been a rupture of some congested veins somewhere around the neck of the bladder. In cases of blood collecting

in the post-prostatic pouch, it will usually flow only on the completion of micturition.

Whether sexual power is really impaired to any great extent by prostatic enlargement is as yet a moot question. It is a well-known fact that prostatic fluid is essential to the life of the spermatozoa, and in those cases where the gland is enlarged uniformly, it is difficult to see how the function could be successfully carried out. In the early stages of prostatic disease, many instances are known of painful intercourse, the pain being usually most severe after the orgasm, and in practically all cases of advanced disease in the prostate, sexual power is lost. It remains, however, yet to be learned whether prostatic hypertrophy, except in the final stages, has any direct effect upon the procreative powers.

The prostate increases in size very slowly, and consequently there is never any pain associated with its growth. When pain is present there is invariably some associated complication, such as inflammation or congestion of the mucous membrane. According to the severity of the complication, pain may vary from a slight aching in the perineum to an intense and intolerable agony, involving any or all the branches of the sacral plexus. The suffering most commonly complained of is an intense burning sensation around the neck of the bladder, associated with pain in varying degrees of intensity at the end of the penis.

Many patients complain of a sense of fullness in the rectum, as though there was a mass there which they could not pass. In these cases, examination reveals a prostate enlarged toward the rectum, and sometimes making a very considerable obstruction to the passage of fecal matter. The patient is continually desiring to go to stool and invariably accomplishes no result. Arising from constant straining such as this, will frequently develop a congestion or inflammatory condition of the mucous membrane of the rectum, which is the forerunner of hemorrhoids—or, in more severe cases, prolapse of the rectum itself. These are the cases in which the sense of weight and fullness in the perineum are the greatest.

If no catheter has been in use, urinary changes occur slowly, the most important being a diminution in the specific gravity with an increase in the quantity. This is due in the main to fibroid induration of the kidneys, the result of back pressure from an over-distended bladder. In cases where a catheter has been much in use, this condition is not to be found because of the absence of urinary back pressure. Another contributing cause to a lowering specific gravity is to be found in persistent renal hyperæmia occasioned through constant irritation reflexly transmitted from the acutely congested mucous membrane around the neck of the bladder. Albumen is sometimes, though infre-

quently, present before contamination takes place through the introduction of the catheter, but it is surprising how rapidly albumen may appear when once a catheter has been passed and all the residual urine drawn off.

With the exception of a lowering of the specific gravity, the urine, in the absence of any complication, undergoes but little change. With the first introduction of the catheter, however, it is surprising to note how rapidly changes may occur. The residual urine is removed, the back pressure on the kidneys is relieved, and in many cases, either from some slight damage by the catheter itself, or from the spontaneous rupture of one of the congested veins at the neck of the bladder, free bleeding may occur. Urinary changes are now rapid. Septic organisms which heretofore have been harmless, find in this admixture of blood and residual urine an excellent culture medium. From this an acute inflammatory condition is set up, involving in turn the mucous membrane of the bladder, then the ureters, then the pelvis of the kidney. Detached epithelium, pus, blood and albumen appear in rapid succession; the odor is offensive and the urine rapidly becomes alkaline.

The condition of the general health is by this time commencing to show signs of being undermined. This is not the result of enlargement of the prostate in itself, but rather from the secondary changes it produces in other organs, such as the bladder, the kidneys or the heart. Evidences of failing health, and of early and somewhat premature old age, commence to appear as micturition becomes more frequent, and a greater strain is thrown back upon the kidneys. Loss of weight is a common symptom, the appetite is poor and the general health fails gradually. The patient is frequently unable to state, especially in the early stages, just what he really does complain of, so general and insidious do the symptoms appear.

All this is changed, however, the instant acute congestion attacks the neck of the bladder. Increased congestion means an increase in residual urine; residual urine with infection results in retrograde pyelitis, which, in turn, rapidly develops into a nephritis—either acute or chronic. Such impairment of the kidneys frequently manifests itself not only in increased frequency of urination, but also in a markedly increased quantity. These are the cases in which acute retention rapidly develops into uraemia. Even although acute retention does not occur, the quantity of urine thus remaining in the bladder may gradually increase to such an extent as to become almost retention, that voided being practically an overflow. In this condition there is a constant dribbling to a greater or less degree. The residual urine rapidly becomes alkaline, and a chronic cystitis exists. The general health is slowly undermined, hydronephrosis frequently occurs, and in many in-

stances, as a result of the retention in the blood of toxic materials which should have been eliminated by the kidneys, uraemia, the final scene, is ushered in.

Although the *subjective* symptoms may be definite, and the conclusions drawn from them may be unmistakable, yet in every instance the *objective* symptoms obtained from a complete physical examination should invariably be obtained to corroborate the conclusions at which we may have already arrived when the symptoms from these two viewpoints are collected, and not much difficulty should be experienced in arriving at a correct diagnosis. More than one examination, however, is occasionally required in order to determine the extent of the trouble caused by the growth itself, and that produced by the congestion or cystitis so liable to be present, for it must be remembered that many conditions other than prostatic overgrowth may be the direct cause of these complications. I have never known a patient to apply for relief when the only symptom was frequent urination, and therefore at a time previous to the appearance of complications; but, on the other hand, many old men having been taught by a neighbor its use, will use a catheter for months or even years, and will only consult their physician when the pain from the ensuing cystitis becomes unbearable, or when perchance, acute retention should supervene.

Since all prostatic cases suffer from more or less urinary retention, and since at least a fair percentage of them have not been in the habit of employing a catheter, the first objective symptom to search for is a distended bladder presenting above the pubes. Should such a distention of the bladder be discovered, *never introduce a catheter and hastily evacuate the contents*. I have known more than one instance where death followed such a procedure. In these cases of chronic retention with overflow, the urine is backed up into the ureters, and its sudden evacuation is liable to produce acute renal congestion. One case of this kind which came under my observation, died on the seventh day from uraemia. Where such a condition is found, repeated catheterization should be made with about three hours interval, each time emptying the bladder a little more until finally, in from two to three days, the bladder is completely emptied, and may now be kept so by catheterizations as often as may be necessary. Should the trouble for which the patient consulted his physician be due to either simple cystitis or congestion, it will now, by judicious catheterizations and irrigations with warm boric acid lotions or a weak solution of nitrate of silver, rapidly disappear; while, on the other hand, should the prostate be the seat of the trouble, it will remain constant and permanent.

In cases of chronic retention, such as this, and much more so in cases of acute retention, no radical operation should ever be performed

—and not until after the bladder has somewhat recovered its normal tone can any definite opinion on the prostate itself be expressed.

The amount of information which may be gleaned by observing a patient pass water is astonishing. The difficulty in commencing the stream, the size of the stream itself, its apparent force, the regularity of the stream, showing whether any interruptions occur, and whether urination is concluded in the normal manner or by the latter portion of the stream dribbling perpendicularly down with no apparent control, are all points of the greatest value bearing on the case. From the urine itself much may be learned. If the quantity passed should be measured, and the time since last urination learned, an approximate idea of the amount passed in the twenty-four hours may be arrived at. A patient thus passing from forty to fifty ounces in this specified time has probably no kidney lesion, or, if so, it has probably not got beyond repair.

Should there be no retention with overflow, a catheter should invariably be passed in order to learn the amount of residual urine and as an aid in palpation of the prostate itself. The prone position I find to be the most convenient for these manipulations. If the prostate is very large, not one, but several, catheters may have to be resorted to before finally reaching the bladder. In some cases a small quantity of a one per cent. solution of cocaine will add considerably to the ease with which this examination is effected, while occasionally it may be even necessary to administer a general anæsthetic. Especial care must be exercised to guard against shock or exposure to cold, and in all cases it is well to keep the patient in bed for at least some hours after the examination is completed. In the absence of a purge given the evening before, a high simple enema will evacuate the lower bowel and make the examination much more satisfactory. Too much caution cannot be exercised in obtaining the strictest asepsis in an examination of this kind, because infection carried into a bladder such as this means untold misery and suffering to the patient.

The bladder having been entered, the absence of strictures noted, and the residual urine drawn off and measured, the first point of interest to observe is the length of the urethra. A graduated metal catheter, which is also used as a sound, will show exactly at what distance from the meatus the urine commences to flow. The mistake must not be made of thinking the bladder has been entered the instant a few drops of urine are obtained, for the prostatic urethra is frequently enlarged sufficiently to hold from one or two ounces. The diagnostic points learned from the passage of the catheter may be enumerated as follows:

- 1 Residual urine favors prostatic hypertrophy.

- 2 If the urethra measures more than eight inches in length, it is strong presumptive evidence in favor of enlargement of the prostate.
- 3 If the vesical orifice of the urethra is raised, as demonstrated by the fact that the shaft of the catheter must needs be greatly depressed between the legs of the patient before urine begins to flow, prostatic enlargement is evident.
- 4 As the catheter passes through the prostatic urethra, hypertrophy will cause it to deviate to the right or left, according to the direction of the growth. In the presence of enlargement, it is rarely possible to pass a metal catheter without deviation to one side or the other.
- 5 Strictures are never present in the prostatic urethra; so that if an obstruction is encountered more than seven inches from the meatus, it may be reliably presumed to be hypertrophy.
- 6 With the catheter in the bladder, the residual urine will flow freely if there is no atony of the viscus, but in cases of long standing hypertrophy with chronic retention and overflow, atony of the bladder may be so marked as to necessitate abdominal pressure from the hand of the physician above the pubes.
- 7 By means of the catheter also a fairly accurate idea of the condition of the bladder walls—whether dilated or contracted—may be obtained. After withdrawing the residual urine, several ounces of warm boracic acid solution should be introduced into the bladder, the amount of resistance indicating the condition of the walls.

Rectal examination alone, after the bladder has been emptied, will frequently reveal considerable information. With the patient on his back and the forefinger of the right hand in the rectum, the posterior surface of the gland may be accurately mapped out. By placing the left hand over the pubes and pressing firmly, the prostate, especially in thin patients, may be easily palpated, and its size and density adjudged. The degree of projection into the bladder may, in this way, be fairly well ascertained.

In general enlargement of the prostate, the posterior or rectal surface is uniform; when either lobe is hypertrophied more than the other, the inequality is easily detected. Rectal palpation in simple hypertrophy should cause no pain. Pain and discomfort on pressure would indicate congestion or inflammatory changes. In cases of marked congestion or inflammation of the gland itself, the rectal sphincter is frequently found in a state of spasm. In spite of the information it may sometimes give, rectal examination will often reveal a prostate appar-

ently normal in size when its anterior enlargement may be enormous, which tends to substantiate that which has been frequently pointed out, that the direction in which prostatic overgrowth gives trouble is vesical and urethral, and not toward the rectum.

Combined examination with the finger in the rectum and metal catheter or sound in the bladder (bimanual, as it were) will reveal the greatest amount of accurate information. To do this it is most convenient to have the patient flat on his back, with his knees drawn up; stand on his left side, pass the index finger of the left hand into the rectum, and with the right hand manipulate the sound or catheter. This catheter may, after some experience has been attained, be used with almost the same amount of precision as a long finger, and bimanual examination would be complete. This method will positively admit of the detection of any enlargement of the prostate.

With the catheter in position in the bladder, the examining finger in the rectum will first detect the catheter in the bulbous urethra, then by tracing it backward can readily detect it in the membranous urethra. In the presence of an enlarged prostate it can be traced no further, but the examining finger immediately comes in contact with the posterior portion of the prostate projecting into the anterior wall of the rectum. By downward pressure on the catheter this projecting mass can be made much more prominent, and the rectal finger can be readily made to pass around and examine either lateral lobe, and if the growth has not attained too great a size, the finger may be able to reach over it and even detect the catheter in the recto-prostatic pouch. To do this, however, would require but a moderate-sized prostate and an exceedingly long finger, and consequently this point can seldom be attained. The exceeding great value of this method of examination is in the fact that it invariably detects without possibility of error the presence or absence of prostatic enlargement. But even in the presence of hypertrophy of this nature, it remains to be disclosed whether the attendant symptoms are due to this or some other cause, for it is equally possible to have hypertrophy without symptoms, and typical symptoms without hypertrophy.

*Cystoscopic Examination* has not proven the success which was at one time anticipated. If the prostate is large its introduction is difficult, and from the fact that it occasionally produces acute retention of urine, it is somewhat dangerous. When introduced, however, certain valuable information is sometimes obtained. Small growths around the neck of the bladder may be detected, and the condition of the vesical mucous membrane may be determined. A calculus which otherwise may escape detection may be seen, and the presence of vesical sacculi is readily noted.

The condition of the bladder and kidneys should, in every case, be carefully and accurately determined, because on this—and, to a very great extent, on this alone—will depend the line of treatment to be adopted for the relief of the symptoms displayed. An hypertrophied prostate is important mainly on account of the changes which are by it wrought in the urinary organs. To determine this accurately, four main points are of special interest:

- (1) The amount of residual urine .
- (2) The condition of the vesical mucous membrane.
- (3) The amount of vesical atony.
- (4) The renal condition.

*The amount of residual urine* is probably the least important of the four. A very large amount may be retained by a very small prostate. An accurate estimate of the amount may be best obtained after making several repeated measurements. The patient is directed to pass all the urine he can, and when he has, as he supposes, completely emptied his bladder, a catheter is introduced and the residual urine drawn off. After several such measurements, taken at different times of the day and under different conditions, an approximate average may be obtained. As the nervousness of the patient decreases, and by continued catheterizations the tone of the bladder is improved, the amount of residual urine may perceptibly diminish.

*The condition of the vesical mucous membrane* is seldom difficult to determine. The means at our disposal for such an examination are the cystoscope and chemical examination of the urine. When the cystoscope can be introduced without difficulty, the vesical wall can be examined minutely for evidences of congestion and inflammation, and this instrument will also reveal the presence of any adherent encrustations from urinary deposits. But it is from chemical examination of the urine that the greatest amount of information is obtained. In making this analysis, the frequency of micturition, the mode of passing and the amount of pain accompanying it, and the acidity and alkalinity are all taken into account.

Before obtaining the urine it is well to cleanse the urethra from all contamination by an irrigation of boracic acid, otherwise bacteria present there will be mixed with the urine, and may seriously affect the ultimate conclusions. Micturition, frequent and painless, may be invariably taken to mean retention with overflow and without the presence of any complication. When pain is present it likewise invariably means congestion or inflammation at the neck of the bladder, and the amount of inflammatory action may be fairly judged by the urgency with which the call is made. Especially if the pain is burning and intense, and spreads down to, or nearly to, the end of the penis, the pres-



ence of a virulent form of inflammation may be suspected. This inflammation, on the other hand, may be the result either of an enlarged prostate or a calculus.

The mode of passing the urine is important in estimating the condition of the bladder wall. If sacculi are present there may be much difficulty in starting the stream, and likewise in fulfilling its accomplishment. If this difficulty is experienced, and the immediate introduction of a catheter reveals little residual urine, it is strong presumptive evidence in favor of the presence of such sacculations. In these cases, it is sometimes possible to slip the catheter into another pouch and evacuate an ounce or more of urine after the instrument has already apparently emptied the bladder.

The reaction of the urine is one of the greatest importance. If it is strongly alkaline, and has been so for some length of time, its effect on the condition of the bladder wall may be well estimated. The mucous membrane is likely to be raw on the surface, probably ulcerated in spots, and tends to bleed freely on the slightest irritation. If the case is at all advanced, the muscular fibres of the wall itself are commencing to break down and the lymphatics are clogged with inflammatory exudate or septic foci. This condition is of the utmost importance in determining a line of treatment, because the occurrence of a marked cystitis and the length of its existence marks the possibility or impossibility of any line of radical treatment. In this condition there may be marked atony of the urinary walls with the serious weakness from chronic disuse; but so long as there is no acute inflammatory congestion from septic origin, it is not yet too late for a cure if the cause is promptly removed—provided always the general condition of the patient is such as to warrant such a radical procedure.

The condition of the urine must invariably be accurately determined, for in it lies a strong clue to the condition of the vesical mucous membrane. The reaction has been already noted. The condition of the sediment is equally, if not more, important. From the fresh specimen it is collected by centrifuge and examined microscopically. If any doubt exists regarding the micro-organisms, cultures should be made. If an inflammatory condition exists, bacilli or pus are always present. Moullin is authority for the statement that there is no such thing as idiopathic or catarrhal cystitis. With the exception of specific organisms, inflammation of the bladder is always purulent, and the micro-organisms will invariably show after centrifuging or from a culture. The more severe the inflammation, the greater the deposit of pus corpuscles, of septic organisms and of blood will be found in the urine. In such cases the mucous membrane bleeds freely on the slightest irritation.

*The amount of vesical atony* is best estimated by watching the patient void urine through a catheter. If the bladder walls have retained their power, the urine passes away in a full-sized stream; if atony is developing, the stream will pass more slowly, will rise and fall with each respiration, and the last few ounces may even have to be expelled by suprapubic pressure.

*The renal condition* is of supreme importance in all cases of prostatic hypertrophy. The changes in the kidney come slowly, and are sometimes well advanced before they are even suspected. The symptoms are vague and indefinite, and may be nothing more than premature old age. On examination, the urine will at first show a greatly increased amount with a corresponding decrease in specific gravity. When septic nephritis once supervenes, the symptoms become rapidly more marked. The effect upon the urine is decided, casts of various kinds at once appear, albumen is increased and urea is decreased; the general health rapidly fails.

In order to throw as much light as possible, a thorough physical examination should invariably be made. The condition of the arteries, of the circulation, of the heart, and of the advent of premature old age, should always be sought for. Where renal pressure is marked, cardiac hypertrophy soon makes its appearance. Dilation of the heart is not infrequent, and when accompanied by dyspnoea, oedema of the extremities or hepatic congestion, the outlook is anything but promising.

*Differential Diagnosis.* As in duodenal ulcer the symptoms are almost pathognomonic, so in prostatic hypertrophy the chain of symptoms presenting themselves in their characteristic sequence, may be regarded as almost pathognomonic. In a man past middle life increased frequency of micturition, especially at night and in the early morning, decrease in the force with which it is expelled, difficulty in starting the stream, and dribbling at the end of urination, all point unmistakably to enlargement of the prostate as the existing cause. But it must be remembered that other diseases also produce an increase in the size of the gland, and to distinguish with certainty chronic hypertrophy from any of these, a careful urethral and rectal examination must be made. In thus making a differential diagnosis, the greatest difficulty is usually experienced in those cases where a small or impassible stricture prevents the passage of a sound, and consequently prevents a combined rectal and intravesical examination.

Cystitis almost invariably makes its appearance sooner or later, and using this as the turning point in these case histories, it is frequently possible from the subjective symptoms to foretell with fair accuracy the stage to which the disease has already advanced. As in the case in many other surgical affections, so in prostatic hypertrophy, it

holds true that the earlier the case presents himself for treatment, the greater is the hope for cure. It is seldom that patients apply for relief before they have commenced catheter life, and it is also seldom that any complications ensue until after the commencement of catheter life. The catheter introduces the infection, and complications rapidly multiply. The lower the constant specific gravity of the urine the more grave the outlook, and when it remains consistently below 1012 or 1010, it indicates an advanced state of kidney involvement, and bespeaks a very doubtful prognosis indeed.

Two main classes of prostatic overgrowth occur—the adenomatous and the fibrous. In the adenomatous variety, the history will usually date back many years, a history mainly of frequent urination without pain. In these cases there is likely to be a much dilated bladder with a considerable quantity of residual urine, and cystitis is infrequently present. Mimanual examination reveals a growth much larger than the fibroid variety; it is less dense. Unless it reaches an abnormal size, and from its size alone becomes fixed, rectal palpation will find it moveable, and the mucous membrane of the rectum will glide easily over its surface. The two lobes can frequently be distinguished, and even the dividing commissure is occasionally palpable. These are the cases in which dense and well-defined tumors can sometimes be distinctly felt jutting out from the substance of the gland.

In the fibrous variety the prostate is sometimes but slightly enlarged. Periprostatitis has invariably occurred, and as a result the gland is solidly fixed in position and is correspondingly much denser and harder than in the adenomatous variety. The mucous membrane of the rectum is fixed to the gland, and the two lobes are exceedingly difficult to determine. The gland is hard and smooth and is characterized by an absence of protuberances. In this variety, too, much more marked changes are found in the bladder itself. As a result of early infection, cystitis has been an early symptom, and the viscal walls are thickened and contracted. The history of the case will reveal very early suffering, and the stage of chronic retention with overflow is seldom, if ever, reached on account of the above-mentioned condition impelling him to keep his bladder empty or nearly so, and the constant use of the catheter in doing so, continually adds fuel to the already unquenchable flame and adds materially to the distress. Truly the fibrous prostate produces a clinical picture deplorable in the extreme.

Clinically speaking, then, there are two distinct types of prostate, the adenomatous with a dilated and passive bladder, the absence of cystitis until late in the disease, and the presence of a considerable quantity of residual urine; the fibrous with a contracted and irritable bladder due to acute cystitis, a short case history and the absence of

any considerable amount of residual urine. From these clinical symptoms it would appear that the two conditions may indeed be due to different contributing causes.

In differentiating between diseases which either directly or remotely simulate chronic prostatic hypertrophy we must take into consideration the following:

- (1) Atony of the bladder.
- (2) Stricture.
- (3) Cystitis.
- (4) Calculus.
- (5) Chronic prostatitis.
- (6) Tuberculosis of the prostate.
- (7) Abscess of the prostate.
- (8) Prostatic malignancy.

*Atony of the Bladder*, itself one of the complications of prostatic hypertrophy, is likewise produced by other pathological conditions as well, though the differentiation is easily established. The symptoms produced by atony are the same no matter what may be the cause of the atony. For instance, if the atony should be produced by urethral stricture the chain of symptoms would include delay in starting the stream, decrease in force, a certain amount of residual urine left behind, and, because of the latter condition, urination more frequent than normal. Thus, from the subjective symptoms alone, it may be impossible to differentiate atony from hypertrophy, from atony from any other cause; but bimanual examination will in every instance indicate whether hypertrophy is the cause of the trouble. Vesical palpation with a metal catheter, combined with rectal palpation with the finger, will prove or disprove beyond a doubt the presence or absence of enlargement of the prostate. The presence of a stricture may, however, make the combined examination very difficult, or even impossible.

*Stricture*. Stricture in the urethra is met with at all ages, and is not infrequently the cause of atony of the bladder. It is most frequently found before middle life—the converse of which is true in prostatic hypertrophy. With stricture in many instances the symptoms strongly simulate those displayed in prostatic enlargement. The one strong distinguishing point can be demonstrated on the passage of a full-sized sound. When stricture is present it will be encountered in the membranous portion of the urethra, or, to be more exact, within seven inches of the meatus. If obstruction is encountered beyond seven inches, it is in the prostatic urethra, and must therefore be due to hypertrophy, as organic strictures are never found beyond the membranous urethra. If a stricture is encountered, and by dilation can be successfully passed, combined examination as before described will reveal the absence of any prostatic enlargement.

*Cystitis.* When in a patient past middle age cystitis is present, it is often accompanied by symptoms strongly simulating prostatic enlargement. A catheter, however, will readily reveal the fact that there is no residual urine. Residual urine is present in only two conditions—stricture and prostatic hypertrophy. A count will speedily show the absence of stricture, and combined examination will reveal a prostate of normal size.

*Calculus.* A calculus simulates an enlarged prostate only in those cases in which the stone is firmly fixed in the immediate neighborhood of the prostate, and is so thickly coated as to make its presence imperceptible with the employment of a sound. If the calculus is prostatic, the difficulty in diagnosing becomes doubly great. A calculus co-exists with an enlarged prostate in about one case in four. In chronic prostatic hypertrophy residual urine is one of the most constant of symptoms, while in calculus it is rarely present; and once again the urethral sound will deviate neither to the right nor to the left while passing through the prostatic urethra. Unless a calculus is prostatic and embedded in the body of the organ, bimanual or combined examination will reveal a normal gland.

With calculus pain is a more pronounced symptom, especially when the bladder is emptying itself. This pain radiates to the end of the penis. In simple chronic prostatic hypertrophy, pain is an insignificant symptom. With stone, increased frequency of micturition is marked during the day in contradistinction to the nocturnal frequency of enlarged prostate. Calculus causes no diminution in the force of the stream. Exercise especially produces much more marked hemorrhage than is present in hypertrophy. When other means fail, an X-ray photograph of the bladder will sometimes detect the presence of calculus.

*Chronic Prostatitis.* Chronic prostatitis is a common sequel to the acute form. Acute prostatitis, especially in the younger patient, is usually the sequel to gonorrhœa. The history and character of its onset is sufficiently characteristic to admit of positive diagnosis. Prostatic palpation through the rectum is excessively tender. Prostatorrhœa, totally absent in prostatic hypertrophy, is a common accompaniment of chronic prostatitis. It is when chronic prostatitis occurs past middle life, and in the absence of gonorrhœa, that the greatest difficulty is experienced in the differential diagnosis. In these cases considerable confusion may occur, especially as the two conditions at this time of life so frequently co-exist. In the case of chronic prostatitis developing on chronic hypertrophy, it usually commences in the mucous surface of the gland and is the result of either septic or specific urethritis, the contamination having been introduced by the passage of catheters. The symptoms common to both chronic prostatitis and an adenomatously

enlarged prostate are few; those of the fibrous variety more definite. In cases where fibroid degeneration of the prostate early takes place, and at the same time the symptoms of chronic prostatitis are manifest, it is often only after the most exhaustive analysis of the general symptoms that a conclusion can be reached as to the origin of the prostatitis.

*Tuberculosis of the Prostate.* Tubercular disease in the prostate is not an uncommon affliction, and by the symptoms it produces may sometimes simulate to a remarkable degree chronic hypertrophy of the gland. The disease, however, occurs for the most part in young adults and only occasionally in men past middle age. It is accompanied by deposits or encrustations in the mucous membrane of the bladder. The symptoms of tubercular disease as a rule do not appear until cessation commences, or even until the mucous membrane lining the prostatic urethra has given away. Rectal palpation of the gland will now reveal it to be irregular in outline and of variable consistence. Combined examination reveals a prostate but slightly, if any, increased in size. When cessation has set in, or when the urethral mucous membrane of the prostate has given way, the pain and the suffering are unbearable. The constant desire to urinate, with all the symptoms of acute ulceration, produces an almost uncontrollable agony. The tubercle bacillus can usually be detected in the centrifugized urine. In tubercular disease the cystoscope may be of considerable value in enabling the physician to locate a tubercular ulcer.

*Abscess of the Prostate.* Prostatic abscess is in its course so acute that, except in special cases, it is unlikely to be mistaken for hypertrophy. It is usually inflammatory in origin, though sometimes it may result from an injury. The abscess will always point either in the perineum, the urethra or the rectum, and careful palpation will frequently indicate the location where it will likely break.

*Prostatic Malignancy.* Malignancy in the prostate simulates to a greater degree than any other, chronic prostatic hypertrophy, and is also a more common affliction than is commonly supposed. It is chiefly of the adenocarcinomatous type. True sarcoma of the prostate is one of the rarest of diseases, and, when encountered, is usually present in boys under twenty. To a much more marked extent than is the case in carcinoma, cachexia is rapidly developed, and the rate of growth is correspondingly increased. Carcinoma produces severe pain, both local and referred. It is sometimes felt severely at the end of the penis, and thus may simulate stone in the bladder, though the most common location for referred pain is down the inner side of the thighs. Rectal examination reveals a prostate firmly fixed, dense, hard and somewhat enlarged. Hemorrhages are not uncommon, and may occur into either the urethra or the bladder.

The first known operation for prostatic cancer was performed by Billroth in 1867, and two years later was repeated by Jolly; but it is only within recent years that any success has attended this treatment. One reason for this may be the difficulty of an early diagnosis. In its early stages, prostatic cancer simulates to an exceptional degree ordinary prostatic hypertrophy, and consequently is often beyond help before a diagnosis is made. One great difficulty in diagnosis is apparent—its inaccessibility. It is intrapelvic at best, but one side of the organ can be felt and examined; and since it is so frequently the site of inflammatory changes and of bacterial invasion, an error in early diagnosis is made the more probable. This is furthermore exemplified in the frequency with which prostatic cancer and chronic prostatic hypertrophy co-exist in men over fifty years of age.

An established rule in the etiology of cancer in any part of the body, is that it is prone to follow in the wake of chronic or prolonged stimulation or irritation. There is no reason why this should not hold good in prostatic cancer, and is, *per se*, one reason why so large a percentage of cases (variously estimated at from ten to twenty per cent.) of prostatic hypertrophy should rapidly degenerate into prostatic malignancy.

Prostatic carcinoma is always glandular in type, and usually of the hard variety. When the growth originates in an already hypertrophied gland, the differential diagnosis is much more difficult, and consequently the disease has frequently spread beyond hope before the real malady is discovered. The growth rapidly infiltrates the tissues inside the capsule, and penetrates the latter only at a late stage in the disease. The usual course of involvement is along the ejaculatory ducts and along the lymphatics to the trigone of the bladder. Metastatic deposits in the bones sometimes occur very early in the disease.

An additional difficulty in differential diagnosis is due to the fact that cancer and benign hypertrophy occur about the same time in life—from fifty years upward. The duration of symptoms will vary according to whether the cancer originates in an otherwise normal gland, or in an adenomatically enlarged prostate of long standing. In the former instance the symptoms may be of less than a month's duration, while in the latter they may have been present for many years. In either case, the nature of the symptoms will be much the same—increased frequency of urination, difficulty in starting the stream, more or less dribbling, residual urine, and always more or less pain with occasional hemorrhage.

As is the case in cancer in any other part of the body, three distinct stages of the disease may be here demonstrated microscopically:

- 1 The class of case in which there is no physical sign, subjective or

objective, suggesting malignancy. This is the early intramural invasion, and may attack either the otherwise normal gland or the one already hypertrophied. In those cases in which hypertrophy is present, the operation is usually performed for the relief of the symptoms produced thereby; the patient goes on to complete recovery and unless microscopical examination is made, no suspicion will be entertained that cancer was really present.

- 2 The second stage of the disease is demonstrated by the microscope when the infection attacks the periphery, when it becomes sub-capsular, when it travels backward along the ejaculatory ducts and even involves the seminal vesicles. Pain, sometimes severe, is now present, hemorrhage is not uncommon, and rectal examination will reveal an hardened, nodular and immoveable growth.
- 3 When the third stage is reached, pain and hemorrhage are the two most constant symptoms. Cachexia and anaemia, marked and progressive, are ever present. Metastasis, especially in the long bones, is of frequent occurrence, while the same condition through the lymphatics is always evident. The prostate is much enlarged, urinary embarrassment are distressing, and the clinical picture of one so afflicted is pitiable in the extreme.

Any definite line of differentiation between classes one and two, and again between two and three, is exceedingly difficult to determine. In fact, the bladder so gradually adjusts itself to the altered conditions as to make, in many instances, even the presence of disease unsuspected. In all cases of senile hypertrophy of the prostate, cancer is liable to co-exist, and until it has passed well into the second stage where hemorrhage and pain become more pronounced, the symptoms are liable to be mistaken for the ordinary frequency of urination commonly believed to be the natural condition co-existing with advancing years. Certain symptoms, however, may cause the patient some anxiety, and cause him to seek the advice of his physician. The more persistent of these will be pain, frequency of urination, and haematuria.

*Pain.* In cancer of the prostate, three distinct and separate stages of pain are encountered. At first it is present only during micturition and is felt in the bladder, the rectum and the penis. As the disease progresses, it becomes more intense, and is especially so during defecation. The third stage is when the pain becomes almost continuous. Referred pain is not at all uncommon, and may be present as sciatica, or manifest itself in the femoral, sacral, scrotal, or inguinal regions. One peculiar feature about this referred pain is that it is always ex-



aggregated by either urination or catheterization.

*Frequency of Urination.* Probably seventy-five per cent of prostatic cancer cases suffer from frequency of urination before the pathologic condition has produced any obstruction to the urinary flow, and as is the case in benign hypertrophy, this is the most constant and dependable symptom. This is occasioned by the encroachment of cancer cells stimulating muscular activity and lessening nervous control of the bladder. As a result, an almost continuous state of contraction is produced and the vesical contents are thus frequently expelled. As the disease progresses the prostate enlarges, and before long there is exhibited the frequency of micturition from an hypertrophic cause as well as the one just named.

*Haematuria.* Opinions differ widely as to the persistence with which haematuria is to be encountered in prostatic cancer. All will agree that hemorrhage is more indicative of stone or even of tumor, but the cystoscope will readily reveal these causes. In the absence of any such apparent cause, hemorrhage of frequent occurrence must be viewed with suspicion, as it is one of the most significant symptoms of prostatic cancer. Microscopical examination of the blood thus obtained will occasionally help to clear up the diagnosis by revealing the presence of cancer cells. If, in addition to the presence of any one or all of these three conditions, the patient should be at either extreme of the prostatic life—that is, before fifty or over seventy—suspicion will be much more firmly grounded.

Some of the more important objective signs may be gleaned from a comprehensive rectal examination, and many points of differentiation between cancer and simple senile hypertrophy may be demonstrated. In cancer, the gland is at first but very slightly increased in size; in fact, not nearly enough to account for the train of symptoms presented. The consistency of the gland in atony is hard, and it may be smooth or nodular. The hard induration usually starts in the left lobe, and the unilateral hardness is considered by some as almost pathognomonic of cancer. The mobility of the gland is much reduced by cell invasion of the deep urethra and of the vesiculae seminales. Rectal palpation shows the gland to be practically immobile.

A valuable sign of malignancy is to be observed in the passage of a catheter. The prostatic and membranous urethra become more or less infiltrated with carcinomatous cells, making the walls hard and inelastic, and consequent catheterization extremely painful.

Taking it all in all, the differentiation between prostatic cancer and simple hypertrophy presents many difficulties indeed—more so, in fact, than any other pathological condition of the prostate; and because of these difficulties many cases of early carcinoma are even to-day passing

undiagnosed to that stage where all treatment, of whatever kind it may be, is doomed to failure.

*Prognosis.* When a patient with chronic enlargement of the prostate gland appears for relief, the most important question to his mind is, "What is my chance for a complete and permanent cure, and if such cannot be attained, what amount of amelioration of my present suffering can be obtained?" The conscientious surgeon in attempting an answer to the foregoing question, must consider each question on its own merits, as not even a general line of treatment for all cases can be laid down; and in placing before the patient the possibilities or probabilities in his particular case, much sound judgement and experience is required.

One of two general lines of treatment are applicable to each case, the palliative and the radical. There is the patient advanced in years, with arteriosclerosis, with kidney involvement, and with his general health in such a condition as to preclude the possibility of any radical treatment. To this man, general palliative measures, judiciously applied, may add many months of comparative comfort to his already miserable existence. To him, careful attention to his general health, careful catheterization and judicious irrigations of the bladder may promise much; not in the way of even any attempted cure, but only as an attempt to make more comfortable the remaining months of his life. To the other man, even though he may have attained just as many years as the former, and though his sufferings may be just as great, yet because of a lesser degree of involvement of the kidneys, his prospects of a radical cure by total extirpation of the gland, and the chances of prolonging his life for many months (or even years) in complete comfort, may be very bright indeed. It is in advising and carrying out in each individual case the treatment which will, in that case, be productive of the best results, both immediate and remote, wherein the responsibility of the surgeon lies so great.

If due care is exercised, no death-rate is directly resultant from catheterization; and, therefore, in all those advanced cases where the approaching end is only a matter of time, it should be given a prominent place in palliative treatment. Catheter treatment, however, in cases in which it is possible to remove the gland, should never be employed except as in so far as may be necessary to get the patient into the best possible shape for operation. The continued use of the catheter must sooner or later always end fatally. It must not be forgotten that the average life of a catheter patient is only four or five years at the most. At first it succeeds admirably, and the patient is buoyed up with false expectations, the hope of a permanent cure. But time soon tells a different tale. The prostate continues to grow, thus rendering the

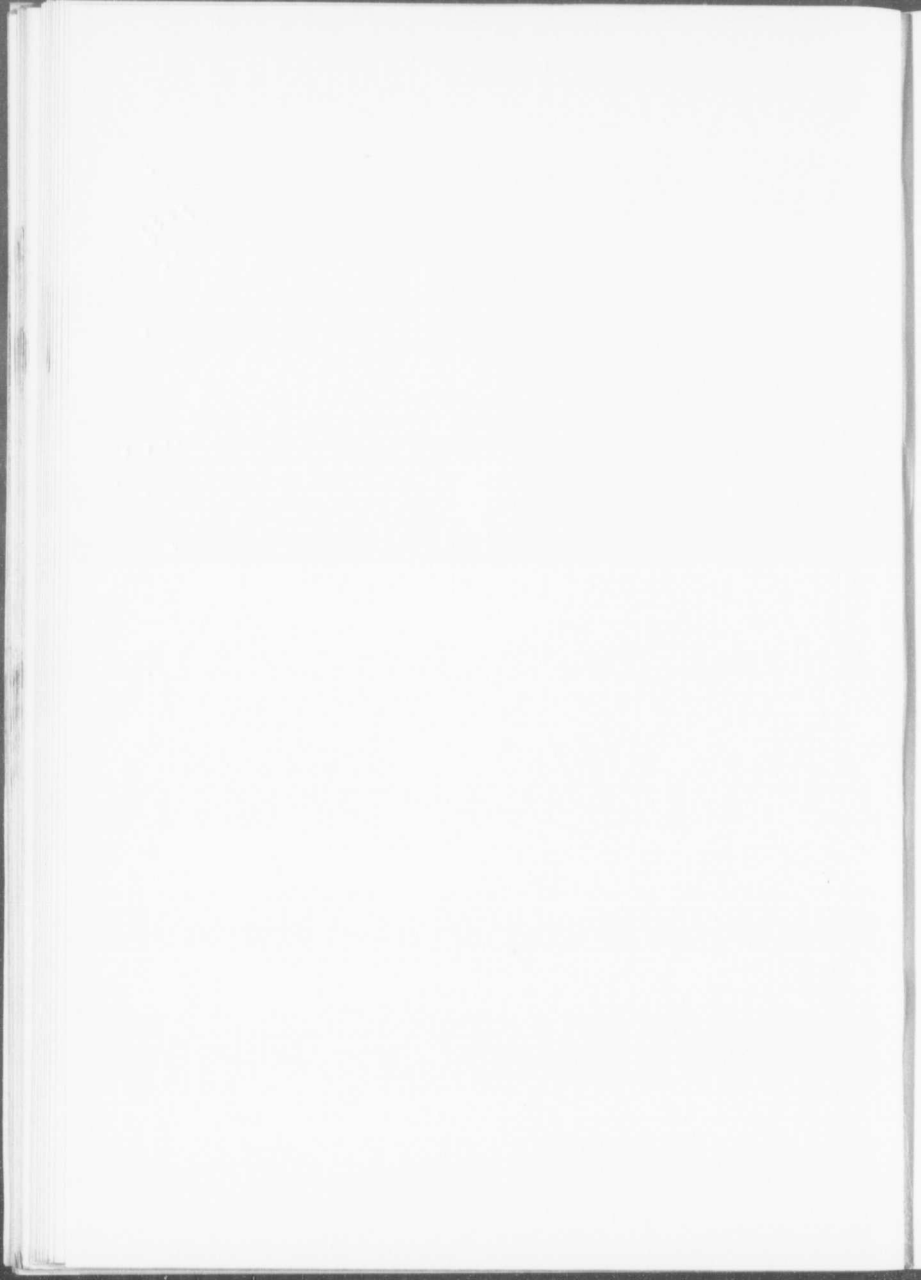
obstruction greater; and adding, as it were, fresh fuel to the fire, the very means of supposed relief—the catheter—is continually carrying infection into the bladder, and ere long we have not only the obstruction to deal with but an infective cystitis as well. Could the final condition be foretold by the patient, he would never lend himself to the end which certainly awaits him; but by the apparent improvement in the early stages, he is led by a false sense of security to reject the advice of the experienced physician or surgeon.

The mortality in radical treatment is greatly reduced by judicious preliminary treatment. Never operate immediately after an attack of acute retention or of acute cystitis. Always disinfect the genito-urinary tract as far as possible by such agents as urotropin and aseptic bladder irrigation, and the intestinal tract by the use of salol, duotal, etc. Always build up the appetite and the general health by such tonics as iron, quinine, nux vomica, etc. Upon the care with which the preliminary treatment is carried out, as much as upon the expertness with which the operation itself is performed, will depend to a very large extent the mortality rate in prostatectomy.

Where immediate relief is imperative on account of acute ulceration or cystitis, drainage of the bladder (preferably suprapubic) will offer the best possibilities. This not only gives immediate relief to the distress, but prepares the way for the more radical operation of prostatectomy, by causing amelioration of the cystitis, and thus giving the kidneys an opportunity to get into better shape.

By exercise of the best judgment in dealing with each particular case, whether it be by catheterism, by drainage, or by the radical removal of the gland itself, the mortality rate may now be kept very low, and the amount of relief obtained in selected cases be conversely very high.

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## PROSTATIC HYPERTROPHY: ITS TREATMENT

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THE sufferer from chronic prostatic hypertrophy has in the past been able to look forward to but one future, and that an exceedingly dismal one—catheter life. This is indeed one of the most deplorable conditions to which man is heir, and one which, when relieved, occasions more genuine satisfaction than that produced by almost any other surgical procedure of to-day. When one or both lobes of the prostate attain such a size as to preclude the possibility of voiding all the urine in the natural manner, life becomes miserable indeed, as the daily introduction of the catheter to evacuate the bladder of the residual urine soon begins to sow the seeds of that inevitable misery, the direct result of cystitis, ascending pyelitis, etc.

Until within the last decade the treatment has been entirely medical, and this, of course, could, even at the best, afford but temporary relief. Irrigations of the bladder, along with the various medicinal agents employed, could only for a time assuage the distress of the accompanying cystitis, and in every case the patient must ultimately bow to the inevitable. Surgery, however, has to-day come to the relief of this condition, and where formerly no hope of recovery could be entertained, the sufferer may now look forward with the utmost confidence to a complete and permanent cure.

The real advancement in the treatment of prostatic disease has taken place during the past ten years. In the decade prior to this, much experimentation had taken place, but little practical knowledge had been actually accumulated. Surgical interference had been advised by various illustrious surgeons, only to be accompanied by such an enormous death-rate as to cause its complete abandonment. Various routes and modes of attack had been exploited by their various advocates; but no matter what route or what method was employed, the result was inevitably the same—a mortality so high as to make its employment almost suicidal.

To illustrate the status of prostatic surgery, even twenty-five years ago, I might quote from a lecture delivered to his students in the latter part of 1888, by Sir Henry Thompson, at that time the most illustrious genito-urinary surgeon in England. After describing in detail the then most approved plan of treating the enlarged prostate, he says in part: "I now proceed to say a few words relative to a question which I think

must have already arisen in the mind of some of you, although I have not hitherto made any allusion to it. The inquiry is naturally suggested: Does not the enlarged prostate offer to the enterprising surgeon an opportunity for the skilful exercise of his art, for the purpose of removing some salient outgrowth, or of dividing some obstructing portion, and, by this means, of affording to the patient an improved or even an unobstructed outlet for the urine? I need hardly tell you that this very obvious suggestion has occurred to the minds of many surgeons; and that, too, in times long preceding our own. The obstructing portion of an enlarged prostate has been sometimes simply divided from above downwards, when, forming an eminence or barrier at the internal meatus—like a bank as it were, defining the boundary line between the urethra and the bladder—and it is by no means difficult to do this by using a blade which can be unsheathed when it arrives at the spot required. Such simple division was soon discovered to be useless; adhesions took place, and no benefit accrued from the operation, but often much distress to the patient. Then it became a natural and easy matter to carry down an instrument something like a lithotrite, and by means of a double blade to cut a V-shaped piece entirely out of the ridge. This was declared to be useful in a few instances; but a careful investigation of the cases, made several years ago by myself and others, has disproved the value of the proceeding, despite the occasional endeavors by some later advocates, who, not being fully informed of the history of the past, have endeavored to revive or make fresh claims for the practice. But I observe that quite recently Guyon, of Paris, has given an authoritative decision relating to the proceeding. He is on the spot, has examined patients thus operated on by Mercier and others, and states without hesitation that the results give no encouragement to repeat this mode of treatment. More lately, too, the same sections of the prostate have been made by means of the electric cautery—a safer way, no doubt, of effecting the object than by the knife, if such operations are to be done at all.

“Then there is another proceeding which one hears of, which takes a less definite form than those just alluded to. Now and then it is reported that during a lateral operation for stone, when the prostate or growth therefrom has been found in the way, the operator has dealt with it, either by chance or by design, removing perhaps a portion as large as a filbert or more. I have heard it stated, somewhat vaguely perhaps, that the patient, who has been frequently much troubled with retained urine, has, on recovery from the operation, regained a natural, or nearly natural, control over his bladder. I once, at least, saw the late Sir William Fergusson thus remove a rather large mass. What is more to the point, I have on four occasions myself removed considerable portions

of the prostate (twice without intention—when a large outgrowth has been evidently caught with the stone between the blades of the forceps, and so detached in the act of removing it). But I have had the good fortune to operate for stone by the lateral operation on two patients who had been accustomed to pass for a year or more all urine by catheter, on account of advanced prostatic obstruction, and have in each case been able to remove, with the express intention of improving or restoring the function if possible, a considerable portion of prostate—in one of them a complete median portion salient at the neck. These cases were to me occasions of extreme interest, as I keenly watched the results in the sanguine hope that I might find substantial improvement from what I had done. Three of the four cases lived afterward to test the value of the experiment, and it was not without disappointment that I found no difference whatever in their condition in regard of retaining power as compared with what it had previously been. My experience, then, does not support the theory. It has not been so fortunate as that which I have heard occasionally alleged, in general terms it is true, by some persons. General terms, however, mostly denote inaccurate observation or looseness of statement, and I think I am entitled to require that if it does happen, or has happened, to any surgeon to divide or remove any part of an enlarged prostate for a patient who had previously been compelled to pass all his urine by catheter, say for a period of twelve months, and that after the division in question he was enabled to dispense with the instrument, or at any rate to pass, say only half his urine by natural effort, the case ought to be seen and examined by others. I desire extremely to see such a result from any of the proceedings alluded to. I have long wished to see this sight, and have travelled considerable distances abroad and elsewhere expressly seeking it, but at present without success. Such is my report concerning the matter.

“And I am bound further to add that the restoration of the function by such means can scarcely be expected to occur; and for this reason: when it has been necessary to practise habitual catheterization for retention from enlarged prostate during a period of one or two years, the coats of the bladder lose their power and are incapable, I believe, of regaining it in almost any case after that lapse of time, and would fail to expel their contents, even supposing the obstruction to be entirely removed. There is good ground for concluding that no operation would restore a *status quo* on account of our inability to restore the expelling function to a bladder which has long ceased to exercise it.

“It has been recently proposed to open the bladder above the pubes for the purpose of removing salient portions of the prostate in some cases; and what I have just said in reference to advanced cases holds

good equally in relation to this proceeding. No benefit can result to such. In an early stage some relief may perhaps be afforded by carefully removing an obstructing portion; but I suppose few persons, whether surgeon or patient, would be strongly disposed to sanction a suprapubic operation at the commencement of prostatic troubles on the chance of removing a small growth there—especially as there would be no guarantee that the process of enlargement might not, at that stage, continue its activity for some time. Still, if any operative aid is to be given of this kind, it will probably be more effective by way of the suprapubic route than by operation on the prostate through the urethra, or by perineal incision.”

How marvelous has been the change wrought by the few intervening years since Sir Henry Thompson expressed the foregoing opinion.

In a lecture delivered some two or three months subsequently to the one from which the above extract is taken, Sir Henry describes his own method for the surgical treatment of the prostate. After commenting on the futility of simply removing some isolated outgrowths of prostatic tissue which may be projecting into the bladder, he says that in his opinion the only efficient method of securing comfort to the patient is the establishment of a permanent urinary fistula above the pubes. This he accomplished by making a suprapubic incision through which he introduced a silk gum tube, surrounded by a silver plate, which was fastened tightly to the abdominal wall. This tube could be daily removed, cleansed and easily reinserted. Immediately on its arrival in the bladder, all the urine is drained through this tube into a rubber receptacle conveniently placed. So well pleased was the profession in general with the results obtained by this method of treatment, that it was for a time extensively practised, and the surgeons of the continent looked forward, with more hope than at any former period in their professional experience, to the effectual relieving of a class of cases by no means uncommon, but hitherto producing more suffering at a later period in their history than any other—cases of malignant disease alone excepted.

Although from time immemorial the symptoms of prostatic enlargement have been known, yet it is only within the space of the last decade that the operative surgery of the gland has acquired a place at all worthy of its magnitude and importance. The wonder is that an organ, so liable to such important pathological changes, and so prone to produce such suffering and misery in the afternoon and evening of life, should have received so little attention for so many decades, and yet such is the fact.

From the commencement of the sixteenth century—the time when the gland was first discovered—nearly four centuries elapsed before



any surgical procedure worthy the name was accepted by the profession at large. It was only at the commencement of this present century that the surgical relief for prostatic hypertrophy was described and carried out in such a manner as to leave no possibility of a doubt but that the time had arrived when the gland could be safely removed. By a singular coincidence, two papers (both epoch-making articles) appeared almost simultaneously in the year 1901; Freyer, of London, describing the suprapubic route for total enucleation, and Proust, of Paris, the perineal. These are two operations which, with few modifications, are to-day the accepted methods of relief from the evils following in the wake of enlargement of the prostate.

In the London *Lancet*, of February 4th, 1888, McGill first brought prominently before the profession his operation for the removal of any obstruction to the free flow of urine, due to any enlargement of the prostatic gland. This consisted mainly in opening the bladder suprapubically and removing any portion or portions of hypertrophied glandular tissue which may be projecting into the viscus. This article was well received, and, for a time, the operation was practised extensively; but in those early days the mortality was exceedingly high, and this, combined with the only transient relief obtained, soon caused the operation to fall into disrepute, and for a time it became practically obsolete. The cause of these early failures was to be found in the fact that at best only a small portion of the obstructing gland was removed—that projecting into the bladder; whereas, it has now been demonstrated beyond all question, that only after complete and entire enucleation of the enlarged lobe, or lobes, as the case may be, will there be that radical and permanent cure so devoutly to be wished. The failure of McGill's operation to procure the desired relief, caused Van Dittel, in 1890, to suggest and practise an incision through the perineum. By this method he dissected the rectum free from the prostate, and then removed a wedge-shaped portion from each lobe, thus relieving the pressure on the urethra. His procedure also speedily fell into abandonment, owing to the incomplete relief obtained, and the presence of a permanent fistula in nearly all his cases.

Nicoll next conceived the idea of combining these two operations. After making the perineal opening and dissecting the rectum free from the prostate, he performed suprapubic cystotomy with the idea of introducing the fingers into the bladder and pushing the prostate well down into the perineal wound, thus enabling the operator to remove a much larger portion of the offending organ than he otherwise could accomplish.

To Goodfellow, however, belongs the credit of being the first surgeon to advise the passage of a sound, and then make a perineal median

incision directly onto it through the prostatic urethra. This incision he carried downward to the neck of the bladder, as in an ordinary perineal cystotomy. He discarded the suprapubic opening altogether. Through the wound just made he inserted his finger and shelled the prostate out of its sheath. This, of course, necessitated the destruction of both the prostatic urethra and ejaculatory ducts.

The first practical and scientific advocacy of the perineal route was described in the October issue of the *Presse Medicale*, in 1901, by Proust, of Paris, and during the four or five succeeding years was extensively practised, especially by American surgeons. In this operation a special retractor is used for the purpose of bringing—or rather pushing—forward the prostate into the wound, thus greatly simplifying the operation. This instrument is L-shaped, with its respective arms about six and two inches in length. At the end of the small arm are two small reversible flanges. After the prostatic urethra has been opened and the staff withdrawn, the short arm of this instrument is introduced through the opening in the urethra, the arms opened and fixed and then by exerting pressure downwards the prostate is brought more fully into view. No attempt whatever is made to save the ejaculatory ducts, though the damage to the urethra may not be so very great.

In Young's modification of this operation, he introduces his retractor, a perfectly straight instrument with folding arms at one end, in the same manner, through the same opening in the urethra, and after opening the arms behind the lobes, pulls the gland directly forward within easy reach. He also makes a definite attempt to save the ejaculatory ducts by making an incision on either side of the median line of the prostate, for the full length of the organ, thus leaving behind a central bridge of glandular tissue containing the ducts. In this manner he claims to leave the ducts and urethra intact. So much for the evolution of the perineal route.

On December 1st, 1900, Freyer, of London, performed his first total enucleation of the enlarged prostate through a suprapubic opening, and on July 20, following, described his method in detail in the *British Medical Journal*, reporting four successful cases. The appearance of Freyer's paper, and the excellent results claimed therein, precipitated a wide-spread discussion on the possibility of such a procedure. Many surgeons, eminent men on both sides of the Atlantic, claimed that this operation was not only surgically, but even anatomically, impossible; and at the same time, as is usually the case under such conditions, several men claiming priority appeared in several parts of the country. As, however, none of their cases had been reported, to Freyer—and to Freyer alone—must belong the credit of devising a procedure of almost unparalleled value to suffering humanity to-day.

In an attempt to prove the anatomical impossibility of the operation advised by Freyer, and that it is nothing more or less than the enucleation of large adenomatous masses from the substance of the gland, Wallace, one of the severest of his critics, says: "The more rapidly growing areas (of the diseased prostate) increase at the expense of the more slowly growing ones, which are compressed and stretched over the surface of their quickly growing neighbors. By this process a capsule is formed, ill-defined at first, but later becoming more distinct. The elements forming this capsule show in process of time a lamellar disposition. The adenomatous mass can now be easily enucleated, and not only presents a smooth surface, but also leaves behind a smooth cavity."

Wallace's opinion was based mainly on the fact that because in one or two instances he had removed an hypertrophied prostate, post mortem, by the method described by Freyer, and in the remaining capsule had discovered some shreds of prostatic tissue; that, therefore, his conclusions must be correct. On the other hand, the operation has been done on many occasions, post mortem, when it was utterly impossible to discover even the faintest trace of any prostatic tissue in the remaining capsule, which would tend strongly to prove the contention of the originator, that the operation is in reality a complete and total prostatectomy. But when all is said and done, what difference does it really make whether any prostatic shreds are left behind or not, so long as the patient experiences complete relief from the condition from which he has been suffering? The treatment, therefore, of hypertrophy of the prostate divides itself sharply into two distinct classes, the non-surgical for those cases which either refuse operation or for some definite reason are distinctly inoperable; and those where surgical interference offers excellent prospects for ultimate and complete recovery.

*Non-surgical Treatment.* The non-surgical treatment of prostatic hypertrophy is exceptionally important, and mainly from the fact that the large majority of such patients never come to operation. It is usually not until some such complication as acute urinary retention or cystitis develops that the patient will consent to more radical treatment than the ordinary palliative measures to which he has already become accustomed.

Of the various diseases to which man is liable none appears to give greater concern to the physician, and none more genuine suffering and anxiety to the patient, than the sequelæ of prostatic hypertrophy. Whether a given case should be treated medically or surgically is frequently a vexed question, and the not unusual result is palliative temporization until such time as the complications have become so severe as to make operation extremely hazardous. Palliative treatment by means of regu-

lar catheterization may succeed for a time. It usually does. It raises the false hopes of the patient, it leads him to believe that at last he has found a panacea for all his sufferings; but as the growth continues and the obstruction increases, the continued use of the catheter, by introducing fresh dangers, is soon productive of cystitis—usually infective—and the patient passes from bad to worse. If the physician or patient could from the beginning foresee the ultimate result in the continued and systematic use of the catheter, this instrument would not be used beyond the time when it becomes necessary to use it habitually.

Catheter life never proceeds smoothly for any considerable length of time. Early dangers are frequently encountered in the form of rigors, of sepsis, or of acute retention. Even should these early dangers be successfully avoided, serious complications always occur sooner or later, and in many instances may be directly traced to the method of treatment used.

All prostaties require rigid general treatment, and this line of therapeutics is deserving of more consideration than it usually receives. If on many occasions the presence of some acute complication can be directly traced to some form of catheterization, it can also be said with equal sincerity that many times the presence of acute cystitis or acute retention is resultant upon some act of indiscretion or carelessness, which under careful constitutional treatment might have been avoided. The general or constitutional treatment of prostaties may be conveniently divided into three classes—hygiene, diet, and drugs.

*Hygiene.* The hygienic treatment consists largely in avoidance of cold and exposure, by seeking a suitable latitude and by wearing suitable clothing. Not many prostaties are able to afford the luxury of a change of climate, but for those who can, this northern climate should be abandoned for the fall and winter months and residence taken up in a southern zone. During the cold weather flannel should always be worn next the skin to avoid the result of draughts. The habitual bath will sometimes work wonders in the prevention of acute complications. In a well-heated and carefully ventilated bathroom, the patient should regularly enjoy a warm bath. This will cause him to perspire freely, and thus, by the excretory action of the skin, he will get rid of waste products which would otherwise remain in the system.

The irritability at the neck of the bladder may be frequently relieved by hot hip baths just before getting into bed. The immersion should last but a short time, not more than two or three minutes at the most. Straining at stool favors pelvic congestion, and in order to avoid this, saline purges should be a matter of routine, at least once a fortnight, even when the bowels are moving quite normally. Moderate exercise is exceedingly beneficial in that it is of assistance in maintain-

ing the general health of the patient by keeping the liver and bowels in good order.

The bladder should be regularly emptied every three or four hours during the day, and its complete evacuation should be a routine procedure each night, the last thing before retiring. For he who must urinate once or more during the night, it is safer to use a urinal in bed, as getting out exposes him to cold and draughts.

*Diet.* Kidney complications are a frequent accompaniment of prostatic disease, and consequently the question of food becomes of particular interest. Meat may be eaten in moderation, and vegetables of all kinds are not only permissible, but prove a highly satisfactory diet. Cereals of all kinds may be partaken of liberally. Fluids should be taken in abundance, especially water. Alcoholic beverages should be studiously avoided. Dinner should always be the mid-day meal, and no food should be partaken of late at night or before retiring. Great care should be exercised by the patient to eat only that food which thoroughly agrees with him, and by being observant he may regulate his diet with admirable benefit to himself.

*Drugs.* No drug has as yet been discovered which has the slightest influence in controlling the rate of growth of the enlarging prostate, but some are of undoubted value in maintaining the tone of the bladder walls. When the bladder begins to distend from loss of tone, nux vomica is probably our most useful agent in maintaining this tone. Other drugs are probably useless. As a good general tonic the tincture of nux vomica with the fluid extract or the infusion of gentian will prove of great value. For the urine, on the other hand, many drugs will be found extremely useful. The urine may be diluted or concentrated by either increasing or decreasing the amount of fluid taken. Irritability of the bladder, due to excessive acidity of the urine, may thus be controlled by increasing the quantity of fluid taken in the twenty-four hours. This will produce simple dilution. In some instances a few doses of calomel will produce the desired effect. If these fail it may be controlled by the administration of alkalies, such as lithia or citrate of potash. Alkalies, however, should never become a routine in the treatment of bladder irritability, but should only be used when other means fail.

Urinary alkalinity, frequently dependent upon the decomposition of urea in the bladder or the pelvis of the kidney, is usually responsible for the formation of incrustations. Hence the presence of stone is usually co-existent with alkaline urine. Alkalinity as a general rule is dependent upon some disorder of metabolism, and consequently can best be treated by treating the original cause. The drugs best suited for increasing the acidity of the urine are the acid phosphate of soda, ben-

zoate of ammonia in ten-grain capsules three times a day, or boracic acid in doses of from seven to ten grains three times a day. Mineral acids have no direct effect in decreasing alkalinity. If alkaline urine, on the other hand, is the direct result of ammoniacal decomposition, as occasionally happens, it is best controlled by the administration of urotropin in six to ten-grain doses every four hours. Salol is also in many cases exceedingly efficacious.

In treating congestion of the mucous membrane around the neck of the bladder, copaiba and cubebs will usually give the best results, while sandal wood and eucalyptus oil are sometimes of very great value.

The *local treatment* of the effects of enlargement of the prostate consists mainly in the judicious use of the catheter. Catheterization will in no instance cure a patient, but in many it will make life much more comfortable, and where for some such definite reason as chronic nephritis, operation is contra-indicated, it must become the routine treatment in every instance.

Catheter life, or the systematic use of the catheter, commences very frequently with an attack of complete retention. This will bring forcibly to the mind of the patient the necessity of completely emptying the bladder at stated intervals, and recall to his remembrance the fact that probably for some considerable period of time he has been rising two or three times every night to evacuate the bladder. Where a patient habitually rises more than once every night, and where more than two ounces of urine remain in the bladder after micturition, catheter life should commence at once.

The catheter best adapted to the routine use of the patient is the softest one which can be introduced. The red rubber one will be found the softest and the most easy to keep aseptic. The eye should be moulded in the catheter and not cut afterward, as by so doing it is more liable to be roughened, and the tip beyond the eye should be rounded and full to prevent the collection of dirt. The catheter should be at least fourteen inches in length, and should be equally smooth and polished inside and out—the latter to prevent any friction, and the former to prevent the absorption of any urine by the fabric. Were it not perfectly smooth inside, collections would of necessity accumulate on the roughened surface and be a breeding bed for infection. If the soft rubber instrument cannot be passed, it may become necessary to use a gum elastic one, and if in turn this is impossible, the prostatic metal catheter may have to be relied on. Whatever catheter may be used, it is well to have the calibre as large, or almost as large, as that of the urethra, to prevent it becoming obstructed in any false passage.

The passing of a catheter is always fraught with danger, and consequently every caution must be exercised to prevent trouble. The hands,

the prepuce, the glans, and the meatus must be thoroughly washed with soap and water, and finally a solution of one in five thousand bichloride of mercury should be used. In many cases it is also well to syringe out the urethra with a solution of boracic acid.

The sterilization of the catheter is all-important. Soft rubber ones may be prepared by boiling, provided they are not placed in the water until after it is brought to the boiling point. Repeated boilings of this nature will not injure them; whereas, if they are put in the water before the boiling point is reached, they will rapidly deteriorate. Metal catheters should always be prepared by boiling. Gum elastic instruments, on the other hand, are very unreliable, because of the difficulty in securing complete asepticity. They cannot be boiled without effecting their destruction in a short time, and their immersion in any disinfectant solution of sufficient strength to render them aseptic will, by roughening the surface, very rapidly render them useless. The catheter should always be cleansed and rendered aseptic immediately after its being used, as this will greatly facilitate its sterilization the next time it is required. The habit of putting a catheter away just as it is withdrawn—with blood clot or perhaps some particles of pus on its surface—is very pernicious indeed, and to a very great extent mitigates against its perfect sterilization the next time it is required. When the care of the catheter is left to the patient himself this routine is very difficult to carry out, as it is hard to make him understand the necessity of the two cleanings.

The employment of the catheter, though absolutely necessary, has many disadvantages. Some of these dangers, such as sepsis, inflammation or rigors, are introduced by the instrument; while others, such as the loss of the expulsive power of the bladder, is directly due to the mechanical emptying thus obtained.

The lubricant which I have been in the habit of using is carbolic acid in olive oil, sterilized by boiling. This may be used in the strength of one in twenty, and for all purposes will give the best of satisfaction. I have also found that there is less danger of infection if the lubricant is forced directly into the urethra by a syringe, rather than spreading it over the catheter. Various other lubricants are suggested by various surgeons, but I venture to say none will give such all-round general satisfaction as the one just mentioned.

The passing of the catheter itself is always an important operation. The hands must be scrupulously clean, and the glans penis and the foreskin must also be in like manner sterile. A soft rubber catheter should always be used where possible, and this failing, a gum-elastic one with or without a stylet. All recent cases should be easily overcome with one or other of these instruments, but where the inflammatory

action has been long-standing, and a semi-sclerosed condition exists, considerable force may become necessary to pass the obstruction—in which case a metal catheter will be necessary.

It must never be forgotten that whenever a metal catheter is used there is very grave danger of producing a false passage. To do this may require no more force than to pass the obstruction when the urethral canal is strictly followed. The obvious lesson is to use, and to use exclusively, a non-metallic instrument, even if one must persist for a very considerable length of time before he succeeds in passing it. The metallic catheter is justifiable only after conscientious and persistent efforts in the use of all others have failed.

*Prostatic Complications.* The treatment of the many complications following in the wake of enlargement of the prostate gland is most effectually accomplished in their prevention; and in very many instances this is possible for a time at least, by the exercise of ordinary care and judgment. In marked hypertrophy, however, things do not run smoothly for long. One or other of the various complications is inevitable, and may be caused by either the obstruction itself, or by the method of treatment employed.

The sequelæ producing the greatest amount of trouble may be enumerated as follows:

- (1) Cystitis
- (2) Urinary retention.
- (3) Vesical atony.
- (4) Irritability of the bladder.
- (5) Calculus.
- (6) Hæmaturia.
- (7) Renal complications.

*Cystitis.* Since in almost every instance cystitis is the direct result of contamination from without being introduced into the bladder through the medium of instrumentation, it can in nearly every instance, by judicious care, be prevented for months or even years. The great importance of thorough asepticity in passing a catheter cannot be too strongly emphasized, and the instrument should be introduced no oftener than is absolutely necessary. Cystitis cannot be prevented, but it can be indefinitely postponed by rigid adherence to these principles. Frequent urinalyses should be made, and alkalinity or over-acidity sedulously guarded against. In this connection the diet and drugs prescribed should be selected to prevent vesical irritability or congestion of the mucous membrane of the bladder.

When cystitis has once developed, be it mild or acute, the surgeon is face to face with the most formidable complication resulting from the presence of an enlarged prostatic gland. This is the one condition



producing practically all the suffering of the prostatic's life, and in every case treated by catheter it is certain to appear sooner or later. It does not always confine itself to the mucous membrane of the bladder, but in many instances involves the ureters and even the kidneys.

The virulency of an attack and the persistency with which it remains depend to a very great extent upon the character of the infection and the ability of the bladder to throw it off. In the absence of sacculations in the bladder wall, and in the absence of residual urine, there is less likely to be a nidus wherein the infective germs may thrive and thus the attack is likely to be of shorter duration.

Where the urine is acid the bacillus coli is the most common cause of the cystitis, while in the presence of alkaline urine the infecting germ is frequently a staphylococcus. The colon bacillus may also be present, and when so, the combination produces a doubly virulent condition.

Cystitis in the presence of acid urine is a mild condition in comparison to that produced in the presence of alkaline urine. In the former, systematic treatment will very frequently rid the patient of all traces of it, while in the latter the complication is very grave indeed. The very means taken to rid the patient of his intense suffering—bladder irrigations, etc.—appear to add fuel to the fire, and in at least a fair proportion of the cases, septic pyelitis and acute interstitial nephritis follow.

The treatment of cystitis is both local and constitutional. The local consists in the administration of drugs, in bladder irrigations, and, where necessary, in the drainage of the bladder.

*Drugs.* Medication has not proven of great value in cystitis, though occasionally some benefit may be derived. When the urine is acid, urotropin will be of the greatest value; while in the presence of alkaline urine, the acid phosphate of soda with salol has given the best results. These are practically the only drugs which will have any direct effect on the urine. What is even of greater import than the direct treatment of the urine, is the general condition of the patient. Sedatives will be required in every instance, and there is only one drug which can be relied upon in this respect—opium. Sulphonal, trional and veronal will sometimes produce sleep for a time, while the same may be said of chloral and the bromides; but none of these will relieve strangury, nor will they save the patient's strength. In all cases where the kidneys will permit of it, opium in some form or other should be used. It may be given by the mouth or per rectum. In cases where the strangury is severe, morphine should be administered hypodermically.

*Bladder Irrigations.* When medication fails, and when there is much pus or blood present, the bladder should be regularly washed out. It is not necessary in most instances to use any drugs in the fluid with which the bladder is irrigated, normal saline solution acting as well as

any; but in some cases where the infection is unusually severe, drugs may be of great benefit. Boracic acid (five grains to the ounce) will often prove valuable, while permanganate of potassium in the strength of 1 in 4000, is also very useful. In no case of acute cystitis should nitrate of silver be used, but when a case becomes chronic it will frequently clear it up more quickly than anything else. It should be commenced in the strength of one-half grain to the ounce, and gradually increased until five grains to the ounce are being used. When this drug is employed, it is best to thoroughly wash out the bladder with a boric acid solution first, then throw in an ounce or two of the silver nitrate solution, which is left for a few minutes, then allowed to drain away from the catheter. Nitrate of silver in the treatment of chronic cystitis is to-day the sheet anchor.

The principals on which to carry out local irrigations are manifest. As long as the bladder continues to completely empty itself, all septic organisms are carried away and the appearance of cystitis is unlikely. As soon, however, as a post prostatic pouch is formed, and residual urine remains in the bladder, it becomes infected by these organisms, introduced by the catheter or otherwise, and consequently leaves a septic focus which on urination is not entirely cleared away. It is to effectually clear the bladder of this nidus of infection, to prevent the growth of the septic organisms, and to free the mucus membrane of the irritation thus produced, that irrigations are employed.

The solution employed should always be as nearly as possible of the same temperature as that of the body, and the best results will be obtained by having the patient in the supine position. If necessary, as in cases of a very large post prostatic pouch which is very difficult to empty, the pelvis may with advantage be raised several inches.

The most simple and effectual apparatus for carrying out irrigation is a glass funnel, to which is attached a long piece of rubber tubing, which in turn is attached to a catheter. If a catheter with a side branch and stop-cock can be obtained, it will relieve one of the necessity of removing the rubber tubing each time the bladder is full. Hydrostatic pressure should always be used in preference to a syringe in bladder irrigations, and the height to which a funnel should be held above the pubes is only a few inches. This will require more time and greater patience, but it will prevent any force being used, and consequent irritation to an already inflamed mucus membrane.

After withdrawing the residual urine, the bladder is allowed to fill slowly then empty itself through the side branch on the catheter. After several repetitions, the fluid will return free from pus or mucus, when the irrigation should be discontinued. In none but the most offensive cases should this operation be carried out more than once in the twenty-four hours.

In cases of recent or mild cystitis this treatment will often suffice; but where the inflammation is very acute, or where the introduction of a catheter is very painful, or perhaps impossible, more than mere irrigations may be required. Drainage should be established at once. This may be done in three ways—tying a catheter in the urethra, perineal or suprapubic cystostomy.

To retain a catheter in the required position in the bladder is a very difficult undertaking. To ensure the best results the eye of the instrument should lie just inside the vesical cavity and drain the urine away drop by drop as it comes from the ureters. But even where the instrument does remain in perfect position this method of treatment is far from satisfactory. The mere presence of the catheter itself is liable to cause a severe inflammation of the urethral mucus membrane which is prone to spread to the epididymis, or even the veins of the prostatic plexus. This method will fail where from pressure from the enlarged prostate the orifice of the bladder is pushed upward; it will fail when the vesical walls have lost their tone so that they cannot contract evenly.

When once the prostate and the bladder have reached the condition which requires the continued presence of a catheter, a relapse is sure to occur as soon as it is removed, and consequently, for obvious reasons, it is better to do a cystostomy at once.

Two routes are available, the perineal and suprapubic. The perineal, once so popular, has of late fallen into disuse mainly from the fact that its employment does not afford an avenue through which the interior of the bladder can be explored. Through a suprapubic opening digital examination of the viscus is a very easy matter, and, if necessary, visual examination may readily be made. The size of the prostate is easily discernable, and the presence or absence of calculi observed; moreover the drainage is just as perfect as though the opening were made into the more dependent portion through the perineum.

An opening by dissection rather than by trocar and cannula is much to be preferred. In this way all danger of penetrating the peritoneal fold will be obviated, a calculus will not be overlooked, and the intravesical portion of the enlarged prostate can be readily examined. Furthermore, when the time comes for the removal of the gland another opening does not have to be made. (The technic of the cystostomy operation will presently be described fully, as this operation is the preliminary step in the radical cure.) The bladder having been opened and explored, a medium-sized rubber drainage tube is introduced, the cut edges of the bladder wall are drawn up and sutured to the skin around the tube in order to produce a permanent opening. This will also obliterate the pre-vesical space and prevent infection. Some through-and-through sutures of silk worm gut are now used to bring the wound together right up to

the tube and the operation is complete. The bladder is now irrigated daily, either through this tube or through a catheter introduced per urethram, when the fluid will wash out through the upper opening. On the third or fourth day the tube is removed and the irrigations continued, or not, according to the condition of the bladder.

When it is necessary for a fistula such as this to remain permanent, some contrivance must be used in which to collect the urine as it dribbles away from the bladder. The most convenient will be a soft rubber catheter passing just through the sinus opening, and held in place by a silver cap. From this catheter the urine is drained through a piece of rubber tubing into a rubber receptacle strapped to the leg.

*Urinary Retention.* In prostatic enlargement two forms of urinary retention (acute and chronic) are commonly met with, in fact, form one of the most common complications.

*Acute Retention.* It has been well said that in prostatitis this condition is quite as serious and demands as urgent attention as strangulated hernia. If the bladder for a long time has been contracted and lost its expansive power, it will not take a great deal of urine to cause great distress. This is the class of case in particular in which retention causes the most intolerable pain. The pain and intense suffering in this condition is probably as great as any to which the human flesh is heir. In the case of a contracted bladder, the danger of rupture is not as great as in the case of a dilated viscus from chronic retention, nevertheless it remains as an ever present menace. The great danger apart from the indescribable suffering endured, is the damming of the urine back onto the kidney, and the development of acute uraemia. Acute retention is usually the result of acute congestion of the veins at the vesical neck, and consequently no amount of hot poultices, of hot hip baths, or any of the so-called expectant treatment is likely to have the slightest effect.

Radical measures must be used at once. A soft rubber catheter should first be tried, and in the majority of cases—where there is no stricture and where no false passage exists—a little patience and perseverance will accomplish the desired result. This failing, the semi-flexible catheter moulded to the prostatic curve should be tried, and in the event of this also proving futile, a metal catheter may be introduced. I may say, however, that where the webbed semi-flexible catheter has failed, the metal one is not likely to succeed.

All attempts having failed to introduce a catheter, no time should be lost in either temporary tapping the bladder or doing a cystotomy for drainage. If the surroundings are at all suitable, a cystotomy should always be done, as it will require some time for the congestion to subside and thus make patent the natural channel; but where this is inconvenient or impossible, the bladder must be tapped by trocar and

cannula until suitable arrangements can be made to have the drainage established. If much time will be consumed in making such arrangements, it is better to leave the cannula in position rather than have to make several punctures.

Acute retention never occurs without leaving behind some serious result, and the longer it remains unrelieved the greater will be the disaster which follows. Atony almost invariably follows in its wake, and the condition passes from one of acute, to one of chronic retention. Hæmaturia is not an uncommon complication. As a result of the means employed to obtain relief, cystitis not infrequently is one of the various train of results following acute retention. Suppression and uraemia sometimes form the end result in this unfortunate class of case.

*Chronic Retention.* This condition is almost invariably caused by atony of the bladder walls, though occasionally it may be the result of the prostatic obstruction itself. The first may be tested by watching the force with which the bladder will empty itself through a catheter. If the urine drops perpendicularly down from the end of the instrument, atony may be assumed as the direct cause; while if the stream is expelled with considerable force, the cause may be looked for in an obstruction from the prostate itself. If atony is present, a catheter should be tied in the urethra for two or three weeks, and by thus keeping the bladder empty the tone of the wall may be recovered. If the chronic retention is caused by the prostatic obstruction, it is obvious that the obstruction must be removed.

*Vesical Atony.* Atony of the bladder walls, it will thus be seen, is a very serious condition indeed. In extreme cases it cannot be completely remedied even by the subsidence of the congestion around the vesical neck, nor yet by the removal of the prostate. In almost all cases, however, it can be greatly improved by habitual catheterization. The bladder should always be kept from becoming at all distended, and to accomplish this a catheter should be passed regularly and the last drop of urine drained away. By thus preventing distention, the tone of the bladder walls will, in the majority of cases, improve to a very great extent.

*Irritability of the Bladder.* Irritability cannot, in the true sense of the term, be considered a complication, but rather a symptom of prostatic hypertrophy. It may also indicate the presence of cystitis, of a calculus, or even of malignant disease. It may, however, in some cases, from its mere persistence and extreme annoyance be considered a complication. In the absence of cystitis or a calculus, this extreme irritability is usually caused by either the very rapid growth of the prostate or simple congestion. If no prostatic enlargement is present, this irritability soon yields to treatment. Confinement to bed, hot hip

baths, the bowels kept well opened, a bland diet and the administration of alkalies, will, as a rule, rapidly clear up the trouble. Where, however, any considerable degree of enlargement is present, these remedies will not suffice—something more radical is required. Twenty drops of a one or two per cent. solution of nitrate of silver passed into the neck of the bladder immediately the urine is drawn off, I find to give the best result. A one per cent. solution of protargol used in the same way sometimes answers equally well.

*Calculus.* Calculus is an exceedingly common complication in prostatic cases, some observers stating that stone will be found in one case in every five. This is the result of the presence in the bladder of a collection of stagnant urine in the post prostatic pouch, and consequently cannot be reached by a sound. They do not produce the ordinary symptoms because the stone never comes into contact with the neck of the bladder. The possible and even probable presence of stone in many cases of great irritability is a strong argument in favor of suprapubic cystotomy for drainage in these cases; as, by this method, the stone is easily searched for and removed.

*Haematuria.* On account of the chronic state of congestion around the neck of the bladder, haematuria is fairly common in prostatic cases from the irritation produced from the passage of a catheter. If the presence of blood is due to this cause, it usually comes away after the withdrawal of the instrument, while if due to the rupture of one of the varicose veins in the mucus membrane, it is more likely to be mixed with the urine. Retention of urine by producing great distention of the bladder and thus causing rupture of some of the numerous varicose veins, is a frequent cause of hemorrhage.

In but very few cases is any treatment required. The blood will come away with the urine, and where clots have formed they will usually break down and come away in the same manner. Occasionally, however, a hemorrhage is very severe, when even the bladder may become distended with blood. In these cases large clots are liable to form, and the viscus can be felt as a hard lump above the pubes. When this is the case, a suprapubic cystotomy should be done at once, the bladder cleared and thoroughly irrigated with normal saline or saturated boracic acid solution at 110 degrees F. to check all bleeding. If much pain is present, opium may be given.

*Renal Complications.* Surgical kidney, nephritis or uraemia are some of the most serious of all the complications liable to be met with in prostatic disease. They are usually the result of back pressure on the kidney, and all care must be exercised to prevent this as far as possible. Regular catheterization is usually sufficient, though sometimes it may become necessary to fasten a catheter in the urethra to secure persistent

drainage. Where again, this is not feasible, permanent drainage must be secured through either the perineum or above the pubes by establishing an artificial channel. Permanent drainage when well secured is usually a sufficient guarantee against uraemia.

*Indications for Radical Operation.* When palliative treatment ceases to improve the condition of the patient, then, if his general health warrants it, radical operation is urgently indicated. This will be in the case of decided prostatic enlargement in a person of probably advanced years, where the symptoms are so urgent as to require the passage of a catheter habitually to evacuate the bladder of its residual urine. In recommending operation, however, one must take carefully into consideration the nature of the growth, to ascertain if it is capable of being completely enucleated, and above all, that there is nothing to contra-indicate operation—such as acute cystitis or acute or chronic nephritis. In practically every such case it will be found that a catheter has been long in use, probably for some years, and that the main indication for operation is the supervention of one of the complications so certain to appear at some period in the life of almost every prostatic. The most constant complication demanding operative interference is usually to be found either in a persistent cystitis, or great difficulty (or even the impossibility) of passing a catheter.

I am yearly becoming more firmly of the opinion that in the case of an otherwise healthy man, whose necessity for using the catheter is very frequent, that the supervention of serious complications should not be waited for, but should be anticipated, and the prostate removed at this time, when the mortality rate is so low as to be almost nil. Serious complications are certain to occur sooner or later, and if time is taken by the forelock, many valuable lives are thus certain to be saved.

There is one more danger, and that an exceedingly serious one, in delay; one which should weigh heavily in favor of early operation in all cases where a catheter must be used habitually. In this, I have reference to the ever present danger of the development of carcinoma from the constant irritation of the passing catheter.

In a progressive case of prostatic hypertrophy, any treatment other than radical invariably ends in disaster. At first the patient may be greatly encouraged by the results of catheterization, but as the growth becomes larger and causes greater obstruction, and contamination is introduced from time to time by an unclean catheter, the condition of the patient grows from bad to worse, until finally the clinical picture is dismal in the extreme. In the majority of cases which give any serious trouble at all, palliative treatment is only procrastination.

There are few diseases which cause more misery and suffering amongst men in the afternoon and evening of life than chronic hyper-

trophy of the prostate; and he who is the victim of this deplorable condition must indeed look forward into a dismal future, unless relieved by the surgical measures within our reach to-day. "Catheter life" should be a condition of the past, except in those cases where for some definite reason operation is contra-indicated, as we all know the utter futility of attempting to cure a condition such as this by any means other than its removal.

The diagnosis of enlarged prostate is not a difficult matter, and having been made, no time should be lost in securing for the patient that complete relief which surgery alone can give. In advising operation, one must not lose sight of the fact that it is a serious one; that it involves a considerable risk, but not more so than many other operations which are being daily advised and performed. If we realize our responsibility in advising this operation, we must do so to an even greater extent if we do not advise it, for to temporize with an enlarging prostate which had already commenced to give trouble, is only to invite certain disaster. It has been truly said that deaths occurring after prostate operations "ought to be attributed to want of operation at the proper time, rather than to the operation done as a last desperate chance to save a dying man."

*Indications for Operation.* In all cases where palliative treatment has been given a fair trial, and yet failed to produce results, radical treatment in the form of total enucleation of the gland is urgently indicated—provided always that the growth is of such a nature that it can be removed, and there is nothing in the general health or age of the patient to contra-indicate this procedure. The immediate cause of reference to the surgeon in the majority of cases is usually one of acute complications—difficulty in passing a catheter, recurring or chronic cystitis, calculus, acute retention or persistent hemorrhage. When a patient once becoming the victim of regular catheterization, could only foresee the baneful results of such practice long continued, he would have no hesitation in submitting to the radical operation before any of the above baneful complications ensue, and at a time when the mortality is so low as to bring the operation within the realm of almost perfect safety. The danger in prostatectomy is increased in proportion to the amount of secondary troubles which have already ensued. When undertaken at a period before the advent of any complication, the mortality should be almost nil.

*Choice Of Route.* A considerable difference of opinion has existed as to the best route through which to attack this offending organ. The perineal and suprapubic routes both have their staunch supporters, and each has some advantages over the other. The operation which I find to give the best permanent results, and that which I am in the



habit of performing, is that devised by P. J. Freyer, surgeon to St. Peter's Hospital for Stone and Other Urinary Diseases, London, Eng. It is a suprapubic operation.

Now, why do I favour the suprapubic rather than the perineal route? Because a complete enucleation, if done early, means a complete cure. The power of retaining and voiding urine in the natural manner is restored. The wound speedily granulates, leaving no urinary fistula. There is no return of the symptoms, and, furthermore, since the ejaculatory ducts are left intact, there is no diminution of sexual power. This latter is indeed a very strong reason in favour of this route, because so many cases presenting themselves are not far beyond the age of fifty.

Can so much be said for the perineal route? I think not. In the first place, perineal prostatectomy is not a total enucleation, but a partial extirpation of each lobe. If total enucleation is accomplished, it must only be at the expense of the ejaculatory ducts—a very serious drawback indeed. If the ducts are left intact, it can be only after leaving a small portion of each lobe, a condition to be avoided if at all possible for many reasons. Primarily, the presence of any remaining glandular tissue favours the return of the former symptoms. In at least some cases where a portion of the gland is left to protect the ejaculatory ducts, even this portion may cause enough compression on the urethra to prevent the bladder completely emptying itself, hence we have the first retrogressive step toward old conditions—residual urine. This, of course, occurs in only a small percentage of cases, but it does occur.

The most serious drawback and gravest danger in leaving behind any portion of prostatic tissue, is that it is conducive to the ultimate development of cancer. That this is a very real danger indeed we knew, because in a large percentage of cases of prostatic cancer, the malignancy is grafted onto an adenomatosely enlarged organ. Some observers calculate the percentage of adenomata of the prostate degenerating into cancer as high as ten per cent., and some even higher. Now, are we not as likely to have just as high a percentage of malignancy develop from a portion of the gland left behind as from the entire organ? By the perineal route the operator must decide this question: Shall I enucleate the gland in its entirety and thus run the chance of destroying sexual power, or shall I leave that portion protecting the ejaculatory ducts, thereby leaving a condition which in at least one case in ten, may, as life advances, degenerate into malignancy?

Then once again, by the perineal route it is a common thing for a temporary urinary fistula to remain, and in several instances I have known this condition to remain permanently.

No hard and fast rule can be laid down as to the manner in which a prostate must be removed. One operator chooses the suprapubic route; another, of just as great eminence and just as wide experience, prefers the route through the perineum, and each man appears to have equally satisfactory results. The fact is, that no man should employ one route to the complete exclusion of the other, for there are many cases in which the organ can be removed much more easily and with greater safety to the patient by the route other than the one usually employed by him. Though in my own practice, I prefer and invariably employ, whenever possible, the route over the pubes, yet in certain cases—such as a small adenoma presenting very little or no vesical prominence—I would employ the perineal route. Every surgeon should be thoroughly conversant with both methods, and use the one which appeals to him as presenting the greatest advantage in each particular case. A fairly good rule by which to be guided is to use the upper route in all cases where the vesical prominence is at all marked; the lower where the cystoscope shows little or no projection into the bladder.

*Preparatory Treatment.* The average patient presenting himself for prostatectomy is not a promising subject for any operation, due to the fact that, as a rule, his system is already undermined by cystitis and the various complications incident to the presence of residual urine, or the continued passing of a catheter which is not as aseptic as it ought to be. Furthermore, arteriosclerosis is very frequently present.

The first essential for success in this operation is careful preparation of the kidneys. This is particularly true in those cases where no catheter has been used. We have all seen the old man, decrepit and frail, with marked arteriosclerosis and foul bladder due to long usage of a catheter, successfully stand a difficult prostatectomy and be well. We have also seen the man of younger years, apparently strong, and with no cystitis because a catheter has never been used, gradually weaken and die within a fortnight after operation. Why is this the case? I will venture to say that in practically every instance death is of acute nephritis and suppression of urine. If the occurrence of acute nephritis can be carefully guarded against beforehand, one of the gravest dangers in the operation has been overcome.

In enlargement of the prostate, be it ever so little, there is always a certain amount of residual urine. As this enlargement increases so does the residual urine, until at last the back pressure from such becomes a definite factor in the function of the kidneys by preventing free passage of the urine through the ureter. Should this pressure be kept up constantly for some considerable period of time, and then be suddenly relieved by removal of the prostate, thus allowing the urine to pass unobstructed, the effect on the kidney may be such as to throw it into a

state of acute congestion, and even apoplexy of the kidney may occur. This will in many instances, especially where a chronic nephritis exists, result in acute nephritis and suppression. This applies particularly to those cases in which no catheter has been used. Practically all catheter cases will be free from the ill effects of back pressure.

To obviate this danger and render safer the operation about to be performed, some time may be necessary. It is well to commence by drawing off the urine per catheter every eight hours, gradually diminishing the time until at the end of a week it is withdrawn every two hours. A week will usually put the patient in good condition, though occasionally a longer time may be necessary.

Of course, in the case of a foul bladder, operation must not be undertaken until by the use of irrigations it is made perfectly clean and free from bacteria. Urotropin in ten grain doses will be found of much value in improving the condition of the urine.

Several consecutive twenty-four hour specimens should always be examined. The quantity and specific gravity are the most important factors. Albumin and blood in varying amounts are almost invariably present, but in the presence of other favorable conditions should not be considered contra-indications to operation. Of much more significance is the quantity and specific gravity. If the quantity is small, and specific gravity under 1010, operation should be delayed for several days until they are both increased by the forcing of fluids.

*Cystoscopy* does not add much to our knowledge in preparing a patient for operation. An enlarged prostate is usually diagnosed without difficulty, and its effects are self-evident. Moreover, the use of the cystoscope in these cases does occasionally produce acute retention.

Never remove a prostate in the stage of acute retention. If a catheter cannot be passed, suprapubic cystotomy should be done and the bladder allowed to regain its tone before attempting any more radical measure.

Some of the more important essentials for success may thus be enumerated:

1. Use wherever possible the suprapubic route.
2. Prevent as thoroughly as possible beforehand the advent of acute nephritis or uraemia, by avoiding the sudden relief of back pressure on the kidneys.
3. Secure high specific gravity and large quantity of urine before operating.
4. Never remove a prostate when the bladder is in a state of acute retention; neither when it is in a state of acute cystitis.

*Suprapubic Prostatectomy.* In the immediate preparation of a patient for operation, I always have the pubes shaved the night before,

and after thoroughly cleansing the skin right up to the umbilicus with green soap, have a sterile dressing placed over it until the following morning, when the parts are well painted with iodine. On the evening before is also given two ounces of castor oil or laxol, which in turn is followed in the morning by a high simple enema. No more attention is required until the patient is on the operating table and under the anaesthetic. If possible, a soft catheter is now passed into the bladder, and if not, a gum elastic or any one which can be passed. Through this the viscus is thoroughly washed out with a hot normal saline or boracic solution, and the irrigation continued until the solution returns clear. The bladder is now left full and the end of the catheter clamped to prevent the return of the fluid.

In all cases where the bladder can be made reasonably clean, it should be left full of fluid to ensure greater safety in opening it from above, as the peritoneal reflection is thus forced out of the way; but where there is strong probability of infection, I prefer to drain the bladder dry before opening, then by carefully dissecting back the peritoneal reflection, the viscus may be opened in perfect safety. By so doing any infection from the bladder will be prevented welling out through the fresh wound, and the prevesical space thus kept free, and a consequent more speedy convalescence is obtained.

The bladder having now been thoroughly cleansed, and the catheter left in position as a guide in commencing the enucleation, the dressings are removed from the suprapubic region and the whole again lightly painted with iodine. The surgeon now stands on the left of the patient, with his left hand gloved for intra-rectal manipulation, his right hand bare that the finger-nail may be used in the enucleation. The patient is now placed in the Trendelenburg position and the skin incision, commencing at the pubes and extending upwards in the median line at least three inches toward the umbilicus, is made. In very fat men this may have to be considerably longer. This incision is carried through the skin and superficial fat till the recti muscles are reached. These muscles are now separated with the handle of the scalpel till the prevesical space is opened. All bleeding points are stopped by forepressure, and the finger introduced into the lowest angle of the wound to catch the prevesical fat and push it upward off the bladder. This should be stripped up until the peritoneal reflection is reached, which in turn is pushed up out of danger, and the bladder immediately appears deep down in the wound. It will be easily recognized as a tense bulging of a bluish white colour. In a good light its glistening surface is seen to be covered with small veins, while larger ones may be easily recognized coursing underneath. Two large veins running downward from the viscal apex to the prostatic plexus may be readily recognized, and it is between these that

the bladder wall is opened after it has been picked up by a couple of pairs of toothed forceps. The scalpel blade is pushed boldly through the wall and the incision carried down to the symphysis pubis, then upward far enough to make the bladder opening about one and one-half inches in length, being careful to avoid the peritoneal fold. If more space is required the incision should be extended downward below the pubis symphysis.

As the fluid flows out freely, the two forefingers of the right hand are carried into the bladder, and a thorough exploration made. The internal end of the catheter is located, the internal orifice defined, and the thickness of the growth easily ascertained. It is now well to put a few sutures through the cut edges of the bladder wall to temporarily fasten it up to the recti muscles to prevent injury to the tissues in the prevesical space during the manipulations of removing the gland. I have found this precaution of much value in promoting rapid healing afterward.

The two forefingers of the gloved left hand are now carried into the rectum, and the prostate pushed upward, making its prominence in the bladder much more distinct. In this manner the growth is handled securely between the fingers of both hands. Its exact size and shape and attachments can now be readily made out, and the left hand holds it firm and prominent while the manipulations are being carried on by the other.

In order to get a clearer mental picture of the task before us, it may be well to briefly refresh our memories on the anatomical relation-ship of the gland. The prostate in its normal condition is composed of two lobes laterally situated on either side of the urethra. Each lobe is enveloped in its own sheath or true capsule. These capsules are united in front of, and behind, the urethra, by bridges of tissue, thus forming the anterior and posterior commissures. Along the posterior commissure, and at its upper extremity, the ejaculatory ducts pass, one lying on either side close to the inner border of the capsule, but not penetrating it, until they empty into the urethra. Each lobe moreover has its own gland ducts emptying into the urethra, so that it will readily be seen that the two parts of the prostate are entirely separate and distinct from each other.

Over the entire organ as thus constituted is another covering or capsule enveloping both lobes, and composed mainly of recto-vesical fascia. Thus we have two separate organs, each embedded in its own capsule, and the whole encased in a separate sheath or outer capsule. In this present operation this outer capsule is left, the inner lobes alone with their enveloping sheaths being shelled out.

In the normal prostate there is no middle lobe, the so-called middle

lobe being but an overgrowth from one or other, or both, the lateral lobes. In the hypertrophied organ one or both lobes will be bulging to a considerable extent into the bladder. McGill was the first to advise, and Freyer the first to make use of his suggestion, that no sharp instrument such as scissors or scalpel be used to sever this outer sheath, as it is very difficult to do so without also cutting through the true capsule. If the inner capsule is severed, the finger flounders around in the substance of the gland, which is accordingly removed piecemeal, and the ultimate results are far from satisfactory. With the finger-nail it is a comparatively easy matter to tear through the outer sheath, when a definite line of cleavage can be made out, and the finger having once definitely found this line, the greatest difficulty in the operation has been overcome.

One of two points may be chosen at which to commence the enucleation; either at the most prominent portion of each lobe, or at the urethra. This is a matter of choice which must be decided in each individual case. Having decided on the point at which to commence, and torn through the outer capsule with the finger-nail, the finger is gently insinuated between the inner and outer sheath; stripping downward and backward it then sweeps around latterly to the front, stripping the lobe out of its shell, as it were. During this process the two lobes usually become separated along the anterior commissure and the urethra is readily detected by the presence of the catheter. The ejaculatory ducts lying close to the capsule are left intact, the finger stripping the gland away, up to the point where they enter the urethra. The finger is now carried well down behind the inferior surface, and the gland stripped from the triangular ligament. The lobe is now lying entirely free in its outer sheath except for its lateral attachment to the urethra, which is usually torn across in its removal. This, however, will prove of no serious moment to the patient.

If, as frequently happens, the two lobes are so densely adherent along the posterior commissure as to be inseparable, the whole organ will have to be enucleated at once. In this case after stripping it free on all sides, after stripping it off the triangular ligament below, and after separating it from the ejaculatory ducts, it will be found to be hanging free on the urethra. The urethra should now be deliberately torn across at a point behind the entrance of the ejaculatory ducts, because at this point there is the satisfaction of knowing that this damage to the urethra can result in no harm whatever. As a matter of fact, the urethra is torn across at this point in more than ninety per cent. of prostatectomies.

The prostate having now been removed, the toilet of the wound is commenced. Through the catheter, which has been left in the urethra

throughout, the bladder is flushed with a hot saturated solution of boric acid, the washings coming away through the upper wound. This process is continued until all clots and debris are removed, and the solution wells up quite clear. Hemorrhage is seldom troublesome, as the prostate, except in a condition of acute inflammation or congestion, is not a very vascular organ. Should the bleeding prove at all serious, the temperature of the irrigating lotion should be increased to 110 degrees or 112 degrees F., which will usually control it without difficulty. Bimanual kneading will sometimes accomplish much. This is done by manipulating the two forefingers of the left hand in the rectum against those of the right hand in the prostatic sheath. In rare instances the cavity of the prostatic sheath may have to be packed.

The hemorrhage having entirely ceased, as shown by the irrigating fluid welling up perfectly clear through the wound, the temporary sutures fastening the cut edges of the bladder to the recti muscles are withdrawn, and the bladder wall allowed to drop back to the bottom of the wound. To complete the operation two methods are now possible. If the prostate is at all large and the bladder foul, the viscous should invariably be drained; if the prostate is small and the bladder free from contamination of any kind, it will be better if experienced after care can be had, to close the wound up tight at the time.

If it is to be tightly closed, great pains should be exercised in carefully approximating the cut edges of the bladder wall, then the balance of the wound is closed by layer sutures. If this method is pursued, it will require the exclusive attention of one house surgeon for at least twelve hours subsequently. A catheter is left in the bladder per urethram, and every four or five minutes it is carefully washed out with a few ounces of boric acid solution. This prevents the formation of clot and carries away any blood which may be oozing from the prostatic sheath. The periods between each washing may be gradually lengthened, until in twenty-four to thirty-six hours they may be discontinued altogether, as by this time all hemorrhage will have ceased. The catheter is left in the bladder, however, until the suprapubic wound is entirely healed. This method may only be used in selected cases, and its advantages are simply in the short time in which a patient is confined to bed.

In much the larger percentage of cases the bladder will require drainage, and in these a large India rubber drainage tube (I use red because it is usually softer and more pliable, thus producing less irritation) is introduced into the bladder at the lowest angle of the wound. As it is very essential that all the urine should pass through this tube, in order that none may well up into the prevesical space and thus cause cellulitis, it is very necessary the tube should be of large calibre. I

now invariably use one four inches in length and seven-eighths of an inch. This allows the wound to grip it tightly, and prevent the escape of any urine around it.

Two large eyes should be cut in the tube on opposite sides and close to the vesical end, and these introduced just inside the viscus. Under no circumstances should the tube be carried down to the prostatic cavity, as that must be kept free from irritation. As a rule one inch of tubing inside the bladder will suffice.

No buried sutures are ever used, as they invariably become infected by the urine and cause cellulitis. A couple of deep silk worm gut sutures will now bring the wound together, and a thin strip of gauze may be carried down beside the tube to the prevesical space, and left in position for twenty-four hours. It is well to pass one superficial suture through the skin and tube to keep it in position.

The bladder is now once again flushed out with boracic lotion to see that it is free from blood clot and that drainage is free, after which the catheter is removed, the wound covered with a moist gauze dressing, and the abdomen and sides deeply swathed in absorbent cotton.

*Perineal Prostatectomy.* In removal of the prostate gland through the perineum, the preparation is much the same as when the route over the pubes is chosen, the main point of difference being in the time the purgative is administered. When operation by the perineal route is to be undertaken, it is well to give a purgative of two ounces of castor oil or laxol on the second night preceding operation, and an enema the following morning. In this way the effects of the purgation are all over before the sterilization is commenced. The balance of the preparation, cleansing the skin of the perineum, painting with iodine, etc., is carried out in a manner similar to that when the suprapubic route is chosen.

The earlier attempts at perineal emucleation were carried out through an external urethrotomy opening, but these have long since been abandoned as impracticable because of the lack of sufficient room. To accomplish the best results the posterior surface of the gland must be fully exposed by an elaborate perineal dissection. The varieties of the operation thus performed are about as numerous as the number of men who extensively do this work, each man having his own particular modification. Two particular features, however, stand out prominently in each and every modification; viz., the thorough exposure of the posterior surface of the gland, and the bringing of it well down into the wound where it can be seen as well as felt. If these two essentials are carried out, it makes little difference in what manner the further steps of the operation are completed.

The technic of perineal prostatectomy by an elaborate dissection,



thus permitting the complete removal of the gland (with the exception of that portion which is left for the preservation of the ejaculatory ducts) was first formulated by Proust, of Paris, and later elaborated by Dr. Young, of Baltimore. It is in reality the only method in which to remove the prostate per perineum. For this purpose it is best to have the patient in an exaggerated lithotomy position with the pelvis raised to an angle of at least forty-five degrees from the horizontal plane, and the thighs fully flexed and held apart as far as possible. It is found that this position gives the greatest possible amount of room, and consequently much greater ease in drawing the prostate down into the field of operation.

The bladder having been emptied and thoroughly irrigated until the return flow is as clear as can be obtained, a grooved metal sound is now introduced into the viscus and held tightly against the pubic arch in order to retract and protect the bulb of the urethra in the operative field. An incision, V-shaped, with its apex in the median line and midway between the anus and the root of the scrotum, is now made through the skin and superficial structures, and may be lengthened as far as necessary to give sufficient room. The external sphincter ani is divided through its attachment to the perineal centre, and then by continuing the dissection posterior to the transverse perineal muscles, the posterior layer of the triangular ligament is defined. By now exercising the greatest care not to injure the bulb in front nor the rectum behind, the dissection is carried down between the centrum tendineum and the triangular ligament dividing the attachments of the muscles surrounding the bulbous and membranous portions of the urethra. This dissection should be carried out with a pair of scissors, and the fibres divided very close to the membranous urethra in order to prevent the dissection from being carried below the posterior layer of the aponeurosis of Denonvilliers.

The rectum can now be pushed back out of the way, and the posterior surface of the prostate covered by the levatores prostatae muscles, exposed. The prostate will now in most cases be found to recede away from the finger when it is touched. It is well at this juncture to open the urethra at the apex of the prostate, and after withdrawing the sound already in the bladder, to introduce through the new opening a tractor with which to draw the gland well down into the wound. Probably the best instrument for this purpose is that devised by Dr. Young, of Baltimore. It is a perfectly straight instrument with reversible flanges, which when opened out in the bladder come in contact with the vesical surface of the prostate, and gentle traction holds the gland firmly in the wound during enucleation.

The prostate being now firmly held down in the wound, its sheath,

which is in reality the anterior layer of the aponeurosis of Denonvilliers, is opened by a longitudinal incision on either side, and close to, the urethra. Dealing through each one of these incisions separately, the finger is insinuated between the layer of fascia and the capsule of the prostate, and the gland gently shelled out, commencing on the side farthest from the urethra. After freeing this portion, it is separated below and then above from the vesical membrane, great care being taken to prevent an opening into the bladder. The lobe is now hanging free on the urethra and the ejaculatory duct. The other side is now similarly dealt with and the prostatic tractor removed.

The opening in the urethra is now enlarged by lengthening the incision from the apex of the prostate to the neck of the bladder, and the finger introduced to act as a guide in separating the prostatic lobe from it. In order to prevent contusion, it is better to effect this separation by means of scissors. In many cases a careful dissection will save the prostatic urethra, though in the majority of cases, and especially in all those whose lobes have become densely adherent along the posterior commissure, the urethra must be sacrificed.

Two distinct methods are used in dealing with the ejaculatory ducts. Proust, the leader of the French school, advises their ligation, believing by this means to prevent the onset of orchitis, and also by so doing he is able to remove the lobe in its entirety. The great drawback to this is, of course, the destruction of sexual power.

Young deals with the ejaculatory ducts in an entirely different manner. His incision into the prostate on either side of the median line is made with a scalpel, and is carried down through each lateral lobe parallel to, and as deep as, the urethra. This leaves between these two incisions a definite and distinct bridge of prostatic tissue, including both the posterior commissure and the ejaculatory ducts intact. That portion of prostatic tissue lying external to this incision is now freed from its sheath and its attachment to the urethra and anterior commissure divided by scalpel or scissors, thus leaving also in position and undisturbed the anterior commissure as well. It will thus be seen that Proust does a total prostatectomy, and by so doing destroys sexual power. Young, latory ducts, preserves sexual power and accomplishes but a partial prostatectomy.

Through the opening in the urethra, the interior of the bladder is now explored to ascertain if there is any further outgrowth, or a calculus in the post prostatic pouch. This is best accomplished by the finger.

Each prostatic cavity is now packed with gauze and a drainage tube carried into the bladder through the urethral opening. As it is necessary in many cases to maintain continuous irrigation for some days,

it is well to introduce a catheter through the penis. The calibre of the prostatic urethra is usually large enough to accommodate both these tubes, when, if not, a double one should be carried through the perineal opening.

Around the perineal tube the prostatic urethra is now sutured with interrupted catgut stitches, and after leaving free beside the tube the end of the gauze which is used for packing the prostatic cavity, the perineal wound is closed by interrupted sutures of silk worm gut.

In the subsequent treatment the irrigations are best carried out by allowing the fluid to pass in through the penile catheter and out through the perineal tube. The gauze packing the prostatic cavities is loosened on the second day, and removed at the end of a week. The tubes are removed about the same time. For at least another week the bladder should be irrigated per catheter per urethram.

*After-treatment and Complications.* The after-treatment in prostatectomy cases is of the utmost importance, and the ultimate success of the operation will depend to a very great extent indeed upon the care and judgment with which it is carried out. The patient should be kept lying flat on his back in the prone or semi-prone position, for at least twenty-four hours, after which he may be turned alternately from one side to the other. For the first few days, at least until after the drainage tube has been removed, he should not be allowed to make any exertion of any kind himself for fear of starting a hemorrhage, and any change of position should be effected with the aid of a nurse. Any oozing of blood will generally be controlled by the administration of ergotin by hypodermic injection. Mild shock, a very frequent accompaniment of severe operations on the prostate, may be combatted by hot water bottles, by hypodermic injections of camphorated oil and by enemata of hot strong coffee and brandy. Occasionally severe pain is present, and should be controlled by morphine given hypodermically. The head and shoulders should be raised as shortly after twenty-four hours as possible, in order to prevent hypostatic congestion of the lungs or pneumonia, a condition so liable to develop in old men of the prostatic age.

According to the quantity of urine secreted, the dressings should be changed every four to six hours. During the first twenty-four hours there will likely be found some blood-clots in the drainage tube, and these should be carefully removed with dressing forceps at each dressing. For the first week the bladder should be irrigated daily with a saturated boracic acid solution, to remove all clot and debris, and keep the viscus perfectly clean. This irrigation is best effected by introducing the nozzle of a fountain syringe into the rubber drainage tube in the bladder and letting the solution flow in gently. Care should be taken to avoid too great a force to the flow, otherwise it may dilate the pro-

static sheath and commence oozing of blood. If the irrigating bag is placed about a foot above the level of the patient's abdomen, it will usually be found to have force enough.

When the suprapubic route is chosen the time for removal of the drainage tube will depend on the thickness of the abdominal wall. In the average individual, it should be removed in four days, while in a very thin person three days will be quite sufficient time to leave it; and again in a very stout man it may become necessary to leave it five days. It should be left in position until a coat of lymph has filled the pre-vesical space and thus prevented the danger of infection and cellulitis from that source. It used to be my practice, on the removal of the large tube, to replace it by a smaller one; but for some time past I have discontinued this, and when the large tube is removed, simply leave the wound open and allow it to granulate as speedily as nature will permit.

About the eighth day primary union will have taken place in the wound, save in the track left by the tube, and the stitches should now be removed. After the fifth or sixth day it is well to flush the bladder alternately per urethram and per the suprapubic opening. One day it is flushed by introducing the nozzle through the opening last mentioned and allowing the solution to flow back around the nozzle. The next day a catheter is introduced through the urethra and the flow allowed to pass out through the opening above. In this way the bladder is kept constantly flushed out and perfectly clean. During the transition period between the time when a nozzle cannot be introduced through the suprapubic opening, on account of its contraction, until it is entirely closed, the bladder will require to be washed out per urethram each alternate day.

Prior to operation the bowels should be thoroughly evacuated daily for at least three or four days, and on the morning of the operation when the suprapubic route is chosen, the lower bowel should be thoroughly cleansed by an enema. Succeeding operation, the bowels should be left perfectly quiet for the first three or four days, and then a gentle movement obtained by the use of castor oil, after which they should be kept moved at least once every day.

If all goes well the patient should be allowed to sit out of bed in from a week to ten days' time, and under ordinary circumstances the wound will be entirely closed in from three to four weeks.

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## PERSISTENT INDIGESTION: ITS CLINICAL SIGNIFICANCE. ITS SURGICAL TREATMENT.

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**D**YSPEPSIA is not always the result of some mild functional derangement of the stomach, but is frequently a marked symptom or clinical manifestation of some serious intra-abdominal organic lesion either of the stomach itself, of the duodenum, of the gall bladder or of the appendix. The frequency with which chronic gastric ulcer, the early stages of gastric carcinoma, duodenal ulcer, cholecystitis, stasis, and even chronic appendicitis is the direct cause of a persistent and troublesome indigestion is being revealed in the operating room every day. When we take into consideration the role which is played by each of these organs in the function of digestion, it is readily understood how an organic lesion in any one of them is likely to manifest itself through the old fashioned symptoms of dyspepsia. During the last few years the brilliant work of Sir Arbuthnot Lane has also shown the extent to which these so-called dyspeptic symptoms may be produced by chronic intestinal stasis.

Gastric and duodenal ulcer is an exceedingly common disease. Carcinoma of the stomach is on the increase. Gall stones with subsequent involvement of the gall bladder and bile ducts are now known to exist much more frequently than was commonly supposed, even when no other symptom than chronic indigestion is present, and appendicular gastralgia is now a well-known and accepted pathological entity. While it is all important to locate definitely the source from which the dyspeptic symptoms spring in any of the foregoing pathological conditions, it becomes doubly so when the involvement is due to a carcinomatous nodule, which in the stomach especially, so frequently follows in the wake of ulcer.

Ulcer of the stomach is the most invariable forerunner of cancer, therefore if by reason of the dyspeptic symptoms manifested we can definitely diagnose and successfully remove this lesion before the advent of the carcinomatous engraft, we have gone a long way in eradicating malignancy in one of the most frequent locations in the body. Furthermore this is the only way in which it can be effectively eradicated, for when pylorotomy is done in the presence of carcinoma, it is with the full knowledge that in at least 50 per cent. of the cases there will be a

reincurrence in less than three years. In gastric carcinoma probably more than in any other pathological lesion is the truth of the old adage exemplified, "An ounce of prevention is worth a pound of cure."

It is the surgical conditions in the stomach itself which give rise to typical dyspeptic symptoms—ulcer and its frequent accompaniment, Carcinoma—that this article has to deal.

If definite symptoms were always produced by, and the result of, definite pathological lesions, diagnosis would be readily reduced to an exact science, but this is far from being the case. It is but too often we find that a definite pathological lesion in one patient will produce a certain train of symptoms, and to find in another with the same lesion a chain of symptoms of a very different character altogether. This is what makes the art of diagnosis so peculiarly difficult. When a scientific diagnosis has been definitely arrived at, treatment is a comparatively easy matter. The act of removing an ulcer from the stomach wall, of short-circuiting a duodenal stenosis due to a cicatricized ulcer, or even of removing a portion of the stomach itself because it is affected by carcinoma, is a much easier task than arriving at the diagnosis at a sufficiently early period to make such action productive of the best results.

When a patient suffering from definite and persistent indigestion presents itself for treatment, a routine examination of the stomach must invariably be made. This routine examination will include a thorough and complete history of the case, a physical examination, a test of the motor functions of the stomach, a complete gastric analysis obtained from a test meal, and finally a complete fluoroscopic examination of the entire gastro-intestinal tract. There is a tendency now-a-days to lay too much stress on the value of the chemical analysis of the stomach contents, and too little on the mere clinical examination while as a matter of fact either one can only prove of the highest value when corroborated by the other.

The *history* in all gastric cases is of the utmost importance. Very much valuable information will in this way be noted; whether the indisposition has been accompanied from the first by pain, whether the pain was constant or intermittent, whether it was present before or after meals, whether it was confined to the epigastrium or radiated to the right lower abdomen, and finally the character of the pain itself. The majority of gastric lesions have associated pain almost from the first, but this is also true of other lesions affecting the stomach such as gall-bladder disease or appendicular gastralgia. The location and character of the early pain will frequently help to differentiate these conditions, as in cholelithiasis the pain is often agonizing and situated to the right

of the middle line. Duodenal pain is also as a rule definitely located to the right of the middle line, gastric pain to the left. The pain in appendicular gastralgia ranges all the way from a dull aching in the epigastrium to a severe pain radiating to the right lower abdomen.

The question of constancy of the pain is important. Gall-bladder troubles and duodenal lesions are manifested by an exceeding irregularity in the onset of the pain. In both conditions months may elapse between attacks and in the interval the patient be entirely free from any discomfort whatever. Gall-bladder pain bears no relation whatever to the taking of food: duodenal pain a very definite relationship. The presence or absence of vomiting is important. The amount, frequency, and character of the vomit should be noted. Pyloric stenosis is frequently present when vomiting occurs every two or three days and contains particles of food known to have been eaten two or three days before.

Physical examination does not reveal as much as either a careful history or a complete gastric analysis, though some points may be obtained which will add greatly to the definiteness of a diagnosis. There are times when cancer of the stomach can be diagnosed from the facial expression; so also the facial expression in some instances carries great weight in the diagnosis of duodenal ulcer. In gastric carcinoma the blood pressure is low and the pulse weak, while in ulcer of the duodenum the blood pressure is usually high. If the cancer is far advanced abdominal palpation may reveal a tumor: if the pyloric stenosis has been long present an obviously dilated stomach may be observed.

If the motor functions of the stomach are perfect there will be no food residue in the stomach in the morning. This is best tested by thoroughly washing out the stomach at night, and giving fifteen ounces of milk to drink and a dozen raisins to eat. Under normal conditions the stomach will be empty in the morning, while if pyloric stenosis exists to any extent, there may be even more than fifteen ounces present, and in some instances as much as twenty ounces have been withdrawn. The amount of stenosis regulates the motor function which in turn regulates the amount food residue, so that by this means an estimate of the amount of stenosis may sometimes be made.

When there is no stenosis, duodenal ulcer is frequently responsible for the rapid emptying of the stomach, so much so that when other symptoms point to this lesion, hypermotility may be accepted as almost conclusive evidence.

The clinical examination being complete, the laboratory investigation of the stomach contents is a most valuable aid in diagnosis. Too great importance cannot be attached to the information thus obtained,

but it is only when this information is interpreted in the light of the clinical facts already adduced, that its value will be the greatest, the results of the examination of a series of test meals, when interpreted in the light of the clinical history of a given case will in the majority of instances allow of a fairly accurate diagnosis being made.

The best time to administer the test meal is in the morning. Before doing so the stomach tube should be passed and any gastric contents removed. For this reason it is well to give the test meal from one half to one hour after the motor functions of the stomach have been investigated. The most convenient and generally used meal is that of Ewald which consists of two slices of dry toast and fifteen ounces of weak tea without either milk or sugar. In exactly one hour after the commencement of the meal the stomach contents should be withdrawn. In a normal stomach at least one quarter of the meal or four ounces should be recovered. If stenosis is marked, as much as twenty or even twenty-two ounces may be withdrawn, while in the presence of duodenal ulcer and no stenosis, a condition in which the stomach empties itself more quickly than usual, as little as two ounces, or even none at all may be recovered.

*Qualitative tests.* Normal gastric contents should be acid. The presence or absence of free hydrochloride acid should be noted. It is usually present in cholecystitis producing gastric symptoms, in gastric ulcer at the pylorus, in duodenal ulcer, and *sometimes* in chronic appendicular diseases producing gastric symptoms. Likewise it is unusually absent in any form of malignant disease in the stomach or pylorus, in old gastric ulcer in the cardiac end of the stomach, and frequently in cases of hour glass stomach.

*Quantitative tests.* The two quantitative tests of greatest importance are for the total acidity and the amount of free hydrochloric acid.

In a healthy individual the normal total acidity is 60 and may vary from 55 up to 65. If below 50 there is a distinct hypo-acidity, if over 70 a definite hyper-acidity. Hyperacidity is usually present in gastric ulcer at or near the pylorus and in duodenal ulcer; while hypoacidity in the presence of characteristic clinical symptoms is strong presumptive evidence of malignancy.

In a condition of health the normal amount of free hydrochloric acid is 0.020. In the early stages of gastric ulcer near the pylorus, and in duodenal ulcer, an excess in free hydrochloric acid is the rule. In the late stages of gastric ulcer situated away from the pylorus, or of gastric ulcer causing pyloric stenosis, free hydrochloric acid is frequently absent. Hour glass stomach usually negatives free hydrochloric acid, and in malignant disease free hydrochloric acid is rarely found.



In the fluoroscopic examination much valuable information may be obtained by observing the time required for the stomach to empty itself of a bismuth or barium meal, by noting the position of the viscus, the presence or absence of visible peristalsis, its form, its mobility, whether it is free, slightly fixed or fixed, whether there are any filling defects, the length of time required for the ilium to completely empty itself, and finally the time required for the bismuth meal to be entirely eliminated from the intestinal tract.

*Symptoms.* There are few abdominal lesions in which the symptoms are more unmistakable, clear-cut and simple, than in chronic ulceration of the gastro-intestinal tract at or near the pylorus. In the vast majority of cases these symptoms appear in such a definite and well-defined order, as not to be easily mistaken. True it is, that in an occasional instance, the symptoms may appear in an entirely different sequence, or the acuteness of some one symptom may overshadow all others, but these cases are the exception, and indeed are few.

The diagnosis of ulcer in this region may almost invariably be made on the history of the case. The physical signs, and stomach analysis being employed only as confirmatory evidence. It is a fact however, that the farther from the pylorus the lesion is situated the diagnosis will be correspondingly more difficult. Should the lesion appear on the greater curvature and toward the fundus, the symptoms will invariably lose their peculiar characteristics and clear-cut significance, the patient will be void of that characteristic train of symptoms so peculiar to ulcer near the pylorus, and a positive diagnosis be arrived at only after the greatest difficulty. A careful development of the history of each individual case will, however, almost invariably establish a train of symptoms sufficiently characteristic to allow not only of a diagnosis of ulcer, but also of its location with a certain degree of precision.

*Pain.* In most cases the patient will date commencement of his illness many years back, the complaint coming on so insidiously as to preclude the possibility of fixing any definite time for its commencement. If his memory serves him well, he will recollect the first indication of trouble was the presence of a slight gastric distention, or a sense of fullness accompanied by pain, which would occasionally succeed a hearty meal. As time wore on this discomfort would succeed many meals, until finally, he had his first attack of "indigestion," when every meal would be followed by pain, described by many as burning or gnawing, with eructations of gas from one to five hours afterwards. This condition would last for days, weeks or even months, then without any warning it would suddenly cease, to be followed by a period of perfect health. For a time he would be well, only to be again suddenly stricken

with another attack of the same malady, probably months or even years afterward. So complete may be the relief during these intermissions that even the idea of any organic trouble may be scouted, but the cycle thus formed of attack and relief, are definite links in the symptomatic chain so peculiarly characteristic of chronic ulcer in this location.

At first he notices the attack to appear with any sudden change of temperature, notably spring and fall, then, as the periods of cessation and ease become shorter, his indigestion will return without discernable cause, and in due time will disappear just as mysteriously. Each day's routine is but a repetition of the previous one, ease for a time after meals, then pain, belching of gas, sour eructations making the teeth feel like chalk, and finally more or less vomiting as stenosis of the pylorus commences to develop.

The *time* of the commencement of the pain is very characteristic. Though usually described by the patient as being after a meal, it will be more correct to say, before a meal. It will usually appear in from two to four hours, though sometimes even as late as six hours after partaking of food. In other words it asserts itself when the stomach is commencing to become empty, and consequently has been aptly described as a "hunger pain." The period of time elapsing between the partaking of food and the appearance of pain, depends to a great extent on the character of the food. If the meal consists of solid or heavy indigestible food, the pain is longer in making its appearance; should the nourishment taken be fluid, the pain appears much earlier.

The amount of time elapsing between a meal and the appearance of the pain, will give some indication of the location of the ulcer. If the meal be solid or semi-solid, and four hours or more pass by before the appearance of the pain, the ulcer will almost invariably be found on the duodenal side of the pylorus, and on the posterior surface of the gut. Should the pain, after such a meal, appear in two hours or less, the lesion will undoubtedly be discovered either on the lesser curvature of the stomach right at the pylorus, or if beyond it, on the anterior surface of the bowel.

During one of these periodical attacks, this hunger pain will appear whenever the stomach becomes empty, and is frequently quite severe enough to wake a patient in the night. I have frequently had patients tell me they never retire without laying out a biscuit or a glass of milk on a table beside the bed, to take when they were awakened by pain during the night, having soon learned by experience the benefits to be thus derived. In order to remain as free as possible from discomfort, many patients arrange to take five or six meals during the twenty-four hours. When the pain is severe it will sometimes be relieved by pressure, hence

it does not take the sufferer long to discover the comfort he may experience by doubling up a blanket or a pillow and hugging it to the stomach when he is thus awakened at night.

The ingestion of an alkali mixture will frequently afford great relief, presumably by its neutralizing effect on the already too acid stomach contents. Vomiting will almost invariably produce the same results. In the latter stages of the disease, when one of the various complications, such as cicatricial stenosis is seriously affecting the motility of the stomach, there is nothing which appears to afford such instant and complete relief as gastric lavage. It is remarkable to observe the avidity with which some patients in this condition will resort to the stomach tube, and an occasional one will be found whose daily practice is to wash out the stomach at a stated period after each meal.

Now, epigastric pain, belching of gas, eructations and vomiting are not in themselves pathognomonic symptoms of ulcer. Other conditions such as chronic appendicitis or chronic cholecystitis due to gall stones, are frequently accompanied by similar periodical manifestations. It is not the *chronic* character or the *periodical* attacks of pain, gas or vomiting; it is not the *location*, *intensity*, or *kind* of pain that tells the story; it is the invariable *time* of the pain, two to four hours after meals, it is the fact that during the attack, pain accompanies almost *every* meal, and finally it is the *means* by which the pain can be relieved, injection of food, which stamps it as characteristically pathognomonic of ulcer in this location.

*Hyperacidity.* So called "hyperacidity" of the stomach has long been recognized as an accompaniment of ulcer, and in its direct relationship to this lesion has been the theme of many able discussions. It is an interesting fact to note, however, that in many cases of supposed hyperacidity or "acid dyspepsia," where intensely acid matter is vomited, that a test meal will reveal a normal or even subnormal amount of free HCL. Whether hyperacidity is the cause or result of ulcer has long been a moot question, but as more of these cases are being constantly submitted to operation, and a clearly defined and tangible ulcer is being found in every instance, the weight of proof is fast accumulating to show that this supposed "hyperacidity" is the result and not the cause, of ulcer. This has been demonstrated many times. Sir Berkeley Moynihan has indeed gone so far as to assert that chronic recurrent or protracted hyperchlorhydria *is* ulcer.

*Hemorrhage.* Hemorrhage, as made manifest by hematemesis or melaena should never be considered a symptom, but rather a late complication of ulcer. In at least 80 per cent. of all cases a diagnosis should be made before the ulceration has progressed to such a stage as to

open a deep vessel. The clinical picture of ulcer is now so complete, that its existence should be recognized early, and by timely treatment obviate all the later complications such as hemorrhage, pyloric stenosis, hourglass stomach and eventually the most serious complication of all, carcinoma engrafted on the base of an old ulcer. I have within the last six months seen two fatal cases of duodenal hemorrhage. Both these cases had had malaena for months, one of them also having had several attacks of hematemesis. In each case the patient had refused operation, and in each finally suffered a hemorrhage which proved fatal before surgical aid could be given.

*Tenderness.* In the majority of cases of ulcer, no physical signs or manifestations are present, though sometimes in the latter stages, especially if subacute perforation has produced a localized peritonitis, tenderness will be observed to the right of the median line, if the ulcer be duodenal; and sharply localized in the epigastrium if it be gastric.

*Differential Diagnosis.* The only condition which is at all liable to become confused with ulceration in this location is cholecystitis and its complications due to the presence of gall stones. Cholelithiasis, with the numerous complications occasioned thereby, is the most frequent disease of the upper abdomen. It is four times as frequent as duodenal ulcer, it is eight times as common as ulcer of the stomach, and it presents itself at least ten times for every once we see cancer of the stomach.

I have some time since ceased to believe that the mere presence of stones in the gall-bladder may be productive of no symptoms whatever. It is a common fallacy, a belief concurred in by many of our able men even to-day, that stones may lie quiescent in the gall-bladder for many years, or be even carried throughout life, without occasioning the slightest inconvenience. A stone in the gall-bladder is a foreign body, and the presence of any foreign body is certain to produce some symptoms denoting its presence. The fallacy of the belief that the first symptoms produced by the presence of gall-stones is when they commence to produce ulceration, inflammatory changes, infection, or obstruction to the biliary flow, has many times been demonstrated.

It is now the generally accepted opinion that he who is the possessor of one or more calculi in his biliary tract, is also subject to occasional attacks of "stomach trouble," and these irregular gastric inconveniences may be, and generally are, the only indication of the presence of biliary calculi. If this warning note were more frequently recognized, it would be the means of saving many invaluable lives. The first symptoms of early gallstone disease are invariably referred to the stomach, symptoms which in nearly every instance will permit of a definite

diagnosis being made, and thus, by early operation, avoid all the serious complications which later on are so liable to arise. Operation at this time is also followed by practically no mortality.

The gastric disturbances indicative of early gall-stones formation are frequently but slight, are scarcely considered by the patient, and oftentimes entirely overlooked by the physician. These are sudden and irregular attacks of fulness in the epigastric region, having no definite relation to the ingestion of food. The sensation may be even one of extreme tightness, which, unless relieved by loosening the clothing, may finally be productive of pain. Deep inspiration will frequently produce a pain in the region of the right costal margin. In a small percentage of these cases chilliness is occasionally observed after meals, the evening meal more particularly. The typical syndrome of symptoms of this early stage of gall-stone disease may be conveniently described as epigastric fulness, gas, and a sense of weight and upward pressure in the epigastrium, coming on from half an hour to an hour after meals. This condition may be very irregular, it may be present after every meal, or only after an occasional one. These "dyspeptic" attacks are usually of short duration, and should they be immediately and entirely relieved by belching, or upon vomiting, they may be considered as truly pathognomonic of early gall-stone disturbance as the subsequent and more commonly recognized typical attacks of intense gall-stone colic.

The great majority of all operations performed on the gall-bladder or biliary ducts are for pathological conditions, the direct result of gall-stones. They are in most instances the common cause of empyema of the gall-bladder, gangrene of the gall-bladder walls, acute perforation of the viscus, cystic distension due to block of the cystic duct, or, if the hepatic or common duct should be similarly obstructed, the great distension of the gall-bladder will be accompanied by intermittent jaundice. Cystic distension, accompanied by permanent jaundice, will usually be found to be the result of cancer. This permanent jaundice is produced by the constant pressure on the duct. In 85 per cent. of all cases of cancer of the liver, the gall-bladder or biliary ducts, gall-stones are present.

Without obstructive symptoms, the presence of stones in the gall-bladder may be the cause of any degree of inflammation from a simple catarrhal condition up to the most virulent form of suppuration and necrosis. There is perhaps in all surgery no single exciting cause productive of more extensive and varied complications than the presence of gall-stones. Many and varied are the conditions, frequently of an exceedingly serious nature, which demand operative interference. The chapter on the evolution of the surgery of the biliary passages rivals

only in interest that of recent work on gastric and duodenal ulcers, with their manifold complications. The operative demand may be for any condition ranging from an ordinary catarrh of the bile passages to acute phlegmonous cholecystitis and gangrene of the gall-bladder.

In the large majority of cases, gall-stones cause but few symptoms, and throughout life they may be carried around with but very little inconvenience, mainly occasioned by irregular attacks of supposed indigestion. When, however, a stone leaves the bladder on its migration to the intestine, severe symptoms are produced, such as intense colic caused by its passage through the ducts, dilatation of the gall-bladder or acute cholecystitis, as a result of its impaction in the cystic duct; infective cholangitis and jaundice, should there be obstruction or semi-obstruction of the ductus choledochus. Furthermore, the continued presence of a stone impacted in one of the ducts is liable to lead to ulceration, terminating in perforation and a general peritonitis, should the perforation lead into the general abdominal cavity; or a permanent fistula, should it find its way into any part of the intestinal tract. Superficial fistulae are known, where a gall-stone has suppurated its way through the anterior abdominal wall.

Perhaps the most intense pain the human being may be called upon to suffer is occasionally produced by the passage of a stone through one of the biliary ducts. The passage of such a stone does not always cause much suffering, but in many cases the pain is truly great. It appears, as a rule, suddenly, without any warning, though occasionally prodromal symptoms may have been present. In many instances it disappears as suddenly as it commenced. Commencing in the right hypochondrium, it radiates to the right shoulder blade. In contradistinction to the pain produced by gastric or duodenal ulcer, this biliary colic has no relation whatever to the ingestion of food. This pain is often associated with chills and a rise in temperature of from three to four degrees.

As in an acute attack of appendicitis, tenderness may be elicited over McBurney's point, so in biliary colic tenderness may be and usually is present in the region of the gall-bladder.

*Vomiting*, as a rule paroxysmal, is present at some time during the attack. It usually occurs toward the end of the seizure. In fact, it may be a determining feature in its cessation. In many instances the first sign of relief is experienced immediately after a severe vomiting spell. At first the ejected matter is ordinary stomach contents, to be followed by intensely bitter bile, if the common duct is free.

When a stone becomes so lodged in the cystic duct as to cause obstruction, there will be almost immediate dilatation of the gall-bladder.

This may, in many instances, be of short duration, and the obstruction being removed, there will be an entire subsidence of the symptoms. In other cases, an acute suppurative cholecystitis may supervene, and relief be obtained only after surgical interference.

*Empyema* of the gall-bladder is a common accompaniment of gall-stones. When a stone becomes impacted in the cystic duct, the gall-bladder, as a result of the accumulation of secretions, may attain a very great size. The presence of micro-organisms will produce an infection, suppuration ensue, and the gall-bladder be converted into an abscess sac. Should adhesions be present, as is almost invariably the case in empyema, the organ will be fixed. In the absence of adhesions it may be quite freely movable.

A stone may become lodged in any part of the common duct. Should it be tightly wedged, the jaundice will be deep and enduring. Should it be of the ball-valve type, the jaundice will be more intermittent and transient. A common location is the junction of the cystic and common ducts, where the stone rests partly in each canal. Another common location is the diverticulum of Vater. In common duct obstruction the gall-bladder rarely becomes enlarged, though the common and hepatic ducts may attain a very considerable size. The hepatic branches throughout the liver may also become greatly enlarged.

In *infective cholangitis*, from incomplete common duct obstruction by stone, the patient will suffer from intermittent but repeated attacks of chills, followed by an immediate rise in temperature. This febrile reaction usually reaches from 102° to 103° F. Pain is not a marked symptom. The chills may recur daily, or less frequently, and after each seizure the jaundice may deepen in intensity. Icterus may be intense. Nausea and vomiting are, as a general rule, a marked symptom. These attacks may recur at indefinite periods for years without the development of suppuration, until which time there is frequently no permanent loss of health. In attempting to ascertain the primary condition productive of the existing infective cholangitis, the condition of the gall-bladder is a valuable sign to go by. In practically all cases where the lodgment of a stone in the common duct is the primary cause, the gall-bladder will be found to be either normal in size or contracted. Should the occlusion of the common duct be the result of other causes, the gall-bladder will almost invariably be found to be considerably dilated.

In *suppurative cholangitis* we simply have the former condition in an intensified form. Suppuration may develop in any part of the biliary tract, and, spreading upwards through the hepatic ducts, develop focusses of infection with localized abscesses throughout the liver. Empyema of the gall-bladder is also a common accompaniment. In the

suppurative condition the jaundice is not so intense, and after the attacks does not deepen so appreciably as it does in the infective condition. Suppurative cholangitis with secondary hepatic abscess formation is always fatal.

*Why Operate Early.*—A differential diagnosis having been made and a positive diagnosis of gastric or duodenal ulcer arrived at, what is the proper course to pursue for its relief? Until within the last few years the frequency of this condition has been entirely unappreciated, mainly because these patients were put to bed with a somewhat hazy diagnosis of "indigestion," "acid dyspepsia," or "hyperchlorhydria"; were treated expectantly until the acute symptoms had subsided, and the patient had either become well, or passed into that most unfortunate class, chronic dyspeptics, when the only opportunity of demonstrating the true pathologic condition was the post mortem table.

Of late years, however, the surgeon, in the course of other abdominal work, has been able time and time again to demonstrate decisively an old cicatrized ulcer in the duodenum, or stomach. After treating this condition in the proper surgical manner, the old chronic dyspepsia or recurrent hyperchlorhydria, would disappear, until at the present time, as the result of such work, the characteristic clinical manifestations are so closely associated with a definite pathological lesion, that in the vast majority of cases a positive diagnosis may be readily arrived at, and in those chronic cases at least a complete and permanent cure may be confidently anticipated by the proper application of those surgical measures which we have learned to be peculiarly applicable to each variety of condition. Far be it from me to say, however, that all cases of chronic dyspepsia should submit to surgery. Only those whose condition can be shown to be due to a definite lesion, as typified by the symptoms already described, will reap the benefits they so much desire. This definite demonstrable lesion is in most instances an ulcer of one variety or another, either in the duodenum or the pyloric end of the stomach. If in the duodenum, it will give rise to those classic symptoms of hyperchlorhydria; if in the pylorus, by contraction in the process of healing, will produce stenosis with all the characteristic symptoms of stomach distention; while if in the pre-pyloric region we may have an extensive saddle ulcer on the lesser curvature, or, if on the greater curvature, that somewhat more rare condition, an hour-glass stomach. If any such definite lesion is the direct cause of the symptoms manifested by the chronic dyspepsia, surgery will at once offer to him excellent prospects for complete relief.

But it is not for the exclusive relief of the present symptoms that surgical measures should be undertaken in these chronic cases, but also



to prevent a catastrophe, which in a certain percentage of all cases is sure to come sooner or later—perforation—fatal hemorrhage—gastric cancer becoming engrafted on the base of an old ulcer.

*Acute Perforation.*—An acute perforation of a gastric or duodenal ulcer is not an uncommon complication, and unless prompt surgical measures are adopted every case must rapidly reach a fatal termination. When perforation has occurred, general peritonitis is rapidly established, and death cannot be delayed many days. The subacute form is not necessarily fatal, for protecting adhesions frequently limit the infection, and thus protect the general peritoneal cavity. In this class of cases the resultant condition is usually a localized abscess.

Duodenal ulcer perforates twice as often as the gastric variety. In gastric ulcer perforations occur more frequently in women, in the ratio of about 4 to 1, while duodenal perforations occur more frequently in men, the ration in this case being about 10 to 1.

Perforation in gastric or duodenal ulcer should be of rare occurrence, because, as a rule, the previous history is so clear that ample warning is usually given in time to forestall the occurrence of one of the greatest calamities which may befall the human being. However, the fact remains that even yet in a certain percentage of cases, some authorities place it even as high as 20, there may be no previous warning whatever, the disease may be comparatively latent, and the first indication of serious trouble the acute onset of a severe hemorrhage; hematemesis, as a rule, should the ulceration be on the gastric side of the pylorus; melaena if it be in the duodenum.

*Fatal Hemorrhage* from an ulcer is a complication of comparatively infrequent occurrence, though much more common in the duodenal than in the gastric variety. A severe hematemesis may result from gastric ulcer, and yet the patient quickly rally and rapidly recover, but in the duodenal variety such a happy ending must not be too confidently anticipated, especially if the hemorrhages are recurrent. The risk of fatal termination from this cause is an ever-present danger to one suffering from ulcer.

*Gastric Cancer* is perhaps the gravest complication which can befall the patient suffering from an old, deep-seated, chronic ulcer. That this should be productive of more fatalities than perforation or hemorrhage is because of its more frequent occurrence. Indeed, it may in the near future be decisively demonstrated that in every case of carcinoma of the stomach, by no means an infrequent malady, the disease is engrafted directly onto the base of an old chronic ulcer. At the present time over 70 per cent. of the cases can be thus demonstrated. In perforation, or hemorrhage, the diagnosis is comparatively easy, and

immediate surgical aid will frequently save the patient, but in cancer the prospects for complete cure have so often vanished before a diagnosis is made. The positive diagnosis of cancer in that early stage when operation would procure the desired results is so difficult at the present day that many a patient has lost his chance for life before he is really aware of his perilous condition.

For the immediate relief of the present symptoms so characteristically portrayed in the chronic dyspeptic, and for the prevention of any of the graver complications so liable to occur in the majority of cases, every person whose chronic indigestion, or "dyspepsia," can be directly attributed to a definite lesion of the stomach, or duodenum, should at the earliest possible opportunity receive the benefits of the present-day surgery.

*The Operation of Gastro-Enterostomy.*—There is, perhaps, no operation better illustrating the recent advances in surgery than that employed in the surgical treatment of gastric or duodenal ulcer. The first occasion on which the operation of gastro-enterostomy was performed was when, on Sept. 27, 1881, Wolfler of Vienna short-circuited the pylorus for obstruction from cancer, his patient living four months. From that time until 1885 there are on record thirty-five cases with only twelve recoveries, showing a mortality rate of 65.71 per cent., one so appalling as to cause the operation for a time to fall into utter disrepute. It may be said, however, that this early death rate was largely the result of operations on moribund patients, surgery only being resorted to when all other hope had gone. In all of the cases the operation was performed to overcome obstruction at the pylorus, in most of them the obstruction being due to cancer.

As time went on this operation was revived, and, being recommended for all conditions the result of pyloric stenosis, began to show marvellous results, this being more especially the case when surgery was resorted to in the earlier stages. The results were good and the mortality rate greatly reduced, according to the early stage of the disease for which the operation was performed. As the mortality rate rapidly decreased (in 1905 it had been reduced to five per cent.), thus bringing the operation into the realm of comparative safety, it began to be applied in the treatment of those conditions most likely to produce stenosis and obstruction of the pylorus, notably ulcer in this location. In several instances where gastro-enterostomy was performed in those early days for the relief of pyloric obstruction, and where at operation this obstruction was found to be the result of the cicatricial contraction of an old ulcer, the patient has become entirely well, being completely relieved of all the former symptoms. In some of these cases at least,

death having at some future date ensued from an entirely different cause, the post-mortem table revealed the fact that the old obstruction had disappeared, and the gastro-intestinal tract in this location had resumed a much more normal condition.

As a direct result of several such instances, the question arose as to whether earlier operation, thus securing complete physiological rest of the affected part, would in these cases not only prevent stenosis, but be the means of curing the ulcer. The work on this class of cases has indeed been very recent, the bulk of it having been done since 1905, but the results so far have been good, in fact so good that to-day I know of no operation in surgery which gives such speedy and complete relief and shows such truly remarkable results as does this, in that class of chronic dyspeptics whose primary lesion is ulcer. The victim of an old chronic ulcer, who may be wasted and wan, and who has been, figuratively speaking, for years with one foot in the grave, will occasionally derive such benefits from a gastro-enterostomy as to give him an entirely new lease on life, he will rapidly regain his lost weight, his meals will be heartily enjoyed, and life in general be viewed from an entirely new perspective. Great discrimination, however, is required in selecting cases for operation, but now that the symptoms are so well known, each group of symptoms bearing, as it were, the almost indelible stamp of the pathological lesion beneath, no great difficulty should be experienced.

Of varieties of technic there are many, though of distinct methods only two. In one, Wolfier's, the anastomosis is made between the jejunum and the anterior wall of the stomach. In this case the jejunal opening must necessarily be at a considerable distance from the pylorus, on account of the jejunum being looped up over the transverse colon. This long loop of bowel, by forming an impediment to the onward passage of intestinal contents, has been found in many cases to favor regurgitant vomiting, and consequently, as the operation of election, has given place to the posterior route. In those cases, however, where for some reason or other, such as dense adhesions, the posterior route is impracticable, the anterior is used, and the occurrence of regurgitant vomiting guarded against by anastomosing the afferent and efferent loops of bowel about four inches below the opening into the stomach.

The other method, Von Hacker's, is known as the posterior operation, and is effected between the jejunum and the posterior wall of the stomach. This is accomplished by opening the transverse mesocolon and effecting the anastomosis through this opening. The advantages of the posterior operation are mainly these:

- (1) The anastomosis can be made at the most dependent portion of the stomach, thus securing the most efficient drainage.

- (2) The jejunal opening can be made in most cases at a point within twelve inches of the pylorus, thus obviating the necessity of separately anastomosing the two loops of bowel.
- (3) There is no loop of bowel constricting the transverse colon, hence all danger of obstruction from this source is removed.

No operation of this nature is finally complete without either the excision or the infolding of the ulcer, the primary cause for surgical interference. Infolding will usually be the better method of dealing with it, as it involves much less time and risk, and moreover serves exactly the same purpose. It has recently been shown that this method speedily removes the ulcer, leaving the mucosa intact and clean, and by thus securing a permanent contraction of the gut at this point, doubly ensures the gastro-enterostomy opening as the constant outlet of the stomach, a decided advantage.

In cases where the ulcer is left untreated, the gastro-enterostomy opening secures for that portion of the stomach or intestine containing the ulcer absolute physiological rest, and thus secures perfect healing. But as time goes on and the pylorus again becomes normal, the food commences to take the natural channel, the anastomotic opening contracts, and ere a great while, possibly from the friction of the passing food, the old ulcer is revived and the second condition is the same as the first. The old clinical picture is revived. It will readily be seen then how, by securing contraction at the site of the ulcer, the anastomotic opening will become permanent, and the chances for ulcer occurrence removed to the remotest degree.

Dr. Robert J. Buchanan, of Liverpool University, thus tersely summarizes the results to be obtained by operation on selected cases:

1. Rest to the duodenum and pyloric region.
2. Prevention of mechanical irritation by food.
3. The provision of a second outlet through which food may pass.
4. The neutralization of gastric contents, or the outlet of them before maximum acidity is reached.
5. The relief of pain. This is practically a certain result, at least in the early post-operative period.
6. The prevention of perforation and hemorrhage.
7. A lasting cure and the prevention of recurrence.

One more important result should have been added. By thus inducing early and permanent healing of an ulcer, the possibility of the development of cancer is reduced to a minimum.

*After Treatment.*—In any operation of any magnitude the after treatment is one of the most important essentials of success, but especially is this true after an operation on the gastro-intestinal tract. After an

operation such as the one just described, it is always well to get the patient in the Fowler position as soon as possible. This can usually be done in from three to four hours, the feeling of nausea from the anaesthetic having worn off by this time. This Fowler, or sitting, position is used for the purpose of facilitating drainage of the stomach. As a result of the gastric atony, which in a great many cases is present, there is liable to be an accumulation of secretions which supine position would cause to be retained, but which is readily drained by posturing the patient up in the sitting position.

As a general rule gastric operations are comparatively free from pain, though, if on the first night it should be present, no harm can be done by giving 1-6 to 1-4 grain of morphine by hypodermic injection. This injection, however, should not be repeated on succeeding nights except under exceptional conditions. Water in small quantities, an ounce at a time, may be given as soon as it is asked for, and as the first few hours after operation pass by it may be given in increasing quantities, as much as twenty-five or thirty ounces being taken in the first twenty-four hours. Should weak tea or albumin water be preferred, there is no reason why they should not be given.

For the first few days the patient will usually be satisfied with fluids such as tea, cocoa, broth, soups, etc., and as a rule will not ask for anything solid. These in the meantime may be given *ad lib.* In the course of five or six days the appetite for stronger nourishment commences to assert itself, and as soon as the desire is manifested no harm can be done by giving bread and butter, poached egg, fish, and in fact any kind of light diet.

A high simple or turpentine enema should invariably be given about twenty-four hours after operation, as it relieves the patient of much gas, and makes him feel quite comfortable. About the fourth or fifth day it is always well to thoroughly evacuate the bowels by a dose of calomel or castor oil. About the tenth day he is allowed to sit out of bed for a while, and each succeeding day for a longer period, until in ordinary cases he leaves the hospital in from two to two and a half weeks after his operation.

Such indeed is the usual post-operative routine in patients who have been submitted to gastro-enterostomy, but occasionally complications arise which produce the most alarming symptoms. In the early days of the operation serious post-operative complications accompanied the majority of cases, but as greater care is now being exercised in the selection of cases, and as the technic has of late years been improved to its present state of efficiency, the once-dreaded sequelae have now become the exception rather than the rule. Only two will be considered here—

regurgitant vomiting and secondary jejunal ulcer.

*Regurgitant Vomiting.*—Regurgitant vomiting, in the early days one of the most formidable terrors of all gastro-anastomotic cases, is now being rapidly obligated to oblivion. The early literature abounds with instances in which this "vicious circle" has proved the undoing of the patient, but in the elimination of this one complication, perhaps more than in any other, has the improved technic of these later days produced the most brilliant results. We have learned conclusively that the posterior anastomosis, rather than the anterior, mitigates against its occurrence; we have learned that an intestinal loop of less than ten inches is likely to forestall any complication of this nature, and we have also learned that where, as a result of adhesions or other causes, the anterior anastomosis must be made, or the jejunal loop be longer than twelve inches, that an entero-anastomosis between the afferent and efferent loops of bowel, about four inches below the anastomotic opening, will effectually prevent any such distressing occurrence.

When, however, the vicious circle does become established, and even in the most carefully performed technic it is yet occasionally liable to happen, the symptoms are often severe, alarming, and fraught with the gravest danger. In most instances the vomiting appears within the first two or three days, though occasionally it may not supervene for several weeks. In a recent case in my own practice all went well for three weeks, the patient had returned home feeling in the best of condition, when suddenly and without warning regurgitant vomiting appeared, and almost at once became so severe that he was compelled to return to the hospital and have an entero-anastomosis performed before relief was obtained.

The quantity of ejected material may vary from several ounces to several pints, and usually appears only once, or at most twice, in the twenty-four hours. There is seldom any retching, and as a rule the act of vomiting is painless, the fluid simply pouring from the mouth without the slightest effort on the part of the patient.

Vomiting of this nature is the result of obstruction high up in the bowel. As a rule the obstruction is found in the afferent loop, which, when it is more than nine or ten inches in length, becomes "water-logged" and sags heavily from the anastomotic opening.

Among the means at our disposal for the relief of this condition, the first which should be tried is lavage of the stomach, and it is sometimes remarkable the amount of relief which may be obtained by this simple proceeding. In some instances it will entirely abolish all the symptoms. This lavage should be continued at least twice daily for several days, when, if in spite of its continuance, regurgitation continues, the abdomen should be reopened and entero-anastomosis performed between the proximal and distal limbs of the jejunum, about four or five inches

below the anastomotic opening. This will allow the over-distended proximal limb to empty itself directly into the empty and collapsed distal portion.

*Jejunal Ulcer.*—Mayo Robson has called attention to the fact that peptic ulcer of the jejunum follows with greater frequency the anterior operation, and this may, therefore, be added as still another reason why the posterior route should be invariably chosen whenever possible.

Secondary jejunal ulcer is perhaps the most serious complication which we have to meet to-day. Its occurrence is of greater frequency than the recorded statistics would indicate, and yet in comparison to the number of operations performed, its appearance would seem to be but a remote possibility. Certainly, since the posterior operation has become the one of choice, its occurrence has steadily diminished.

This secondary ulceration is found on the wall of the jejunum within a very short distance of the stomach. If not bordering on the very edge of the stomach mucosa, it will in the majority of cases lie from one-quarter to three-quarters of an inch from the anastomotic opening. Peptic ulcer of the jejunum has never been observed after operation in malignant cases. This may be due to the absence of free H.C.L. in the gastric juice. All recorded cases have followed operation for simple ulcer of the stomach or duodenum, and in most cases there has been an intense excess of free H.C.L. Four distinct varieties have been described:

- (1) The acute round ulcer, which develops very rapidly after operation. This is usually associated with hyperacidity, and may develop so quickly as to be scarcely recognizable before perforation has taken place.
- (2) In this variety the symptoms begin to appear within a few months of operation, and simulate to a great degree those for which the operation was originally performed. In several instances it has been diagnosed as a recurrence of the original ulcer.
- (3) Those falling into this category are very similar to the classic subacute perforation of the stomach. The ulcer develops insidiously, partially perforates, and gradually develops a tumor in the epigastrium, which is frequently adherent to the anterior abdominal parietes. The symptoms are unimportant at first, and in many instances they pass almost unnoticed by the patient for some considerable period of time.
- (4) The fourth and final type of ulcer is one which, by an inflammatory process, becomes adherent to a neighboring viscus, usually the stomach or colon, and finally perforates into either one or other of these organs.

The one ever-present danger in ulcer of the stomach is its exceeding great liability to gradually assume a cancerous character, when we have at once a transformation from a condition of benignity to one of deadly peril.

*Gastric carcinoma*, one of the most formidable of all internal maladies, is, in this portion of the continent at least, steadily on the increase. In order of frequency it stands second only to cancer of the uterus. There is to-day probably no pathological lesion so fatal in its ultimate results, which, at the only time when any hope for recovery can be offered, presents such difficulties in diagnosis. Many a doom is sealed before the patient becomes aware there is really anything serious the matter. The proof, however, which is fast accumulating day by day, that in at least a great majority of cases, the seed bed of gastric carcinoma is the indurated edges of an old peptic ulcer, is shedding that ray of light which may enable us more frequently in the future to discover and radically remove this dread disease, while yet there is time to effectually save life. One thing is certain, that when carcinoma in this region is discovered and radically removed in this early stage life *is* saved. To be diagnosed before metastasis commences to produce involvement elsewhere is to-day the acme of internal diagnostics, and the physician making such early diagnosis does more to save the life of his patient than the surgeon who effectually removes the disease.

Along this line of diagnosis much practical knowledge has been gained through laboratory research, but even more has been achieved by clinical and surgical methods. Surgery has conclusively taught us that at least some of the predisposing conditions may be effectually removed, and by thus operating during this precancerous state, usually a typical history of long-standing ulcer, the development of the cancerous state may be prevented. This indeed is the time ideal for operation, and thus by prevention rather than by cure may we yet succeed in blotting out to a great extent this, one of the most dreaded scourges of our race.

Such indeed is one of the various results aimed at in operation for the radical cure of gastric ulcer, but the day has not yet arrived when the diagnostician may determine which ulcer is likely to degenerate into cancer, and which not. In the meantime we must strive to so improve our diagnostic methods that we may speedily reach the time when all gastric carcinomas may be discovered and removed at a time when practically all lives may yet be saved.

*Symptoms.*—In obtaining the history of patients suffering from gastric carcinoma three distinct types may be elicited:

- (1) Those with a long history of constant gastric disturbance.
- (2) Those with a history of intermittent stomach trouble, which



may have covered many years or been of much shorter duration.

- (3) Those who have heretofore enjoyed the best of health, and whose present illness attacked them unawares, without the slightest previous warning.

The second type of history is by far the most common—the typical clinical condition presented by the long-standing chronic gastric ulcer. Many patients, especially in the later stages of carcinoma in this region, present a typical facial expression very significant of this disease. The presence of this dread malady may indeed be frequently foretold by this typical facial expression. Pallor about the mouth and nose, the face wan and thin, the eye anxious and penetrating in an endeavor to read the opinion of the physician, all combine to give that pinched look its chief characteristics.

The mental attitude as thus depicted in the features is one of hopelessness. The patient is apparently possessed of the idea of impending danger, and is usually resigned to his fate, presenting the appearance of calm dejection. Weight is lost rapidly, a feeling of lassitude and extreme weakness pervades, and anaemia quickly develops. There is often a sickening pain in the region of the epigastrium, or, rather, the feeling of a strange, indescribable distress, which may or may not be directly referable to meals. The fears of the patient, as portrayed by the anxious expression so frequently seen, are well grounded, for in every case when cancer has once developed in the stomach the condition is one of utter hopelessness unless relieved by early surgical intervention. In the absence of such intervention the progress is steadily downward, with seldom any recession in its progress.

The symptoms of gastric carcinoma will very frequently cover many years from the earliest commencement of the precancerous state to the fulfilment of the disease, cancer itself. This early history may be conveniently divided into three separate stages. The first stage is marked by a particularly good appetite, the presence of pain from two to four hours after meals, a feeling of excessive acidity, as manifested by an increasing bitterness in the mouth, and finally an occasional belching of gas and sour eructations. These symptoms will disappear entirely, and for some time the patient will enjoy the best of health, and so complete may be the apparent cure he may even entirely forget he has had any stomach disorder at all.

After several such attacks, or perchance a period of quiescence for a longer or shorter period, the second stage is ushered in. It is practically a repetition of the first, only in a more aggravated form. The vigorous appetite so noticeable at the earlier period has somewhat disappeared, the keen relish for food is lost, and the pain, so noticeable

before, now appears much earlier after meals and in a much more intensified form. Gas and sour eructations are common, and for the first time appears the vomiting of sour, bitter, acrid material, often containing food particles. This vomiting is invariably followed by a sense of great relief, so much so that many patients resort to the use of the stomach tube in order to obtain the same relief and freedom from distress. Loss of weight now commences to appear, though at the culmination of this present attack the lost flesh is rapidly regained.

The third stage is but a further aggravation of the former symptoms, and may only appear after several attacks such as that just noted. It is marked by a rapidly decreasing appetite, and in many cases an absolute fear to partake of any food at all, so great is the distress occasioned afterward by the pain, gas, sour eructations, bloating and vomiting. The period of relief produced by food becomes much shorter. The obstructive symptoms are now, as a rule, well marked. As the patient passes from one stage to the next constipation gradually becomes more obstinate. Blood appears for the first time in a test meal.

The transformation from the third stage to the presence of cancer is extremely difficult to diagnose. It is when this period is more easily read that more lives will be saved, for it is the signal indication for immediate operation. Stage three is still ulcer; stage four, dread cancer. Any peculiar marks of differentiation between stages three and four are exceedingly difficult to locate. The regurgitation, so acid and bitter in the earliest stage, loses to a great extent its apparent acidity, but becomes much more copious. Vomiting is excited more by liquid food, in this later stage becoming intensified, irregular and copious. The vomitus also contains much more frequently large quantities of blood partly digested, thus presenting the classical symptom of "coffee ground" vomiting. Gas and bloating persistently increase the patient's discomfort. Pain, which heretofore was periodical, now becomes much more constant, is of a dull, heavy, sickening character, is less localized than formerly, and will not so readily yield to pressure or the partaking of food. As cancer progresses the pain becomes more diffuse.

The whole composite picture is one which cannot fail to impress. The pale, anxious features, the pinched expression and languid air, the rapid loss of flesh, the character and persistence of the pain and vomiting, all combine in impressing the fact that the stage of ulcer has passed and cancer has at last fastened its hold upon the stomach.

*Differential Diagnosis.*—Of the surgical diseases likely to be mistaken for cancer of the stomach, gall-stones with their accompanying complications, such as duct obstruction, infections, adhesions or pancreatitis, are the most prominent; while large saddle ulcers, hour-glass

contraction, or even pyloric obstruction due to ulcer cicatrization, are more easily differentiated. Duodenal ulcer, because of its typical, clear-cut symptoms, is not likely to be confounded with cancer.

Gall-bladder disease, with its various complications, is the source of the greatest difficulty in differentiation. In the late stages of disease due to gall-stones the stomach symptoms are so truly characteristic of malignancy as to thwart even the most expert in arriving at an accurate diagnosis. The early history of the case in these instances must invariably be relieved on in solving the difficulty. If the early history reveals the presence of sudden severe attacks of epigastric pain, radiating under the right shoulder blade, such attacks ceasing as suddenly as the onset, and being in no way related to the partaking of food, the present trouble will usually be found in the gall-bladder. The early history must invariably be relied on to clear up the diagnosis, and will frequently be the means of preventing an otherwise excusable error.

In extensive saddle ulcers, or marked hour-glass contraction, the clinical picture is frequently one as though stamped with malignancy. There is often that emaciation and cachexia so significant of carcinoma. Hemorrhages are sometimes frequent, and may even present the coffee ground appearance so typically characteristic of cancer. In a condition such as this we may even have a complete absence of hydrochloric acid, and the presence of lactic acid with the Oppler-Boas bacillus, so frequently considered as positively significant of cancer.

In differentiating between such extensive ulceration and true cancer, one must remember that in ulcer the appetite remains good until quite late in the disease, and the loss of flesh and strength is consequently slow. In cancer the appetite is lost early and rapid emaciation supervenes. In cancer the pain is more diffuse, is more constant and depressing, and not so closely related to food. If a movable tumor of the stomach be discovered with the presence of lactic acid and the Oppler-Boas Bacillus, and the absence of hydrochloric acid in a test meal, cancer may, with comparative safety, be diagnosed.

Inasmuch as a definite diagnosis of gastric carcinoma may so frequently be arrived at only in the presence of an exhaustive early history, and as the associated condition is likely to be one of only three, viz.: gall-stones, gastric or duodenal ulcer, I have tabulated below some of the most important points in their differential diagnosis:

## PAIN.

Gall-stones.	Gastric Ulcer	Duodenal Ulcer.
The pain in gall-stones is sudden, sharp, severe, and intense. It commences in the right hypochondrium	Is present in most cases, but is much less excruciating than in gall-stones. It radiates from the epi-	The pain in duodenal ulcer appears in cycles ranging in time from a few days to several months. It is of a

and radiates to the right shoulder blade. It appears without the slightest warning and disappears just as suddenly. These seizures have no relation whatever to the injection of food, and are frequently accompanied by chills, fever, and sweats. Should a stone be occluding the common bile duct, periods of jaundice of longer or shorter duration will frequently follow the attacks of pain.

gastric region to the left shoulder blade. It is increased by the injection of food. The location of the ulcer may be partially determined by the period elapsing between the injection of food and the commencement of the pain. If along the lesser curvature, pain appears in from one-half to one hour. If in the prepyloric region in from one to three hours.

burning, gnawing character, and may be described as a "hunger pain," always appearing from two to four hours after meals, when the stomach is becoming empty. It is invariably relieved by food. An ulcer in the immediate pre-pyloric region will exhibit the same symptoms as one just beyond the pylorus.

#### VOMITING.

**Gall-stones**  
Frequently accompanies the intense pain, and usually gives relief. Is of a greenish color and intensely bitter.

**Gastric Ulcer**  
Is usually a prominent symptom. Occurs from one to four hours after a meal, according to the location of the lesion. These vomiting spells are usually accompanied or followed by distressing eructations of gas.

**Duodenal Ulcer.**  
Nausea and sour eructations are prominent symptoms from the first, while vomiting in the later stages is always present. Commences as a rule from two to four hours after a meal, though in some cases will appear only once a day, or perhaps only every second or third day. Gas formation is typical of ulcer either just beyond the pylorus or in the immediate pre-pyloric vicinity. Is invariably relieved by food for a period of from two to four hours.

#### HEMORRHAGE.

**Gall-stones.**  
Rare—and, if present, is only accidental.

**Gastric Ulcer.**  
Probably 60 per cent. of all cases of gastric ulcer have hematemesis, which in the acute round variety is frequently fatal. Hematemesis is, strictly speaking, not a symptom, but rather a late complication

**Duodenal Ulcer.**  
Many cases of duodenal ulcer suffer from sudden, severe fainting spells, to be followed almost immediately by blood in the stool (melaena). In this condition the stools have a tarry appearance. Microscopically blood is much more frequently found in feces in duodenal than in gastric ulcer.

#### STOMACH CONTENTS.

**Gall-stones.**  
Usually normal.

**Gastric Ulcer.**  
Usually an excess of hydrochloric acid. Blood may be found microscopically.

**Duodenal Ulcer.**  
As in gastric ulcer, hyperacidity is frequently marked. Blood is not usually present in stomach contents, but may be discovered in the feces.

## TENDERNESS.

Gall-stones.	Gastric Uleer.	Duodenal Uleer.
During or immediately after an attack, tenderness is frequently marked in the right hypochondrium. Muscular rigidity is also often present.	Is usually quite marked in the epigastrium. Is sometimes diffuse, though usually quite definitely localized.	If tenderness is present, it will be found to the right of the median line. Is marked, however, only in the presence of localized peritonitis.

The treatment of cancer of the stomach is essentially surgical. True it is that many, anxious for surgical relief, must be refused because of the extensive proportions to which the disease has already advanced; there are also many patients who refuse operation. These two classes must be treated palliatively. To the other class, those whose diagnosis is made at a comparatively early period, while yet there is prospect of cure, and who are willing to undergo the risks of operation, surgery will indeed offer good prospects for a long lease of life. Surgery offers the only hope of cure, and the great problem before the medical profession to-day is to evolve some means of arriving at an early and accurate diagnosis, so that surgical intervention may more frequently be instituted at such an early period as to ensure the saving or prolonging of many useful lives. To the man who may thus evolve such a method of early and accurate diagnosis the world will indeed owe one of its greatest debts of gratitude.

Any operation for the radical cure of cancer of the stomach involves in every case the removal of a greater or lesser portion of the stomach wall. In planning the effectual removal of malignancy in this location, several factors must enter into the consideration of each individual case. In the first place the conception of the modern technic is based on the location of the lymphatic glands and the consequent direction of the lymph currents in the stomach wall. On the observance of this fact more than on any other will depend the freedom from recurrence, our highest aim when effecting such a removal. Then again, the involvement of the duodenum is much more frequent than was hitherto supposed. Heretofore it has been the popular opinion that the instant the involvement reached the duodenal wall the disease was abruptly cut short, but recent researches conducted by Borrmann have shown that in at least one case in every three the disease does not stop there, but continues to invade the duodenum. Hence the necessity of making it an invariable rule to remove at least from one to one and a half inches of the duodenum in all cases of cancer involving the pylorus.

The lymphatic drainage of the stomach stands as the most important consideration when deciding on the lines along which resection must take place. Cuneo has exhaustively studied this question from an experimental standpoint, and to him we are indebted for much of our

knowledge relating thereto. According to his observations, the gastric walls are supplied with two sets of lymphatics, the one draining the mucous and the other the muscular layer. The general trend of the lymphatic stream is toward the right, except at the fundus, where it flows in the opposite direction.

There are in the stomach three separate and distinct areas, each of which is drained by a separate chain of lymphatics. A line drawn from the apex of the fundus to the centre of the pylorus along the juncture of the middle and lower thirds of the stomach wall, and another from the centre of the greater curvature perpendicularly upward to meet the former line, will serve to make out these three areas. From the upper area all lymph vessels flow to the glands along the lesser curvature and to those around the cardia. From the lower right area the drainage is to the glands along the greater curvature and around the pylorus. The glands around the spleen absorb all drainage from the lower left area of the stomach.

It is thus obvious that not only must the growth itself be removed, but also the lymphatic vessels which drain the region, with the primary glands into which they drain. The primary glands liable to become infected in a case of gastric carcinoma are:

- (1) The *Coronary chain*. This comprises a series of half a dozen glands placed along the course of the gastric artery and some of its branches. They receive the lymph from the upper two-thirds of the stomach, and thus from their position along the lesser curvature right up to the cardia necessitate a wide resection when they become involved.
- (2) The *Suprapyloric gland* or glands lie immediately above the pylorus, and in the immediate vicinity of the pyloric artery.
- (3) The *right gastroepiploic chain* is comprised of two clear and distinct glandular groups.
  - (a) The *subpyloric chain* comprise a series of from three to six glands, and lies between the layers of the great omentum immediately beneath the prepyloric zone of the stomach. They are seldom found in the region of the greater curvature, and never in the region of the fundus. These glands receive the lymph from the interior portion of the pyloric end of the stomach, and also from the upper portion of the great omentum, consequently their removal is not so important as if they drained the region of the lesser curvature, the usual seat of malignancy.
  - (b) The *retropyloric chain* is situated along the gastro-duodenal artery, forming a continuation of the subpyloric below and

the coronary above. It is composed of three or four glands which lie along the upper border of the pancreas and immediately behind the pylorus. The presence of this chain is not always constant, but when present is invariably infected. Their lymph supply comes from the posterior surface of the pylorus, the subpyloric group and the first portion of the duodenum.

The technic of pylorotomy is therefore essentially founded on the following three cardinal points:

- (1) The metastatic connection between the stomach and the duodenum is limited, therefore infection is not liable to advance very far into the intestine.
- (2) Metastasis from cancer at the pylorus first invades the glands along the lesser curvature, then the subpyloric group at the extreme right of the greater curvature.
- (3) Since there is practically no lymphatic connection between the pylorus and the dome of the stomach, this latter portion is usually free from infection.

It will therefore be noted that:

- (1) The duodenum may be saved to within one or one and one-half inches of the pylorus;
- (2) That the whole of the lesser curvature with the coronary chain of glands, and the prepyloric portion of the greater curvature with the subpyloric glandular group, must invariably be removed; and
- (3) That the greater portion of the greater curvature, with the entire dome of the stomach, may be saved.

To recapitulate:

- (1) Cancer of the stomach begins as a purely local affection. At first it is confined to the part in which it begins to grow.
- (2) If removed at an early period, it can be cured.
- (3) Unless removed early, it can only end in death.
- (4) Cancer is often present without pain. In some cases pain appears only in the late stages of the disease.
- (5) Ulcer of the stomach predisposes to cancer. In a great majority of all cases of gastric carcinoma the seed bed can be shown to be the indurated edges of an old peptic ulcer.
- (6) The best time to effectually attack the disease is in the precancerous state—the ulcer stage. Thus by prevention rather than by cure will the greatest triumphs in the treatment of this disease be attained.

*After-Treatment and Complications.*—Were it possible that all

danger had passed with the successful conclusion of an operation surgical science would be nearing that perfection for which we never cease to strive; but it is an unfortunate fact that as yet we still have to pass through that period of anxiety coincident with convalescence. In the vast majority of cases, however, recovery is uninterrupted, but occasionally sequelae arise which may seriously threaten even life itself.

Even the most minor operations in which a general anaesthetic has been used are not free from subsequent disturbances, but may cause the patient much discomfort by constant nausea and vomiting, severe pain, extreme nervousness or even persistent hiccough. I remember one patient only a short time ago, who, after a minor operation, was seized with hiccoughs, which for one week remained persistent and severe, and at one time seriously threatened his life. In another case in the practice of a confrere a young woman of twenty years, perfectly strong, robust and healthy, gave birth to her first baby under chloroform. Within a few hours persistent hiccoughing developed, and in spite of all treatment ended fatally. Without doubt this condition in both of these cases was directly due to the anaesthetic.

Atony of the bowel, producing tympanites in all degrees of severity from a mildly rounded abdomen to enormous distention, is liable to follow any intestinal work where there has been considerable manipulation. Prolonged exposure of the viscera or an unusual degree of hemorrhage will frequently be the cause of prolonged shock, from which it may require all the recuperative powers of even the most robust to effectually rally.

The insecure tying of a ligature may be the cause of a fatal post-operative hemorrhage. The use of insecure ligature material may also be productive of the same result. An instance of this kind is vividly recalled to my mind. Some years ago I was assisting one of Canada's foremost surgeons do a hysterectomy. In tying off the ovarian artery he used a strand of No. 2 chromic catgut, *remarking at the same time his belief that it would hold*, because there appeared to be so little tension on it. Until the following morning, eighteen hours after the operation, everything was favorable, and in no way could her condition be improved upon, when suddenly she began to complain of pain in the side, and at the same time the nurse observed a rise in the pulse rate. From this time onward the pulse steadily increased in rapidity, gradually becoming more and more thready, until at four in the afternoon, thirty hours after the operation, she passed away. On reopening the abdomen post-mortem, the ligature on which there had apparently been so slight a strain had given way and the unfortunate patient had slowly bled to death.



Another eminent surgeon once told me that he attributed his success to the fact of his always being prepared for any emergency in any abdominal or other operation. *Preoperative preparation for any emergency liable to occur during operation* is only equalled in its importance by the thorough performance of the surgical work itself, thus insuring as far as possible against any post-operative complications. In many instances these complications may be avoided by more careful technic. In the instance above referred to, a ligature of silk or linen thread would not have slipped, and the life in question would have been spared. The knowledge of having performed each successive step of the operation by the most approved technic will be a matter of great satisfaction to the surgeon, and be his best guarantee against complications, thereby lessening the mental strain during these first few post-operative days on which sequelae are liable to arise.

The early detection and skilful treatment of any arising complication is frequently just as important as the operation itself; consequently the man in whose hands the case is left post-operative will occasionally find himself face to face with a responsibility only equalled at an earlier period by that of the operating surgeon.

If all goes well, the after-treatment is simple. Only ordinary care must be exercised to insure a splendid result in most cases. The general lines of treatment are the same as those indicated after gastro-enterostomy. But in at least a small percentage of cases the road to complete recovery is not just as smooth as one would wish, and we are liable to become confronted with one or more serious complications. These are, of course, much more infrequent than of old, when the technic was in a state of evolution, but even yet, with the present-day technic, certain sequelae are liable to arise which may seriously jeopardize the life of the patient. The most important complications for which we may be prepared are shock, hemorrhage, vomiting, tympanites, peritonitis and acute obstruction of the bowel.

*Shock*, the most common complication following surgical interference, is usually observed either during or immediately after the operation, and may be produced by one of three causes, extensive trauma, prolonged exposure of the viscera and intestines, or loss of blood. Trauma, by producing a profound impression on the nerve centres, will invariably produce the greatest degree of shock, and, because of this impression on the central nervous system, causes more anxiety to the attending surgeon than that produced by either of the other two. Prolonged exposure of the viscera or intestines produces shock only by the radiation of heat, and consequently is more easily dealt with.

Excessive loss of blood in a robust person, or even a moderate loss in a patient already anaemic, will not frequently produce serious collapse.

The extent of shock likely to be produced by any given trauma is difficult to forecast. A long operation accompanied by extensive manipulation may be productive of but the slightest degree, while, on the other hand, a very short procedure with scarcely any manipulation at all, may produce a deep impression on the nervous system. The same may be true with loss of blood, only to a lesser degree. A small hemorrhage may be the cause of considerable shock, while an extensive loss of blood may not produce nearly so much as would appear consistent with the amount of blood lost. As a general rule we may say that loss of blood is attended by shock of a lesser degree, and that it is more rapidly recovered from than that produced by extensive traumatism. While any one of these conditions may independently of each other produce a condition of prolonged collapse, any two or all of them acting in combination will produce a condition from which the patient may fail to rally at all.

*Symptoms.*—The symptoms of shock will vary more or less with the temperament of a patient. A highly strung, nervous, excitable person will manifest the effect of trauma in a much more marked degree than the less excitable, phlegmatic individual. One of the characteristic features of this condition is the almost immediate culmination of the distinguishing symptoms, and we have at once a clinical picture complete.

An increase in the pulse rate of from thirty to fifty beats, accompanied by marked pallor and a cold and clammy skin during the operation, indicates the rapid onset of shock, and demands the urgent attention of the anaesthetist. The operation is completed as rapidly as possible, and the patient placed in a bed previously heated to a high degree. Consciousness is regained slowly, he lies on his back helpless, unable to move, scarcely able to utter a sound, pays no attention to what is transpiring around him, and appears utterly oblivious to the gravity of his condition. The face is pale, the features are pinched, the nostrils are dilated, the body is bathed in a cold and clammy perspiration, the pulse is almost imperceptible, and is small, wiry, thread-like and often intermittent. After the initial rapidity it will often drop to fifty, or even forty, beats to the minute. The respiration becomes irregular, sometimes deep and prolonged, then again superficial, frequent and scarcely perceptible. The body temperature becomes subnormal.

In recovery, all the vital functions gradually begin to show signs of a general reaction. The temperature rises, the pulse becomes stronger and more regular, the respirations are deeper, the color improves, and the general expression becomes brighter and more natural.

*Diagnosis.*—A diagnosis is usually not difficult when the condition is pronounced, and, following an operation, must lie between shock, syncope, and chloroform asphyxia. Syncope is much more sudden in its onset, is transient, and produces at least momentary loss of consciousness. In chloroform asphyxia the onset is also sudden, the face becomes ashen white, the pupils dilate and the pulse entirely disappears. These symptoms will be promptly relieved by lowering the head, withdrawing the tongue and resorting to artificial respiration. In shock the onset is gradual and, in marked contradistinction to the other two conditions, all resuscitative measures act very slowly indeed.

*Prognosis.*—Those cases which recover usually begin within the first few hours to show promising symptoms in the form of a rise in temperature, return of color to the lips and face, deeper respirations, and a desire to change position and take notice of what is transpiring around them. These symptoms frequently develop within the first few hours, but if delayed beyond twenty hours the prognosis becomes very gloomy indeed. A persistently low temperature is a very grave symptom, and one which falls to  $96^{\circ}$  or below offers but the poorest prospect for recovery. On the other hand, should the temperature suddenly rise to from  $102^{\circ}$  to  $104^{\circ}$  and be accompanied by delirium, the case will almost invariably prove fatal.

*Treatment.*—The first consideration and primary principle in the treatment of shock is to aim to avoid it if possible, and for this reason an operation should never be performed in a cool room. The most satisfactory temperature is from  $75^{\circ}$  to  $85^{\circ}$  F. Surgical interference on a weak and debilitated patient should be deferred until such time as he may be strengthened by regular nourishing diet, tonics, etc., unless by such waiting the disease is making too rapid progress. He should be kept as warm as possible by having the extremities wrapped in blankets and, if necessary, hot water bottles placed at the feet and between or beside the lower extremities. If it is found necessary to lift the omentum or intestines out of the abdomen, they should be wrapped in gauze wrung out of normal saline solution at a temperature of  $110^{\circ}$  F., and should be frequently wetted with the same solution at the same temperature. Extreme care must be taken to avoid all loss of blood by promptly clamping or ligating all bleeding points. As general anaesthesia is frequently a potent predisposing factor in the production of shock, all preparations for the performance of the operation should be completed before the commencement of the anaesthetic, and then the patient kept under its influence for as short a time as possible.

*Immediate Treatment.*—When, in spite of all preliminary prophylaxis, shock develops, a reaction must be established as quickly as pos-

sible, though at the best all treatment must of necessity be purely symptomatic. As a rapid cardiac stimulant, brandy and strychnine have not lived up to the reputation they once possessed. It is not so very long ago since brandy M. 30 and strychnine sulphate gr. 1/30 were given hypodermically immediately there was any indication of shock, and followed up by the administration of the same quantity of brandy and strychnine gr. 1/60 every hour until twitching of the muscles or stiffness of the jaws was observed. The indiscriminate use of strychnine in this connection cannot be too strongly deprecated, as it has been clearly demonstrated that its administration is of doubtful value, except, perhaps, in cases of collapse due to mental impression. Probably the safest and most reliable drug used in this connection is adrenalin chlorid. Of the 1-1000 solution M10 may be given hypodermically every hour until a beneficial effect is indicated by the pulse or respiration. In cases of profound collapse, as high as M20 or even M30 may be given, though the effect of each administration must be closely observed, and the dose reduced as soon as any response begins to be manifested.

Hypodermic injections of sterilized camphorated oil is highly recommended by some surgeons, and I have experienced exceedingly beneficial results from twenty minims administered by this method every fifteen minutes until four doses are taken. Just a word at this point in regard to the administration of a hypodermic. Very little benefit will be derived by injections into the legs or arms where the circulation is almost at a standstill, but should be given in the deep tissues over the chest or abdomen. The old method of merely running the needle along under the skin will be much less beneficial than were the needle injected at right angles to the skin, and at least one half inch deep.

*Enteroclysis.*—By this term is meant the administration of nutritive or stimulating enemata, and has been practised for many years. With the lower bowel already cleansed, an enema consisting of *brandy* two ounces, *carbonate of ammonia* twenty grains, and sufficient beef tea at a temperature of 100F. to make an eight ounce mixture, will, in case of moderate shock, prove beneficial. Hot normal saline solution given every three or four hours in quantities ranging from one pint to a quart, is very satisfactory treatment indeed, but the best way to administer normal saline solution is that devised by Murphy, of Chicago, in which he gives it continuously. A fountain syringe is hung about six inches above the level of the bed and the nozzle of the tube introduced into the rectum. This height is usually sufficient to allow but a drop at a time to pass, and this process is kept up continuously, being allowed to flow only as fast as it will be taken up by the bowel. Several instru-

ments have of late been devised for giving a continuous saline, but none appear to give any better satisfaction than the method just described.

*Hypodermoclysis.*—The injection of a stimulating solution, usually normal saline, beneath the skin, is less frequently indicated than formerly. Absorption is necessarily slow, in fact, much slower than will be obtained from the mucous membrane of the bowel. There is also the added danger of inducing pressure necrosis to the surrounding soft parts by the injection of too great a quantity at one spot. One half pint in a place should never be exceeded, and even this quantity will make the skin tense and hard. In case of moderate shock, this method is still popular, and no doubt is very effective. Massage of the parts should always succeed the injection, thus assisting absorption.

*Infusion.* The introduction of normal saline solution into the circulation in order to increase the blood pressure, is a very valuable remedy indeed. It must be carried out under the strictest aseptic conditions. It is better to open a vein at some distance from the site of operation, one of the large veins of the arm being preferable. A bandage is tightly wrapped about the arm to render prominent the vessel to be opened. After thorough disinfection of the skin, the vein is exposed and isolated from its surrounding structures, and a fine linen ligature passed around this vessel and tied securely. Another ligature is now passed around the vessel at a point about one inch proximal to the first ligature, and left untied. This second ligature is nearer the heart, as the saline flow must be invariably introduced in this direction. The bandage is now removed from the arm, and the vein transversely incised by a pair of seissors for about one half of its circumference, and a cannula attached to the tube of a fountain syringe suspended about three feet above the level of the bed, introduced into the vessel, the loose ligature tied with a knot over it, and the flow allowed to proceed. To obviate the possibility of air entering the vein, it is well to have the fluid flowing freely from the canula as it is introduced. When a sufficient quantity, usually from one pint to a quart, at a temperature of 118F. has been received by the vein, the canula is withdrawn and at the same time the knot on the vein is tightened and tied securely, and the skin wound closed.

Various solutions have been used from time to time. In a private home one heaping teaspoonful of ordinary sterile table salt to a quart of sterile filtered water will answer very well. In our hospital the following formula is kept prepared and ready for use:—

℞ Sterile filtered water .....	32 oz.
Sodium chlorid .....	1½ drams.
Sodium carbonate .....	15 grains.

An exceedingly useful ingredient may be added to either of these formulae, in the form of one dram of adrenalin chloride (1-1000) to the quart of saline solution. Its action when administered in this manner is very prompt, and strongly recommends its use.

*Needling the Artery.*—In cases of great emergency during an operation it may become necessary to raise the blood pressure, when time becomes the very essence of success. An ordinary hypodermic needle of large calibre is attached to the tube of a fountain syringe. An artery is picked up and isolated, the needle introduced directly into its lumen, and the saline solution to the extent of one to two pints allowed to enter. The possibility of the accidental introduction of air into the artery is obviated if the syringe is elevated at least 6 inches above the table, and the solution allowed to flow during the introduction of the needle. Should the vessel bleed on the withdrawal of the needle, an ordinary pair of haemostatic forceps will readily control it.

*Transfusion.*—The direct transfusion of blood from one person to another has been made not only possible, but perfectly safe, by the experiments and technic devised and elaborated by Dr. Crile, of Cleveland. Shock, as a result of the direct loss of blood, will consequently be benefited to a greater extent by the direct introduction of blood into the depleted circulatory system, than by any other means. To accomplish this safely, it becomes necessary to preclude the possibility of clot, and this can only be done by attaching the vessel of the donor to that of the recipient in such a manner as to prevent leakage and make continuous the intima of one blood vessel with that of the other.

The instruments required for making this anastomosis comprise a specially prepared canula, scalpel, scissor, blunt dissector, very fine mosquito haemostatic forceps, special forceps for compressing the blood vessels, fine linen thread and a needle for closing the skin at the conclusion. This canula is made in various sizes to accommodate the various sized vessels which may be brought into use. The kind I prefer is simply a straight steel barrel about one inch in length. On one end there is a small handle at right angles to the barrel, which may be readily grasped by a pair of haemostats, and dividing this barrel into thirds are two grooves.

The donor and recipient are placed on separate tables so that their left arms may lie closely together on a table intermediately placed. Experience has proved that in the majority of cases it is best to open the radial artery of the donor and the median basilic vein of the recipient. When these vessels have been dissected free from their surrounding structures, a ligature is thrown around each and tied securely. A pair of arterial compression forceps is now applied a short distance proximal

to each ligature, care being exercised to bring the pressure only to the point where the flow is checked, and not exerted beyond this for fear of injuring the vessel walls. The artery and the vein are now each divided between the forceps and the ligature, and the distal end of each, containing the ligature, dropped back into the wound.

The handle of the canula is now grasped by a pair of haemostats, a ligature passed through the end of the vein, this ligature then drawn through the lumen of the canula, and by means of traction on it, the vein drawn through also, so that it projects slightly beyond. The vein is now turned inside out backward over the end of the canula, thus forming a cuff, and tied around the groove nearest the handle. The artery is next drawn over the canula on top of the vein cuff and tied in the first groove, and the anastomosis is complete. The forepressure is now relieved from the vein first, then from the artery, and circulation is immediately established. At the conclusion of the treatment, each vessel is ligatured, cut off and dropped back into the wound, which is now closed.

As to how long the anastomosis should be allowed to continue, no definite rule can be exercised. This will depend entirely on the condition of the donor and the recipient, which should be carefully watched, and the responsibility of its discontinuance rests entirely with the operating surgeon. It may be said, however, the main symptoms to watch for in the donor are loss of color in the mucous membranes, uneasiness, a slightly increased pulse rate, and a decrease in arterial tension. When these symptoms become progressively marked, the anastomosis should be immediately stopped. In the recipient the chief danger to avoid is acute cardiac dilatation, caused either by transfusion at too rapid a rate of flow, or in excessive amount. This condition is particularly liable to occur in persons suffering from some organic cardiac complication, or perchance one who has become greatly weakened and the system depleted by a long or severe illness. The rate of flow can be steadily controlled by the finger on the artery of the donor, at a point slightly proximal to the point of anastomosis.

*Post Operative Hemorrhage.*—Secondary hemorrhage, one of the most frightful of accidents, is fortunately of very rare occurrence. It is usually caused by either the slipping of a ligature or capillary oozing, though occasionally the pressure of a drainage tube against an important vessel may produce sufficient necrosis to cause a large hemorrhage. The slipping of a ligature is usually the result of dividing the vessel in too close proximity to the ligature, or occasionally to a defective knot. After a ligature has been tied, care must be exercised to put as little traction on it as possible, else it may become loosened and subsequently

slip. Extensive oozing is directly due to the separation of adhesions.

*Symptoms.*—The rapidity of the symptoms will develop in proportion to the activity of the hemorrhage. When sudden bleeding occurs from a large vessel, pain radiating over the abdomen will be experienced at once, the pulse becoming quickened and very much diminished in volume. The skin becomes cold and clammy, with an increasing pallor. Sighing respirations are accompanied by a distinct restlessness. The pain in the abdomen continues. Vomiting sometimes occurs, and is occasionally persistent.

*Treatment.*—The indications for treatment are perfectly clear. The hemorrhage must be controlled, employing if necessary the boldest and most heroic methods. On symptoms of extensive hemorrhage appearing, the abdomen must be immediately reopened, the bleeding point searched for, located and controlled. Should this be a slipped ligature, the vessel will be re-tied; the abdomen sponged dry and closed. Should the cause prove to be extensive oozing, the part must be firmly packed, and this packing left in situ for at least forty-eight hours. After a severe hemorrhage, it is always well to bolster up the blood pressure by the infusion of from one to two pints of normal saline solution into the circulation. By this means the crisis is tided over in safety.

When hemorrhage occurs subsequent to an operation on the stomach, it can only be from one source, the cut edges of the stomach or jejunum where the anastomosis is made. If proper care is exercised in making the anastomosis, no fear of subsequent hemorrhage may be entertained. The inner, overlapping, through- and-through suture, drawn tight, will effectually control all bleeding from the cut surfaces of stomach or bowel. The most sedulous and painstaking care must be exercised in all stages of the operation, and this, more than anything else, will mitigate against any subsequent sequelae which otherwise might supervene.

When, however, hemorrhage does occur in any considerable quantity, the stomach should be immediately irrigated with normal saline solution as hot as can be conveniently borne. This is followed by the administration of adrenalin (30 minims of the 1-1000 solution) in a couple of drams of water every half hour until six or eight doses have been taken.

*Vomiting.*—Simple post operative vomiting, if not one of the most dangerous, is certainly one of the most distressing of symptoms. Although following to a more or less extent the administration of an anaesthetic at any time, it is only liable to become severe or persistent or excessive when a patient has been under such influence for some considerable length of time. That the nausea is due directly to the narcosis, and



not to the operation itself, is shown by the fact that it is present in as high a percentage of cases where anaesthesia is produced for the purpose of making a complete physical examination, as where some definite operation has been performed. The element of personal idiosyncrasy enters largely into each individual case. Where one person may be able to endure complete narcosis for a lengthened period without inducing the slightest gastric disturbance, the next, as the result of only the slightest degree of anaesthesia, may be the victim of excessive vomiting.

The condition of complete narcosis is produced in no small degree by the presence in the blood of certain toxic substances. In the majority of patients these are thrown off completely by the lungs, kidneys and skin, but in others the gastro-intestinal tract becomes an important eliminative channel, hence producing nausea to a greater or lesser degree.

*Treatment.*—As a prophylactic, a hypodermic of morphia, gr.  $\frac{1}{4}$ , and atropine, gr. 1-100, given an hour before the operation, will sometimes be the means of avoiding a troublesome nausea afterwards. With this object in view, some surgeons use it as a routine treatment. My own objection to this routine administration of morphia before operation, is that it interferes with the pupil of the eye, and consequently makes more difficult the administration of the anaesthetic.

For at least twelve hours after operation, the stomach must have absolute rest. The *rational* of this is readily recognized, when we remember that the gastro-intestinal tract, during this time, is playing its part in the elimination of toxic elements produced by the narcosis. There is usually, however, no contra-indication to the administration of a teaspoonful or two of hot water at frequent intervals. This is exceeding grateful to the patient, and, moreover, may assist in quelling the nausea by its diluent action on the offensive material already in the stomach.

If, after a few hours, there is no improvement, it is well to make a definite attempt to control the nausea by means of gastric lavage, which is probably the most reliable remedy in cases of obstinate nausea, and in every case where vomiting continues beyond a few hours I would strongly recommend its use. The stomach should be thoroughly washed out with either a normal saline or saturated boric acid solution. If much offensive material has already collected in the stomach, this lavage may have to be repeated two or three times, but the cases are few and far between where this will not give complete and permanent relief.

If lavage should fail the nausea may be controlled by medication. *Tincture of capsicum* in three or four minim doses given in a teaspoon-

ful of hot water is sometimes beneficial. *Spirits of chloroform* given at frequent intervals in the same manner will often have a good effect. *Subnitrate of bismuth* with *cerium oxalate* in small doses frequently repeated, has worked well in many cases. *Iced champagne* has been freely recommended, and in several cases in my own practice I believe it saved the life of my patient.

The medication which in the majority of cases I have found to give the best results is *dilute hydrocyanic acid*. It may be given in the following form:—

℞ Acid hydrocyanic dil. . . . . 1 dram.  
 Aq. Laurocerasi ad. . . . . 2 ounces.  
 Sig. Thirty minims every half hour until stomach is settled.

*Cocaine* in the two per cent. solution in a ten to twenty minim dose, will frequently settle the stomach completely. *Chlorotone* in ten grain doses sometimes acts well. *Counter irritation* to the stomach in the form of a weak mustard plaster will occasionally give very beneficial results.

In all cases it is best to withhold all food by the mouth until such time as the stomach is thoroughly settled, and there are no more evidences of nausea. Nutrient enemata are easily assimilated if the bowel is previously prepared by a cleansing enema, and, if necessary, be relied on exclusively for two or three days. A very good formula is the following:—

One egg;  
 One-half ounce of brandy;  
 Three ounces of peptonized milk;  
 A little table salt.

Thirst may be relieved by a pint of normal saline solution thrown high up into the bowel.

*Tympanites*.—Extreme abdominal distention from atony of the bowel may follow even the simplest of abdominal operations. In cases of greater severity, where, for instance, a gangrenous portion of intestine may have been resected, or where purulent peritonitis is present as the result of a perforated appendix, gall-bladder or stomach, the loss of tone in the bowel may become such that the distention will be the direct cause of death. Death will occasionally occur from paralysis of the diaphragm as a direct result of the intense pressure from an enormously distended intestinal tract. In any event this complication is frequently one of the most distressing which may follow an abdominal section. If there is no acceleration of the pulse rate, nor fever, nor constipation, nor vomiting, it is probably the result of simple atony,

which will readily yield to appropriate measures; while the presence of fever, of constipation, of vomiting, or a rapid pulse would indicate the onset of peritonitis.

*Treatment.*—The application to the abdomen of hot turpentine stupes so widely recommended but a few years ago, has not been productive of the good results so much anticipated, so that the practice is now falling somewhat into disuse. Turpentine enemata, however, are exceedingly beneficial, and when given high in the bowel will usually relieve the patient of large quantities of gas. The best method of administering turpentine by bowel is by either of the following formulæ:

℞ Turpentine, 2 drams;  
White of one egg;  
Hot water ad one pint.

or

℞ Turpentine, 2 drams;  
Hot water soap suds ad one pint.

A rectal tube should be passed at least twelve to fourteen inches into the bowel, and either of the above preparations allowed to pass through it from the nozzle of a fountain syringe suspended some feet above the bed. In cases of minor flatulence small doses of turpentine by mouth will occasionally assist the expulsion of gas. Doses of five to ten drops on a little white sugar will usually be sufficient, though more may be given if necessary.

If possible the bowel should invariably be opened and evacuated by a copious draught of sulphate of magnesium. It is best to give half an ounce of the sulphate in two ounces of hot water. If in three hours this has not been effectual, it should be repeated.

When the magnesium by mouth and the turpentine by bowel have either individually or in combination been unsuccessful, a very efficient remedy is what is popularly known as the 1-2-3 enema. It consists of:

℞ Mag. sulph. . . . . 1 ounce.  
Glycerine. . . . . 2 ounces.  
Aqua. . . . . 3 ounces.

making a six-ounce mixture in all. This is introduced hot into the rectum as high as the rectal tube can be passed. The forefinger should always be well oiled and passed into the rectum to guide the end of the tube through the ampulla and into the upper bowel, else it is likely to become coiled up in the ampulla, and the injection never reach the upper bowel at all. This should always be done whenever the restal

tube is passed for any purpose whatever. I must say that of all the remedies for relieving distress due to excessive distension, I have found the 1-2-3 enema to give the best results.

The administration of ox-gall in the form of a high enema has frequently given splendid results. Used in the following formulæ it can be relied on in many cases.

℞ Ox-gall. . . . .	2 drams.
Glycerine. . . . .	2 drams.
Turpentine. . . . .	4 drams.
Aqua ad . . . . .	1 pint.

*Peritonitis.* Post operative peritonitis is fortunately becoming much more uncommon than of old. It is not so very many years ago that this complication was of very frequent occurrence, but the advances in technic and after treatment have been so great in recent years, that this once most dreaded of all sequelæ is being rapidly shorn of its terrors. One is well within the mark in stating that up until within the last five years, post operative septic peritonitis claimed more victims than all other sequelæ combined. During the past five years the mortality from this cause has year by year been so perceptibly and persistently reduced, that now we look for its occurrence scarcely more frequently than ileus or hemorrhage or profound shock. Whenever it does appear and become general, it carries with it the gravest danger to the patient, because at the present time there is no post operative sequelæ offering a more grave prognosis. In the majority of cases this condition is present prior to operation, and operative interference is undertaken in the hope of removing the cause.

Where septic peritonitis is entirely post operative, it is the result of either introducing some infection into the abdomen during operation, or contaminating the peritoneum by some localized infection within its limits. Either of these is due to faulty technic. The first is easily prevented by the proper preparation of the patient, the instruments, the assistants, and the operator himself. The second is much more difficult, as will be readily understood when we consider the difficulty which is occasionally experienced in approaching an acute suppurative cholecystitis, an acute suppurative pyosalpingitis, or an acute appendix greatly distended with pus. In one case of the latter description, I was only able to protect the peritoneal cavity from infection by first aspirating the acutely distended appendix and through the aspirating needle withdrawing all the pus, then closing the aspiration aperture by fine

Lembert sutures and dissenting the organ free from its bed. Had an attempt been made in any other manner, rupture would certainly have occurred and infection been inevitable. As it was, the abdomen was closed without drainage, and an uninterrupted recovery ensued. On several occasions I have been compelled to follow the same technic in cases of suppurative pyosalpingitis. The comparative infrequency of septic peritonitis of a purely post operative character is due solely to the prophylaxis obtained by the great advances made in technic.

*Symptoms.*—The diagnosis of acute septic peritonitis is not always an easy matter. It may readily be mistaken for simple traumatic peritonitis, or for acute obstruction of the bowel. The main symptoms, however, are, as a rule, outstanding and clear, and quite characteristic enough to make a typical clinical picture. The patient will frequently pass the first two or three days without the appearance of any untoward symptoms, then he will commence to complain of sudden sharp stabbing pains in the abdomen. These attacks are intermittent and severe, and as the case progresses in severity, the pain entirely disappears, leaving in many cases of the general diffuse variety, no pain at all. Tympany is usually present. In the milder forms it is frequently excessive, and may occasionally remain so even in the severest variety, though as a rule in the latter condition it is often absent. Accompanying the peritonitis at its onset, is tenderness which increases in intensity as the peritonitis does in severity, until in the severest form the tenderness is excessive. Vomiting is frequent and protracted. The temperature usually runs a high course and shows no tendency to fall, the pulse is feeble and rapid, with a tendency to steadily increase in rate. In the milder cases it runs from 120 to 130, and in the more acute conditions to 160 and above, according to the severity of the case. The vomit is at first brown, becoming darker, until finally it is black. The general appearance is that of a patient extremely ill, the facial expression is pinched and anxious, and as dissolution draws nigh, the mind becomes cloudy, and there is a tendency to gradually drift into delirium.

*Prognosis.*—The prognosis in septic peritonitis is invariably bad, although the degree of gravity will depend on the extent and character of the infection. If the whole of the peritoneum is involved, it will almost invariably end fatally, even though the character of infection be of lesser virulence. If the pus shows the presence of streptococci, even though the area of infection be limited in extent, the prognosis is far more serious than in a case of much more extensive infection from the colon bacillus. A microscopical examination of the pus should invariably be made, and according to the presence of streptococcus or colon bacillus will the prognosis be of the gravest order or somewhat more

hopeful. One thing is certain, and that is a large percentage of cases of general diffuse septic peritonitis end fatally, no matter what the character of the infecting medium may be.

*Treatment.*—In probably no department of abdominal surgery have the advances been so great in recent years as in the treatment of septic peritonitis. Where only a few years ago the prognosis was almost invariably fatal, a large percentage are now rescued from the doom which heretofore would have awaited them to a certainty. No small portion of the credit for bringing about this transformation is due to the late Dr. Fowler, of New York, and Dr. Murphy, of Chicago. A combination of the treatment instituted by these two men has wrought marvelous results.

*Medical Treatment.*—On the appearance of the first symptoms of peritonitis, the immediate indication is to secure a thorough evacuation of the bowels. In securing this result medicinal agents are of doubtful utility, owing to the persistence of the vomiting. After lavage of the stomach, calomel may be retained, and of the various medicinal agents in use, it will probably offer the best prospects for success. Castor oil, to those who have no repugnance for it, will sometimes produce excellent results, when all other measures fail. In several instances I have proved this to be the case.

The value of eserine given hypodermically is in these cases of doubtful value, though on several occasions I have used it with decided success.

Atropine has its advocates, and doubtless is not without value in these cases of intestinal paresis.

Gastric lavage is decidedly beneficial. It removes from the stomach all accumulated offensive material, thus greatly comforting the patient and leaving the stomach in a condition to accept and retain any medication which may be administered.

*Enemata.*—Any of the various enemata discussed under the heading of tympanitis, will prove of decided value in reducing tympanites in these cases. Personally, however, I have obtained more direct value from the 1-2-3 than from any of the others.

*Drainage.*—The placing of an efficient drain (a gauze cigarette is best) into the peritoneal cavity in such a manner as to guard against the further accumulation and absorption of septic material is at all times very necessary and important, though I cannot speak too strongly against the routine practice of reopening the peritoneal cavity as soon as septic peritonitis may be suspected. The question of when to open, and when not to, is a matter of serious responsibility to the surgeon, and of great import to the patient. Any definite and fixed rules are

useless, though on evidences of the accumulation of septic products with a tendency to localization, it is always well to provide an avenue of escape.

*Combined Fowler and Murphy Treatment.*—The treatment first instituted by Fowler, and later elaborated by Murphy, had for its primary object the drainage of the peritoneal cavity, and the subsequent prevention of absorption of toxic products. This treatment has been concisely described as follows:—

- (1) "Drainage of the germ-impregnated fluids into the pelvis, where absorption is least active, and away from the diaphragh, where absorption is most active, thus tending to diminish systemic infection. This is accomplished by means of the Fowler position.
- (2) Drainage of the pelvis to prevent stasis and accumulation of the peccant matters, which is in furtherance of the same object. The drainage is effected through tubes usually introduced through a suprapubic incision, to the bottom of the pelvis, though on occasions the drainage may be effected through the vault of the vagina.
- (3) Surcharging the lymphatics with a saline solution to prevent their taking up and conveying into the general circulation the poisonous products of the pathogenic germs themselves. This is effected by rectal installation."

If septic accumulation shows indications of localization, a drainage tube should be introduced at that point; if the septic peritonitis is of the diffuse variety, with no tendency to localize, drainage should be established to the bottom of the pelvis, where in the Fowler position the septic fluids will gravitate. This tube drainage should be left in position until the last indication of a purulent discharge ceases. This will often occur about the fourth or fifth day.

For the effectual accomplishment of rectal installation, it is necessary that the patient should be seated on a rubber ring to avoid a kink in the tubing and thus stop the flow. A small nozzle is attached to the tube of a fountain syringe, introduced into the rectum and left there continuously; for days, if necessary, according to the virulence of the infection. The flow should never be regulated by forcipressure to the tube, but rather by the height of the syringe above the level of the buttocks. About six inches will usually give the proper pressure, though

this can be raised or lowered according to circumstances. The pressure should be such as to give drop by drop an average of one pint an hour, thus administering by this method twelve quarts in the twenty-four hours. This should be kept up until the acute stage of the disease has passed, which in many instances, will be several days.

*Acute Intestinal Obstruction.*—This accident is by no means a common occurrence after operation on the stomach. But very few cases are on record. As is the case in most post operative complications, this accident may almost invariably be prevented by the most careful attention to technic. If the cut margins of the mesocolic opening are not sutured to the stomach wall, an internal strangulation is liable to occur from a piece of the bowel slipping through into the lesser sac. A more likely occurrence is for a portion of bowel to slip through between the duodeno-jejunal flexure and the anastomosis, where it is liable to become constricted by pressure between these two, and against the mesocolon. Should the anastomosis be made on the anterior part of the stomach, the loop of jejunum crossing the transverse colon may be drawn too tight, and thus constrict the colon to a point of complete obstruction. This will only occur if the point of the jejunum selected for anastomosis is too close to the duodeno-jejunal flexure. In one of my own cases, a loop of the distal limb of the jejunum became strangulated by an adhesive band from a point on the greater curve to the anastomatic suture. The abdomen was reopened and the obstruction relieved, but the patient succumbed to acute suppression of urine, the result, in our belief, of chloroform poisoning.

*Symptoms.*—The first indication of an ileus is intermittent colicky pain in the abdomen, the paroxysms commencing mildly and increasing until the maximum of intensity is reached, then gradually waning, only to be repeated in a few minutes. If the bowel is much distended above the obstruction, the peristaltic wave may be readily observed through a thin abdominal wall. Tympany of the abdomen becomes apparent at an early stage, and the passage of feces and flatus per anus is entirely stopped. Vomiting, first mucous, then bilious, and finally fecal, is established early, and is greatly aggravated by any attempt to force an intestinal evacuation by purgatives. The temperature is rarely affected in the early stages.

*Diagnosis.*—With the presence of the symptoms above enumerated, the diagnosis of an ileus is made comparatively easy. That it should be made early is of the utmost importance, for on this early diagnosis lies the only hope of success in its treatment.

The two most common conditions with which post-operative ileus



is liable to be confounded, are excessive tympanites and peritonitis. In tympanites the pain is not paroxysmal in character, the pulse is but slightly affected, the expression does not portray that profound depression so common in ileus, and finally persistent efforts will result in a copious evacuation of the bowels.

The differentiation between peritonitis and ileus may be an exceedingly difficult matter. Both conditions are frequently present at the same time. If the abdomen has been opened for an acute infection, the resultant ileus will probably be caused by intestinal adhesions around a septic focus. In peritonitis the temperature is usually elevated, while in an uncomplicated obstruction there is but little rise. In peritonitis again, the pain is more diffuse and is not paroxysmal in character, and vomiting is more continuous.

In ileus it is frequently possible to detect the presence of a hard tumor immediately above the seat of obstruction. This is caused by the accumulation of gas, which, in its efforts to pass the obstruction, produces a distinct rounded mass, sometimes readily detected on palpation.

The prognosis in these conditions is always grave, but the degree of gravity will depend entirely on the time elapsed before a diagnosis is made. The earlier the diagnosis, the greater will be the prospects for a successful result.

*Treatment.*—When the presence of an ileus has been definitely established, no time should be lost in re-opening the abdomen for its relief. Four main lines of treatment are open to the operator, viz.:

- (1) He may separate any adherent coils of intestines from a raw surface, or divide bands of adhesions, and thus establish the continuity of the intestine.
- (2) Failing in this, a short-circuiting operation may be done, thus side tracking the obstruction by a lateral anastomosis of the proximal to the distal loop of intestine around the seat of obstruction.
- (3) In the presence of gangrene it may be necessary to resect the involved intestine, making union of the divided ends by either an end-to-end or lateral anastomosis.
- (4) Should the condition of the patient be extremely bad, it may be necessary to simply bring a distended loop of intestine to the surface, preparatory to the performance of enterostomy. This may tide the patient over in the meantime, and thus an-

able him to get into good condition for the radical treatment of the obstruction later on.

In the class of cases in which this operation becomes necessary, the patient is usually in a very weakened condition, and ill able to withstand the shock of much intra-abdominal manipulation. As little anaesthetic as possible should be given, as these patients always stand it badly. I have seen two cases terminate fatally as a direct result of the second administration of an anaesthetic. The operation must be completed as quickly as possible, and especially is it necessary to avoid evisceration, or any extra handling of the intestines.

Hot water bottles must be placed around the patient both during and subsequent to operation, in order to maintain the body temperature. The heart action must be sustained by interstitial or intravenous injections of one pint of normal saline solution, to which had been added thirty minims of adrenalin (1-1000). In one case where a weak thready pulse was running at 160, an intravenous injection of one half pint of normal saline solution brought it down at once to 80, and it immediately became strong and regular.

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## SOME INTERESTING SURGICAL CASES: FROM A DIAGNOSTIC STANDPOINT.

By W. J. MACDONALD, M.D.

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IF definite symptoms were always produced by, and the result of, definite pathological lesions, diagnosis would be readily reduced to an exact science, but this is far from being the case. It is but too often we find that a definite pathological lesion in one patient will produce a certain train of symptoms, only to find in another patient with the same lesion a chain of symptoms of a very different character altogether. This it what makes the art of diagnosis so peculiarly difficult. When a scientific diagnosis has been definitely arrived at, treatment is a comparatively easy matter. The mechanical act of removing a portion of the stomach because it is affected by carcinoma is a much easier task than arriving at the diagnosis at a sufficiently early period to make such action productive of the best results.

For the purpose of studying intimately the differential diagnosis of surgical disease in the upper abdomen, I have selected a few cases of recent date which have been peculiarly difficult to diagnose. Each one of these cases has presented serious difficulties, and I have endeavored to show by what method, and by what reasoning a diagnosis was arrived at. In each case the result is also shown.

Case No. 1,206.	ONE.	Date, Sept. 10, 1914.
Mr. J. D. _____		Address, L_____.
Age, 64.	Civil State, married.	Nativity, Canadian.

### CLINICAL HISTORY.

On September 10th I saw in consultation Mr. J. D. \_\_\_\_\_, of L\_\_\_\_\_. Though only 64 years of age, he presented the appearance of a man at least ten years older. His expression was drawn and haggard, his complexion sallow, dark rings around his eyes, a distinct tinge of jaundice throughout the sclera, and his entire demeanor that of one who has lost all interest in life.

His previous history had been good. At six years of age he had measles, and at fourteen scarlet fever, from which time till the summer of 1909 his health had remained perfectly good. In November of that year he had noticed a lump in his neck, which kept gradually enlarging in size, and finally in March of the following year he had it removed, and was told it was carcinoma, though as far as I could learn, no microscopic examination was made of the growth. The wound healed per-

fectly and gave him no further trouble. This illness, however, appeared to be the starting-point of all his future troubles, for following it he had never been entirely well.

From time to time he suffered short spells of uneasiness in the "pit of the stomach," and occasionally was greatly annoyed by the belching of gas after meals, but he never vomited. He occasionally suffered spells of dizziness so that on several occasions he was obliged to sit down until the attack passed off. During the preceding four months he had lost flesh rapidly, so much so indeed, that during that time his weight had been reduced from 212 to 166 pounds.

Physical examination revealed little, and it was evidently clear that a diagnosis must be made on the history of the case, rather than on present conditions. The heart, the lungs and the kidneys were normal. His physician reported no variation in the temperature during the preceding month, having averaged during that time between 98 and 99 deg. F. There was no abdominal rigidity, no distention, and no tenderness except on deep palpation in the region of the gall-bladder. The tongue was furred, and the bowels somewhat constipated. The stools were of normal color and consistency. At the time of examination he complained much of a burning soreness in the stomach almost immediately after partaking of food, which in turn would be followed by the belching of gas at short intervals. His appetite was much less keen than heretofore, though even yet his meals were sometimes taken with a certain degree of relish. No melaena, no hematemesis, stools and urine normal, gastric contents normal.

#### PHYSICAL EXAMINATION.

**HEART**—Normal.

**LUNGS**—Normal.

**ABDOMEN**—Abdominal wall thin and emaciated, showing up the venous circulation remarkably well. Tender point in epigastrium.

#### CLINICAL EXAMINATION.

**URINE**—

Amount in 24 hours, 42 ozs. Color, amber. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1012. Albumin, none. Sugar, none.

**Microscopical Examination**—

Pus, none. Blood, none. Crystals, none.

**Tube Casts**—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

**BLOOD**—

**Hemoglobin**—Dare (80%). Temperature, 98. Pulse, 72.

**Blood Pressure**—Systolic, 120 (Normal, 100-120 mm.) Diastolic, 90 (Normal 75-95 mm.)

**Red Cells**—No. 4,200,000 per cu. mm. (Normal—Men 5,000,000, Women 4,500,000.)

**White Cells**—No. 10,600 per cu. mm. (Normal 7,500.)

**Differential Count of 600 Leucocytes**—

Small lymphocytes, 22% (Normal 22-25). Large lymphocytes, 4%, (Normal 3-6).

Large mononuclear leucocytes, 1% (Normal 1-2). Transitional Forms, 2% (Normal 1-2).

Polymorphonuclear neutrophils, 70% (Normal 70-72). Eosinophiles, 3% (Normal 2-4).

**GASTRIC ANALYSIS**—

Gastric extract. Meal given, toast and tea. Quantity removed, 3 ozs. Food remnants, none. Blood, none. Tissue bits, none.

**Chemical Examination—**

Reaction, acid. Total Acidity, 66. Free H. C. L., present. Combined H. C. L., . . . . Total H. C. L., . . . . Lactic Acid, absent. Altered Blood, none. Bile, none.

**Microscopical Examination—**

Micro-organisms. B. Oppler Boas, none. Yeasts, none. Sarcines, none.

**X-RAY (FLUOROSCOPIC EXAMINATION).**

**HEART**—Normal.

**LUNGS**—Dark shadow in apex of left lung.

**STOMACH—**

Position, normal. Visible Peristalsis, present. Filling Defects, none. Incurva, none. Hypersecretion, not visible. Mobility (a) Stomach, normal; (b) Pylorus, moveable; (c) Duodenum, free. Tender Point, in epigastrium. Residue after six hours, slight. Empty in 8 hours.

**SMALL INTESTINE—**

Duodenum, empty in 10 hours. Ileum, empty in 22 hours.

**LARGE INTESTINE—**

Colon, empty in 30 hours.

**COLON**—Fluoroscopic Examination by Opaque Enema, normal.

*Discussion.*—The facts which we have before us in this case, and which we must endeavor to weave into a composite and definite diagnosis of an undoubted pathological condition, are numerous and somewhat contradictory. A pale haggard man looking much older than his years, a history of carcinoma, jaundice, gastric uneasiness, belching of gas, dizziness, loss of appetite, tenderness over the gall-bladder, and the most dominant symptom of all, the loss of forty-six pounds of flesh in four months, points unmistakably to the upper abdomen as the seat of whatever pathological lesion may be present. As for the lesion itself one cannot help but consider pancreatic cancer, cancer of the liver, of the gall-bladder or bile ducts, ulceration in either the stomach or duodenum or even cancer of the stomach itself.

Probably the better method to pursue is to arrive at a diagnosis by the process of elimination. Presuming this condition were due to pancreatic cancer, what local symptoms would we expect to find at examination in a case so far advanced as we find in this man? We would first look for jaundice, which in the present instance is not marked, though should the growth be in the body or the tail, marked jaundice would not necessarily be present. Emaciation would be expected, and in this case it is marked.

A dull, aching or continuous pain, or one sharp, lancinating and intermittent, radiating through to the back between the shoulder blades is an almost invariable accompaniment to cancer of the pancreas. In the case under consideration the discomfort experienced could scarcely be characterized as either. Though of the aching variety, it was not continuous, but only appeared after the partaking of food.

One of the most common accompaniments of pancreatic cancer is distention of the gall-bladder due to the damming back of bile. This is accomplished by the enlarged gland compressing the common duct. In some instances the gall-bladder will become enormously distended, reaching below the umbilicus, and even to the right iliac region. The liver is also frequently enlarged. In the present instance there was no en-

largement of either gall-bladder or liver, the only symptom referable to either one or other of these organs being tenderness on palpation in this region.

Ascites, a frequent accompaniment of cancer of the pancreas, was absent.

Cachexia accompanied by emaciation was present, though the cachectic appearance was not sufficiently pronounced to lead one to believe in cancer from this symptom alone.

There was no palpable tumor in the epigastrium. Though this need not necessarily be present, yet in the advanced stage of whatever disease from which this man may be suffering, one would expect to find tumor, should the trouble prove to be cancer of the pancreas.

The stools were constipated, but contained neither free fat nor undigested meat fibres, two conditions frequently found in a person suffering from malignancy in the head of the pancreas.

Cancer in this location is almost invariably accompanied by albuminuria. This man's urine was normal.

In summing up the evidence in favor of pancreatic cancer, we find we are standing on very insecure ground. Though emaciation, cachexia and jaundice are present, yet they may also be found in cancer of the liver. In uncomplicated cancer of any of the other upper abdominal organs, jaundice would likely be absent.

In the absence of the characteristic pain, enlargement of the gall-bladder or liver, ascites and a palpable tumor, it appears fairly reasonable to exclude a malignant pancreas, and attempt to account for the jaundice, cachexia and emaciation in some other way.

Cancer of the hepatic or splenic flexures of the colon would be responsible for the great emaciation and cachectic appearance presented in this instance, but it would not produce the jaundice; the presence of which, and the absence of vomiting and symptoms of incomplete obstruction due to stenosis of the bowel at the seat of the disease, will permit us to readily pass this diagnosis by.

Stones in the common bile duct would readily be responsible for both the jaundice and the great loss of weight. It is not an uncommon thing for a heavy patient to lose from thirty to forty pounds in a few months in cases of cholelithiasis. Cholelithitic jaundice, however, is intermittent, while in this instance the jaundice was persistent. Cholelithiasis, too, has its own characteristic pain, usually sharp and lancinating, a symptom entirely foreign in this case. Moreover, cholelithiasis is very unlikely to produce the cachectic appearance so manifest in this instance.

Gastric or duodenal ulcer would not likely be responsible for these symptoms for many reasons. In the first place, great loss of weight could scarcely be occasioned without vomiting except in the presence of malignancy. Then, too, more of the typical symptoms of ulceration such as pain after eating, hyperchlorhydria, etc., have not been present. The only symptom pertaining to ulceration would be the frequency of the gaseous eructations and the uncomfortable epigastric sensation after meals. The complete absence of hematemesis or melaena would also help to throw the weight of the evidence against ulceration.

The diagnostic field is now very much narrowed, especially as the clinical picture would point very strongly toward malignancy. We have satisfied ourselves tentatively that it cannot be in either of the flexures of the transverse colon, and the weight of evidence is strongly against its presence in the pancreas. Of the remaining locations, the liver or the stomach would be the most probable.

Cancer of the liver is rarely a primary disease. As a general rule it is secondary to pyloric involvement. It is also frequently attended by nodules which can be readily palpated through the abdominal parietes. The jaundice is usually deep and persistent. In the absence of deep jaundice, in the absence of any nodular involvement, and especially in the absence of any previous history of gastric or duodenal ulceration providing a focus for the primary nodule, we are forced to the conclusion that the liver itself is not involved, or if so, only to a very slight degree.

As for the presence of cancer in the stomach itself, the weight of evidence is not at all conclusive. This man has never vomited, therefore there is as yet no pyloric obstruction. From this we observe that the growth, if in the stomach at all, must be either very small, or at some distance from the pylorus. There is no palpable tumor, therefore if its presence is proved it will likely be of a small size. The gastric motility is not impaired. A test breakfast shows the presence of hydrochloric acid and the absence of lactic, but even in the presence of cancer this may be expected, as lactic acid is usually the result of food ferments due to retention as a result of pyloric obstruction. The presence of lactic acid very frequently means nothing more than that there is an obstruction at the pylorus, and as cancer is the most frequent cause of such obstruction, the presence of lactic acid usually means the presence of cancer. However, in this case there is no obstruction, therefore we would not expect to find lactic acid.

The clinical picture is indeed complex. A case of undoubted malignancy, and yet the exact location is very difficult to determine. Each of the likely locations have been carefully eliminated and we now have

left but one—the stomach. There is in gastric carcinoma a peculiar facial expression which in many cases almost typifies the disease. The pinched, pale, wan expression often carries with it a conviction which cannot be adduced by obtainable facts. In this instance we have the facies of carcinoma, we have the dislike for food, we have the enormous loss of weight—46 pounds in four months—and after carefully eliminating all the other organs, even in the absence of pyloric obstruction and pain, we must come to the conclusion that in all probability we will find the seat of the disease either in the stomach or duodenum, and as primary duodenal cancer is indeed very rare, it will in all likelihood be discovered in the stomach itself.

*Outcome.*—On September 14th a median incision above the umbilicus revealed a carcinomatous nodule on the lesser curvature of the stomach, about one and one-half inches from the pylorus. The coronary chain of glands was greatly involved right up to the cardia, and the disease had spread into the gastro-hepatic omentum.

## TWO.

Case No. 1112.	Date, Feb. 11, 1914.
Mr. L. E.	Address, N
Age, 58.	Nativity, American.
Civil State, single.	

## CLINICAL HISTORY.

On February 11th, I was asked to see Mr. L. E. ———, of N———. I found a man 58 years of age, somewhat emaciated, and whose whole body presented the appearance of pure saffron. This jaundice was deep, intense and abiding. Since its first appearance some two months previous, it had shown no signs of lightening, but had been steadily getting deeper. Icterus at times was intense. During the two months of his illness he had lost some fifteen pounds in weight. At the time of my seeing him his pulse was 102, and temperature 103 deg. F. Although in a warm room he complained of feeling very cold, and insisted on having heavy blankets over him. From the nurse I could not learn that he had had any distinct and definite chills, but rather that he felt chilly all the time.

His previous history was easily obtained. A travelling salesman by occupation, he had always enjoyed the best of health. For the last fifteen years, however, he had suffered occasionally from severe cramps in the stomach, which he himself attributed to indigestion, but which on more than one occasion had been diagnosed by a physician as gall-stones. No sign of jaundice had ever followed any of these attacks. Of late years he had, in fact, been troubled much less in this way, and the trouble appeared to be wearing off. Apart from these spells he had never had any illness. His father and an uncle on his father's side had died from what was diagnosed as cancer of the stomach.



The present illness commenced about two months ago, and was ushered in by attacks of epigastric pain of a more serious nature than formerly, and the commencement of a slight tinge of jaundice, which gradually deepened into its present color. As the days passed by, the pain disappeared, until at the present time he had absolutely none whatever.

Physical examination revealed little. Deep palpation in the region of the liver elicited some tenderness, and the liver appeared to be somewhat enlarged, the lower border projecting about two inches below the right costal margin. There were no nodules. Gastric analysis revealed nothing. The heart was normal. Slight albuminuria was present. There was no palpable tumor and no ascites. The total leucocytosis was 21,400, of which 88 per cent. were polymorphonuclears.

## PHYSICAL EXAMINATION.

HEART—Normal.

LUNGS—Normal.

ABDOMEN—Liver dullness extended about two inches below right costal margin. Deep palpation elicited tenderness in region of the gall-bladder.

## CLINICAL EXAMINATION.

URINE—

Amount in 24 hours, 38 ozs. Color, light straw. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1016. Albumin, present. Sugar, none.

Microscopical Examination—

Fus, none. Blood, none. Crystals, none.

Tube Casts—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

BLOOD—

Hemoglobin—Dare (85%). Temperature, 103. Pulse, 102.

Blood Pressure—Systolic, 120 (Normal 100-120 mm.) Diastolic, 90 (Normal

75-95 mm.).

Red Cells—No. 4,800,000 per cu. mm. (Normal, Men 5,000,000, Women 4,500,000).

White Cells—No. 21,400 per cu. mm. (Normal 7,500).

Differential Count of 460 Leucocytes.

Small Lymphocytes, 20% (Normal 22-25). Large Lymphocytes, 3%

(Normal 3-6).

Large Mononuclear Leucocytes, 2% (Normal 1-2). Transitional Forms,

1% (Normal 1-2).

Polymorphonuclear Neutrophils, 88% (Normal 70-72). Eosinophiles,

2% (Normal 2-4).

GASTRIC ANALYSIS—

Gastric Extract. Meal given, toast and tea. Quantity Removed, 4 ozs.

Food Remnants, none. Blood, none. Tissue Bits, none.

Chemical Examination—

Reaction, acid. Total Acidity, 60. Free H.C.L. present. Combined

H.C.L. . . . . Total H.C.L. . . . . Lactic Acid, absent. Altered Blood,

none. Bile, none.

Microscopical Examination—

Micro-Organisms. B. Oppler Boas, none. Yeasts, none. Sarcines, none.

X-RAY (FLUOROSCOPIC EXAMINATION).

HEART—Normal.

LUNGS—Normal.

STOMACH—

Position, normal. Visible Peristalsis, present. Filling Defects, none

visible. Incisura, none visible. Hypersection, none visible. Mobility:

(a) Stomach, normal; (b) Pylorus, free; (c) Duodenum, free. Tender

Point, in region of gall bladder. Residue after six hours, none. Empty

in 6 hours.

SMALL INTESTINE—

Duodenum, empty in 13 hours. Ileum, empty in 20 hours.

LARGE INTESTINE—

Colon, empty in 32 hours.

COLON—Fluoroscopic Examination by Opaque Enema, apparently normal.

*Discussion.*—In the discussion of any disease in which the body is deeply jaundiced we must commence on the hypothesis that the bile-ducts are involved to a greater or lesser extent. We may be facing any

one of numerous conditions. This patient may be suffering from a purely catarrhal jaundice, he may have cirrhosis, he may have pancreatic cancer, cancer of the gall-bladder or bile-ducts, cancer of the liver itself, abscess of the liver, or even a benign or malignant growth entirely outside the biliary tract, but producing compression enough to produce the pigmented color of the skin here shown.

Should this condition prove to be due to a growth outside the liver or biliary tract, what form of new growth would we naturally expect to find? Obviously only one—pyloric cancer. In the case under consideration there is neither palpable growth nor any history which would even lead one to expect its presence. There has never been even the slightest suspicion of gastric or duodenal ulcer, the seed bed of cancer in this location. Stomach contents are normal. There has been no vomiting. The condition is obviously not due to pressure from without.

Cancer of the liver, the suspicion for which may have existed, can with greater difficulty be eliminated. Cancer of the liver is usually secondary to pyloric cancer, and as this has been definitely eliminated, malignancy, if present, must be primary. This we know to be occasionally true. Even without any primary focus, therefore, malignancy may exist in the liver substance.

The liver is enlarged to two inches below the costal margin, but it is smooth. No nodules can be felt. There is no abdominal distention. There are no enlarged superficial veins. There is no œdema of the feet. There is no anæmia. Though in hepatic malignancy, ascites is not necessarily present, yet in the majority of cases it is present as a result of pressure by nodules on the portal vein, or extension of the cancer to the peritoneum. In the case under consideration there is no ascites. Furthermore, although this man is running a temperature of 103 deg. F., a symptom thoroughly consistent with cancer, yet the jaundice is of a much greater degree of intensity than is usually found in this condition. His appearance is not typically cachectic. We may, therefore, with comparative safety, rule out malignancy in the liver.

Cancer of the pancreas would almost immediately suggest itself, but in the absence of enlarged gall-bladder, of epigastric pain, of ascites, of cathexia, of free fat or undigested meat fibres in the feces, may be eliminated.

Simple catarrhal jaundice is contra-indicated by the fact that the pigmentation has remained so long. In jaundice due to simple catarrh of the biliary passages, the discoloration is usually entirely cleared up in from two to four weeks.

In cirrhosis of the liver, jaundice is usually slight, the skin being more of a sallow complexion. The spleen is usually enlarged. A his-

tory of alcoholism can almost invariably be obtained. Hemorrhage from the stomach or bowels is a frequent accompaniment of cirrhosis. Ascites is frequently well marked. A facial expression known as the facies hepatica is very common in cirrhosis of the liver. The face is thin, the eyes are watery and sunken, the nose and cheeks show distended venules, which, coupled with the usually slightly jaundiced appearance, presents a picture truly typical of cirrhosis. Albuminuria is common, and fever ranging from 101 to 103 deg. F. is frequently present.

This man presents the albuminuria, the fever, the jaundice and a facial expression which might be mistaken for the hepatic facies; but in the absence of a history of alcoholism, of splenic enlargement, of hematemesis or melaena, and of ascites, we are fairly safe in excluding cirrhosis.

There are remaining but two pathological conditions which are at all likely to produce the present symptoms, gall-stones in the common duct, and abscess of the liver, and many of the symptoms would appear to be associated with both of these conditions.

The attacks of epigastric pain from which this patient has suffered for some years past, the sudden onset and just as sudden cessation, even if not succeeded by jaundice, would certainly indicate the presence of gall-stones. The present loss of weight would also be thoroughly consistent with the presence of stones. The chilly feeling and the temperature are common accompaniments to common duct cholelithiasis. The character of the jaundice, however, is not that which usually accompanies an obstruction in the common duct due to stone. In simple stone obstruction the jaundice is intermittent, I might almost go so far as to say never continuous, and this one point alone may be considered sufficient to rule out stone as the only cause of the present pigmented condition of the skin.

Abscess of the liver, though seldom productive of such intense jaundice, yet would account for its persistency. The toxæmia resulting from abscess would, or could, be responsible for the loss of weight. His persistent chilly feeling, and his temperature of 103 would readily result from pus formation. This patient's leucocytosis was 21,400, with a polymorphonuclear percentage of 88, strong presumptive evidence of pus accumulation, and furthermore, by the high percentage of polymorphonuclear cells, showing a greatly weakened resistance.

A tentative diagnosis of gall-stones complicated by hepatic abscess was made. Operation appeared hopeless and was not urged.

*Outcome.*—On March 4th autopsy revealed an acute suppurative cholangitis. No stones whatever were present. Suppuration had spread up the hepatic duct and reached to its farthest ramifications in the

liver, causing multiple abscesses throughout. No cause was discovered which would be accountable for the preliminary infection.

Case No. 1101.	THREE.	Date, Jan 30, 1914.
Mr. P. A. _____		Address, M_____
Age, 48.	Civil State, married.	Nativity, Canadian.

#### CLINICAL HISTORY.

On January 30, I was asked by his physician to see Mr. P. A. —, of M—, A man forty-eight years of age and a moderate drinker was suffering from a severe pain in the left upper abdomen. He had been confined to his bed for three weeks, and, according to the report of his friends, had lost much weight during that time. When in normal health his weight had for years ranged about 160 pounds; there was no means of weighing him at present, but he had apparently lost somewhere in the neighborhood of twenty pounds. The loss of this weight, however, had not all taken place during the three weeks he had been in bed, but rather from the commencement of his present illness, some six months previous. His complexion was pale and sallow, he was worried over his present condition, his anxiety being continually manifested by his actions and numerous questions regarding his condition.

He gave a perfectly clear preliminary history. With the exception of the usual diseases of early childhood, and pneumonia at the age of twenty-two, he had never before been ill. Eighteen months ago, while on a high ladder picking apples, he had suddenly lost his balance, and on falling to the ground, a distance of nine or ten feet, had struck his side against a scantling lying across the top of an apple barrel. This occasioned him considerable pain at the time, and on many occasions subsequently a severe stitch would suddenly seize him in the location of the former injury—just below the left costal margin.

For twelve months, however, no ill-effects were anticipated, but about this time he first consulted a physician for loss of appetite and a general feeling of lassitude. Subsequently diarrhœa developed, which, however, was of a very intermittent character, and on three or four occasions the stools were black and tarry as though they might contain some blood, but no such stool had been passed for the past five months.

Two months ago he had discovered a hardness in the left side of the abdomen, which in the meantime had given him a good deal of trouble. The pain was of a dull, boring, aching character, and appeared to be persistently worse at night.

Physical examination revealed only a slight degree of emaciation. The entire body had a sallow tinge and there was a rounded fullness to the abdomen. In the upper left quadrant of the abdomen could readily be found a round hard mass, in size slightly smaller than a cocoanut. Pressure on, or in the neighborhood of this mass, elicited but the slight-

est degree of tenderness, but in its region he suffered much from a constant boring ache. There was no spasmodic pain. There was no diarrhoea. There was no blood in the stools. The bowels moved every day, sometimes without and sometimes only by the use of a laxative. There was an occasional attack of nausea, occasionally accompanied by slight vomiting. The appetite was poor, the tongue was furred, the stools were foul. The heart, the lungs, the urine and the blood were normal. There was no history of cancer in the family.

## PHYSICAL EXAMINATION.

**HEART**—Normal.

**LUNGS**—Normal.

**ABDOMEN**—Slight general distention with a rounded hard mass in upper left quadrant.

## CLINICAL EXAMINATION.

**URINE**—

Amount in 24 hours, 38 ozs. Color, amber. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1018. Albumin, none. Sugar, none.

**Microscopical Examination**—

Pus, none. Blood, none. Crystals, none.

**Tube Casts**—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

**BLOOD**—

Hemoglobin—Dare (90%). Temperature, 99. Pulse, 84.

**Blood Pressure**—Systolic, 120 (Normal 100-120 mm.) Diastolic, 90 (Normal 75-95 mm.)

**Red Cells**—No., 4,000,000 per cu. mm. (Normal, Men 5,000,000, Women 4,500,000).

**White Cells**—No., 8,000 per cu. mm. (Normal 7,500).

**Differential Count of 400 Leucocytes**—

Small Lymphocytes, 22% (Normal 22-25). Large Lymphocytes, 4% (Normal 3-6).

Large Mononuclear Leucocytes, 2% (Normal 1-2). Transitional Forms, 1% (Normal 1-2).

Polymorphonuclear Neutrophils, 74% (Normal 70-72). Eosinophiles, 2% (Normal 2-4).

**GASTRIC ANALYSIS**—

Gastric Extract, Meal given, toast and tea. Quantity Removed, 4 ozs.

Food Remnants, none. Blood, none. Tissue Bits, none.

**Chemical Examination**—

Reaction, acid. Total Acidity, 52. Free H.C.L., present. Combined H.C.L., . . . . Total H.C.L., . . . . Lactic Acid, none. Altered Blood,

none. Bile, none.

**Microscopical Examination**—

Micro-Organisms. B. Oppler Boas, none. Yeasts, none. Sarcines, none.

## X-RAY (FLUOROSCOPIC EXAMINATION).

**LUNGS**—Normal.

**HEART**—Normal.

**STOMACH**—

Position, normal. Visible Peristalsis, present. Filling Defects, none.

Incisura, none. Hyperscretion, not visible. Mobility: (a) Stomach,

normal; (b) Pylorus, quite free; (c) Duodenum, moveable. Tender Point,

in region of splenic flexure. Residue after six hours, very slight. Empty

in 7 hours.

**SMALL INTESTINE**—

Duodenum, empty in 11 hours. Ileum, empty in 20 hours.

**LARGE INTESTINE**—

Colon, empty in 42 hours.

**COLON**—Fluoroscopic Examination by Opaque Enema. On account of the perceptibly palpable mass in the region of the splenic flexure particular attention was paid to the fluoroscopic examination of the colon, but nothing which would add any light on the diagnosis was perceived. There was no perceptible narrowing of the lumen of the bowel.

*Discussion.*—The picture we have before us is one which presents considerable difficulty in deciphering. There are no clear-cut typical symptoms which would warrant one in readily arriving at a definite conclusion. We have evidence which on the surface would indicate one

of many conditions, among which may be mentioned new growth in the peritoneum of either tubercular or malignant origin, enlargement of the spleen, cancer of the splenic flexure of the colon, cancer of the stomach, localized peritonitis with the possibility of abscess formation, or even chronic enlargement of the spleen due to cirrhosis of the liver.

A short analysis will suffice to eliminate at least some of these conditions. The presence of localized peritonitis in this location is likely to be induced by one of three conditions, perforation of a gastric ulcer, carcinoma of the stomach, or trauma.

A localized inflammation in this region in the greater peritoneal cavity is rare—in the lesser, somewhat more frequently found. This is accounted for by the anatomical relationship of the structures permitting the collection and localization of an inflammatory exudate in the lesser cavity. It lies behind the gastro-hepatic omentum, behind and below the stomach, and behind the anterior layer of the great omentum. The upper layer of the transverse meso-colon forms the lower limit of the space. It reaches from the Foramen of Winslow to the spleen, it reaches from the hepatic to the splenic flexures of the colon. The transverse fissure of the liver and a portion of the diaphragm form the upper limit. It will readily be seen, therefore, how an inflammatory exudate into the lesser sac would produce a tumor consistent with the one under consideration. But is this what has occurred? True it is that we have the history of an injury which would readily be responsible had this tumor occurred at a much earlier date and very shortly after the accident. But here we have a period of eighteen months elapsing, and not until six months ago was there any indication or even suspicion of serious trouble supervening. The lapse of twelve months before the onset of severe symptoms would be sufficient to rule out trauma as the cause. Cancer of the stomach or a perforated gastric ulcer could readily be responsible for the existing condition, but there is not the slightest evidence of the presence of either cancer or ulcer. Furthermore, the symptoms produced by the perforation of an ulcer of the stomach into the lesser peritoneal cavity are entirely wanting. In the latter case we have the onset sudden and abrupt. The pain is intense, and the vomiting often copious and bilious. Owing to involvement of the diaphragm the respirations are frequently embarrassed. Obviously ulcer cannot have been responsible for the present condition; the typical symptoms are wanting, the lapse of time is too great.

An omental tumor, whether it be tuberculous or malignant, early becomes adherent to the abdominal wall. It is also accompanied by ascites and progressive emaciation. This tumor is apparently non-adherent. There is no ascites.

Regarding new growths in the peritoneum, two forms may be considered in connection with this case, tuberculosis and cancer. Either may develop as the result of an injury, or rather the commencement of the disease may coincide with the occurrence of an injury.

If tuberculous peritonitis is present in this instance, it must be of the chronic variety. What symptoms would we expect to find? Ascites, though probably with but a small effusion, the fluid sometimes being hemorrhagic. In a long-standing case such as this, tympanites may be present as the result of adhesions between the parietal and visceral layers. In the chronic form the temperature is frequently subnormal, often for days at a time running as low as 97 degrees. The simultaneous presence of pleurisy is frequent. One of the most marked features of this disease is the presence of a tumor either by simulation or in reality, in which latter case it is due to the rolling of the omentum into a ball, to the collection of fluid which is confined between the coils of intestines by adhesions, or in somewhat rare cases by the actual thickening and retraction of the intestinal coils themselves.

In the present case we have not the characteristic ascites, nor temperature, nor tympanites, nor pleurisy. We have the tumor alone.

Is it peritoneal cancer? Secondary malignant peritonitis is comparatively common, primary very rare indeed. In fact, it is open to question if primary peritoneal carcinoma ever exists, that which is usually mistaken for it being in reality endothelioma.

As in tuberculous peritonitis, so in cancer we have a mass, usually in the upper abdomen, and associated with ascites. In tuberculosis it is formed by the rolling up of the great omentum; in cancer by spreading induration of the omentum from the primary focus, usually in the stomach.

With the history of a primary focus, the diagnosis of peritoneal malignancy is comparatively easy; in the absence of such focus, very doubtful. We have here neither primary cancer nor ascites. We are not likely to have peritoneal cancer.

Splenic enlargement may be the result of various causes, such as leukemia, pernicious anemia, pseudoleukemia, chronic malaria or syphilis. Chronic enlargement of the spleen is sometimes occasioned by cirrhosis of the liver.

The recognition of certain physical signs will almost invariably result in a definite diagnosis of splenic enlargement; the retention of its notched anterior border, the position of the organ anterior to the colon, and its retention of respiratory mobility; it is not fixed. Our tumor is evidently not splenic.

Cancer of the intestines is often primary. We have here a case of tumor in the region of the splenic flexure of the colon. He has a history of early diarrhœa, to be followed later by obstinate constipation, and later still by diarrhœa and constipation alternating. He has a history of blood in the stools early in the disease, though none has appeared for some months.

He has a great deal of pain concentrating at the seat of the tumor, is emaciated and has a sallow complexion. He has a mild degree of tympanites.

A diagnosis of cancer in this region must be made on general as well as localized symptoms. He has anemia, he has a certain degree of cachexia, he is forty-eight years of age. He has no visible signs of stenosis as would be observed by visible peristalsis or ribbon-like stools, but he has alternating spells of constipation and diarrhœa. Ribbon-like stools would not be expected in this case, because the obstruction, if such it be, is too high in the bowel.

With all other possible conditions having one by one been carefully eliminated, and yet fully appreciating the impossibility of making a definite diagnosis in an abdominal case so obscure as this appears to be, a tentative diagnosis of cancer of the splenic flexure was made.

*Outcome.*—On February 4th exploratory laparotomy revealed an irremovable mass enveloping the splenic flexure, a section of which proved to be carcinoma.

Case No. 1131.	FOUR.	Date, March 21, 1914.
Mr. T. A. _____		Address, H_____
Age, 59.      Civil State, married.		Nativity, Canadian.

#### CLINICAL HISTORY.

Mr. T. A. \_\_\_\_\_, of H\_\_\_\_\_, aged 59 years. Along with his physician I examined this gentleman on March 21st. A man who one year before, the picture of health and strength, had weighed one hundred and seventy-eight pounds, now at one hundred and thirty-seven pounds, presented a very dejected appearance indeed. His eyes were sunken, his expression was pinched, his skin was flabby, his energy was gone. Though he was not distinctly jaundiced, yet the color of the skin presented a slightly jaundiced hue. The same condition was more marked in the sclera.

At twenty-eight years of age he had suffered a severe illness from "inflammation of the bowels," which had kept him in bed one month, and again at thirty-six years he had a similar attack, though of much less severity than the former one. There was no history of tuberculosis in the family. His father had died of cancer of the stomach.



The history of the present illness dates back one year. At that time he began to suffer periodical attacks of pain in the right hypochondriac and epigastric regions, which apparently were in no way related to the partaking of food. For a time they were severe, then eased off for a short period only to return with greater severity. At times these attacks would appear every day, then again several days might pass without any symptoms whatever.

As the months passed by these attacks increased in both frequency and severity, until for the past three weeks he had been given at least one-half grain of morphia hypodermically at the commencement of each attack. Nothing short of that amount afforded any relief. Diarrhoea and obstinate constipation alternated.

During the past four months vomiting spells had frequently accompanied the attacks of pain, in fact, on many occasions he received no relief until after a copious emesis. The vomiting was usually dark green—a typical bilious vomit. As far as I could learn, it, too, had no relation to meals.

Physical examination revealed a somewhat rounded abdomen, slightly tympanitic and slightly tender throughout. The point of maximum tenderness appeared to be in the right hypochondriac and epigastric regions, and from this point radiated throughout the abdomen. No tumor or mass of any description could be discovered. The heart was normal, the lungs were sound, the urine presented no evidence of renal disease. There was no blood in the stools, they were of normal color, there was no hematemesis. Pulse, 78, temperature 98.4-5, respiration 22.

#### PHYSICAL EXAMINATION.

**HEART**—Normal.

**LUNGS**—Normal.

**ABDOMEN**—Slightly rounded and tympanitic. Entire abdomen was tender, but particularly so in the region of the right hypochondrium.

#### CLINICAL EXAMINATION.

**URINE**—

Amount in 24 hours, 46 ozs. Color, amber. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1014. Albumin, none. Sugar, none.

**Microscopical Examination**—

Pus, none. Blood, none. Crystals, none.

**Tube Casts**—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

**BLOOD**—

**Hemoglobin**—Dare (95%). Temperature, 98.4-5. Pulse, 78.

**Blood Pressure**—Systolic, 100 (Normal 100-120 mm.) Diastolic, 90 (Normal 75-95 mm.)

**Red Cells**—No. 5,200,000 per cu. mm. (Normal, Men 5,000,000, Women 4,500,000).

**White Cells**—No. 6,000 per cu. mm. (Normal 7,500).

**Differential Count of 520 Leucocytes.**

Small Lymphocytes, 20% (Normal 22-25). Large Lymphocytes, 3%

(Normal 3-4).

Large Mononuclear Leucocytes, 1% (Normal 1-2). Transitional Forms,

2% (Normal 1-2).

Polymorphonuclear Neutrophils, 74% (Normal 70-72). Eosinophiles,

2% (Normal 2-4).

**GASTRIC ANALYSIS**—

Gastric Extract. Meal given, toast and tea. Quantity Removed, 4 ozs.

Food Remnants, none. Blood, none. Tissue Bits, none.

**Chemical Examination—**

Reaction, acid. Total Acidity, 58. Free H.C.L., present. Combined H.C.L. . . . . Total H.C.L. . . . . Lactic Acid, none. Altered Blood, none. Bile, none.

**Microscopical Examination—**

Micro-Organisms. B. Oppler Boas, none. Yeasts, none. Sarcines, none.

**X-RAY (FLUOROSCOPIC EXAMINATION).**

**HEART**—Slight hypertrophy.

**LUNGS**—Normal.

**STOMACH**—Position, normal. Visible Peristalsis, present. Filling Defects, none. Incisura, none. Hypersecretion, not visible. Mobility (a) Stomach, normal; (b) Pylorus, freely movable; (c) Duodenum, moveable. Tender Point, very tender in region of epigastrium and right hypochondrium. Residue after six hours, none. Empty in 6 hours.

**SMALL INTESTINE**—

Duodenum, empty in 3 hours. Ileum, empty in 30 hours.

**LARGE INTESTINE**—

Colon, empty in 44 hours.

**COLON**—Fluoroscopic Examination by Opaque Enema, nothing abnormal.

*Discussion.*—We have here a man slightly jaundiced, somewhat emaciated, and looking withal as though his days may be numbered. He has severe epigastric and right hypochondriac pain, spasmodic in character and yielding only to large doses of morphia. This pain strikes him unawares, without the slightest previous warning. It is in no way related to food. Vomiting sometimes gives relief. No tumor is palpable. Diarrhœa and constipation alternate.

What pathological condition will produce the above picture? It may be one of many. It may be the result of pyloric spasm due to gall-stones, or appendicitis or tuberculosis of the caecum. It may be pyloric cancer. It may be cancer of the hepatic flexure of the colon. It may be ulceration in the gastric or duodenal mucous membrane. It may be cancer of the pancreas.

There are many reasons why we should first consider the possibility of cancer in the pancreas. He is slightly jaundiced. In pancreatic cancer this jaundice need not necessarily be deep. In 25 per cent. of all cases, the pancreatic portion of the common bile duct is not enveloped by the substance of the gland, but rather lies in a groove on its posterior surface. In these cases malignancy may be far advanced without completely occluding the duct, and the consequent jaundice may be only slight.

When epigastric pain is the result of malignancy in this location it may be of two different varieties, either a dull continuous ache, or intermittent, severe and agonizing. Vomiting does not usually give complete relief, in fact, vomiting may not be present. In the case in point the pain is intermittent, it is severe, it is agonizing. Vomiting sometimes gives complete relief, which, coupled with the fact that the pain is almost as severe in the right hypochondrium as in the epigastrium, would not have a tendency to substantiate pancreatic cancer. He is thin, he has lost forty-one pounds in the last year, which, coupled with the jaundice and pain, looks suspicious, and yet he has no distention of the gall-bladder, he has no ascites, he is not cachectic in ap-

pearance, he has no palpable tumor in the epigastrium, and furthermore no undigested meat fibres could be found in the feces. These are conditions which we would expect to find before we could definitely pronounce cancer present. It would appear from this that the weight of evidence was negative rather than positive.

As to gastric or duodenal ulcer, there is little evidence. He has the pain, the vomiting, the emaciation. The pain, however, is not definitely related to meals. Furthermore, there is jaundice. There has been no melæna, there has been no hematemesis. The possibility of ulceration, therefore, must be very slight.

In considering the possibility of malignancy in the hepatic flexure of the colon we must remember that tumor is a late symptom, and that diagnosis, in order to give prospects for complete relief, must be made in its absence. The diagnosis must be made from a combination of general and local symptoms. If there is increasing anemia, if there is any cachexia, and if the patient is above forty years of age, malignancy, in the absence of any other apparent cause, must be suspected.

In cancer of the hepatic flexure we would expect to find stenosis, obstinate constipation, pain, ascites, cachexia, and emaciation.

Stenosis at some point in the alimentary canal is evidently present, as evidenced by the fact that vomiting is frequent and that it almost always gives relief. Obstinate constipation is not necessarily always present in cancer of the intestine, in fact, it frequently alternates as in the present case with excessive diarrhœa. Emaciation is also present in this case.

Two symptoms which we would expect to find are absent, ascites and cachexia. As these are very important, one would in their absence be very loath to pronounce carcinoma of the intestine. One further condition, the presence of slight jaundice, would at least lead one to look for implication of the biliary tract in the location of the disease.

Is this clinical picture due to pyloric spasm, and if so, what is the direct cause of the spasm? We know of four definite pathological conditions which will produce spasm of the pylorus—appendicitis, cecal tuberculosis, gall-stones and malignancy of the pylorus itself.

At twenty-eight years of age, and again at thirty-six, this man had suffered from inflammation of the bowels. In the first attack he nearly died. Was one, or were both of these illnesses due to appendicitis? The first attack was thirty-one years ago, and the second twenty-three. At that time appendicitis as a disease was practically unknown. We now know that ninety per cent. of all cases of acute peritonitis in the male are directly due to appendicitis. It would appear that we are quite safe in supposing that these two attacks were due to a common cause—

the appendix. It is now twenty-three years since the last attack. During these intervening years no symptom of appendiceal trouble had appeared. It would not therefore appear likely that this condition, even if pyloric spasm, could be caused by the appendix.

Are there any symptoms of cecal tuberculosis which might produce such a spasm? In tuberculosis of the ileocecal region we would expect to find a tumor, fixed, hard and more sensitive to pressure than a carcinoma. We would also look for periodical attacks of severe pain and alternating diarrhoea and constipation, as a result of the enterostenosis which must be present. It is quite rare to find acute obstruction of the bowel supervene in this condition. We would expect to find fever in moderation with evening exacerbations and morning remissions. We would expect less emaciation than in carcinoma.

This gentleman has the periodical attacks of pain, he has the alternating diarrhoea and constipation, he has the emaciation; he has not the tumor, he has not the fever, and furthermore the symptoms are referred to a point in the abdomen considerably higher than the ileocecal region.

Pyloric cancer? There is no history of preceding ulceration in either the stomach or duodenum. There has never been any melæna, there has never been any hæmatemesis. The stomach is not dilated, therefore there can be no pyloric obstruction, which would to a certainty be present after one year's presence of cancer in that region. There is no tumor in the region of the pylorus, which after the disease has been in progress for twelve months, one would naturally expect to find. Altogether we cannot even suspect pyloric cancer.

Have we before us a case of gall-stones? Though the symptoms are obscure and some of them at least apparently misleading, the weight of the evidence must certainly favor the presence of conerctions in the biliary tract. The loss of forty-one pounds of flesh it not at all inconsistent with the presence of gall-stones. The periodical epigastric pain, sudden, lancinating and bearing no relation to meals, would lend strength to the opinion of gall-stone colic. Vomiting frequently relieved the pain, a symptom of importance in the diagnosis of gall-stones. Pancreatic cancer has been ruled out. Jaundice is present, and its presence can best be accounted for by the presence of gall-stones as the most likely cause of biliary obstruction with the foregoing clinical picture and attendant history. A diagnosis of gall-stones was accordingly made.

*Outcome.*—On March 27th, abdominal section revealed a normal stomach and duodenum, a normal gall-bladder and biliary tract, a normal pancreas. A band of adhesions, firm and strong as a large cord, passed

from the base of the appendix across the ascending colon, narrowing its lumen to at least one-quarter its natural size. The appendix itself was buried in dense adhesions. After removal of the fibrous band constricting the colon, and appendectomy, the pain ceased, the vomiting stopped and he began to put on flesh rapidly. No cause whatever was found for the jaundice. After operation it, too, cleared up, so that it must have been simply catarrhal.

Case No. 1168.	FIVE.	Date, May 12, 1914.
Miss A. S. _____		Address, M_____
Age, 18. _____	Civil State, single.	Nativity, American.

#### CLINICAL HISTORY.

When on May 12th, I saw with her physician, Miss A. S. \_\_\_\_\_, of M\_\_\_\_\_, I found a young woman of eighteen who for the past three years had been able to do practically nothing through chronic invalidism. I found her very much wasted in flesh. At fifteen, the picture of health, she had weighed one hundred and sixteen pounds. At the present time she scarcely tipped the scales at eighty-four. She was pale, haggard and worn, was sad and dejected in appearance, and as a result of long-continued ill-health, she had become more or less despondent.

Her previous history is soon told. Shortly after her fifteenth birthday she had commenced to suffer from vague, indiscriminate wandering pains throughout the abdomen. She became slightly constipated, suffered from headaches, from loss of appetite and insomnia. This vague abdominal pain was somewhat periodical in character. For a week she would suffer much, then for the next fortnight would be apparently quite well.

After six months of repeated attacks such as this, her physician thought best to remove the appendix, under the impression that this organ might be the offending one. Appendectomy was followed by a repetition of the same symptoms as previously. No benefit whatever was experienced.

From this time on her weight gradually decreased. When the attacks came on she would remain in bed for a week, then until the appearance of the next seizure, some two, three or four weeks hence, would be about the house in comparatively good health. At seventeen she weighed just one hundred pounds. The vague, wandering pain of heretofore had become more definitely settled in her right side just above McBurney's point. Tenderness on pressure was not marked in the region of the pain, but lower in the abdomen, just above the pubes, pressure on the right side elicited considerable tenderness. Bi-manual examination revealed nothing. Rest in bed, free purgation, and evaporating lotions at this time accomplished much good, so that the lower abdominal pain had quite disappeared.

For the succeeding year she gradually lost flesh, the periodical attacks of pain became more frequent and severe, and the outlook for the future looked very discouraging. On May 12th I saw her presenting the appearance above described.

Physical examination revealed a wasted frame and a tender abdomen. Tenderness was general throughout the entire abdominal cavity, though the point of maximum tenderness appeared to be in the right lumbar region. Pressure here elicited great pain. The right hypochondriac region was tender only to a lesser degree than the right lumbar. The abdomen was scaphoid. Some rigidity was present in the right rectus throughout its entire course. The heart and lungs were normal. The urine showed no evidence of kidney disease. The stools were normal in color, and microscopical examination revealed nothing abnormal in any way. There had never been any melæna, there had never been any hematemesis, there had never been any vomiting. No undigested food remained in the stomach, there was no motor insufficiency, there was no gastric dilatation. A test meal revealed free hydrochloric acid. Temperature and pulse normal.

#### PHYSICAL EXAMINATION.

**HEART**—Normal.

**LUNGS**—Normal.

**ABDOMEN**—Tenderness throughout entire abdomen—most severe in right lumbar region. Scaphoid abdomen.

#### CLINICAL EXAMINATION.

##### URINE.

Amount in 24 hours, 40 ozs. Color, amber. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1020. Albumin, none. Sugar, none.

##### Microscopical Examination—

Fus. none. Blood, none. Crystals, none.

##### Tube Casts—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

##### BLOOD—

**Hemoglobin**—Dare (90%). Temperature, 98. Pulse, 74.

**Blood Pressure**—Systolic, 120 (Normal 100-120 mm.) Diastolic, 85 (Normal

75-95 mm.)

**Red Cells**—No. 4,400,000 per cu. mm. (Normal, Men 5,000,000. Women 4,500,000).

**White Cells**—No. 7,400 per cu. mm. (Normal 7,500).

##### Differential Count of 820 Leucocytes.

Small Lymphocytes, 22% (Normal 22-25). Large Lymphocytes, 4% (Normal 3-6).

Large Mononuclear Leucocytes, 1% (Normal 1-2) Transitional Forms, 1% (Normal 1-2).

Polymorphonuclear Neutrophils 70% (Normal 70-72). Eosinophiles, 3% (Normal 2-4).

##### GASTRIC ANALYSIS—

Gastric Extract. Meal given, toast and tea. Quantity Removed, 3½ ozs. Food Remnants, none. Blood, none. Tissue Bits, none.

##### Chemical Examination—

Reaction, acid. Total Acidity, 58. Free H.C.L. present. Combined H.C.L. . . . . Total H.C.L. . . . . Lactic Acid, none. Altered Blood, none. Bile, none.

##### Microscopical Examination—

Micro-Organisms. B. Oppler Boas, none. Yeasts, none. Sarcines, none.

#### X-RAY (FLUOROSCOPIC EXAMINATION).

**HEART**—Normal.

**LUNGS**—Normal.

**STOMACH**—Position, Normal. Visible Peristalsis, present. Filling Defects, none. Incisura, none. Hypersecretion, not visible. Mobility: (a) Stomach, normal; (b) Pylorus, normal; (c) Duodenum, slightly fixed. Tender Point, most acute in right lumbar region. Residue after six hours, none. Empty in 5 hours.

**SMALL INTESTINE—**

Duodenum, empty in 8 hours. Ileum, empty in 18 hours.

**LARGE INTESTINE—**

Colon, empty in 30 hours.

**COLON—**Fluoroscopic Examination by Opaque Enema, normal.

*Discussion.*—In the face of the foregoing history it is readily seen that arriving at a diagnosis in this case is no easy matter. The picture is complex. An original diagnosis of chronic appendicitis had been made and the appendix removed with no apparent benefit. One year before, there had been great pain and muscular rigidity in the region of the right ovary, but under appropriate treatment this seeming exacerbation had rapidly cleared up, so that any complications in this portion of the abdomen may be readily dismissed. She had periodical pain in the right hypochondriac and right lumbar regions, accompanied by some rigidity. Now what conditions are, along with the other symptoms manifested by the patient, likely to be the cause of her present condition? We must consider tuberculosis of the caecum, gastric or duodenal ulcer, incomplete obstruction of the intestine due to adhesions, chronic pancreatitis, gall-stones and spasm of the pylorus.

Tuberculosis of the caecum is a common cause for pyloric spasm producing just such symptoms as this girl presents. Caecal tuberculosis, however, would long before the lapse of the three years during which this girl had been ill, have produced a definite and prominent tumor. In tuberculosis of the caecum, the tumor which invariably develops is hard and nodular, is usually fixed, and presents every evidence of a carcinomatous growth. On palpation one point must be emphasized, a tumor the result of tuberculosis in this portion of the bowel is likely to be somewhat more tender to the touch, than one the result of cancer. Her periodical attacks of severe pain looked very much indeed like the result of an enterostenosis, which always accompanies ileocecal tuberculosis. This disease is almost invariably accompanied by fever. This girl had none, the absence of a tumor after the trouble had progressed three years would be evidence sufficient to rule out tuberculosis as the cause of this disease.

It looks as though the differentiation must be made between gastric or duodenal ulcer and gall-stones.

Her symptoms do not point to the typical history of ulcer. She has free hydrochloric acid, which we would expect, but she has no vomiting, she has had neither hematemesis nor melaena, she has never had the typical pain one, two or three hours after meals, the pain she suffered was never in any way related to the partaking of food, partaking of a meal never had any tendency to relieve the pain. Under these circumstances it seems fairly reasonable to exclude ulceration.

As for gall-stones the symptoms are more typical. The pain is ushered in suddenly, has no relation to food and passes away just as

suddenly. The character of the pain had the typical appearance of gall-stone colic. Her great loss of weight would be thoroughly consistent with gall-stones. Her age, however, would speak against this, as the presence of gall-stones under twenty years of age is very uncommon. The weight of the evidence was all in favor of gall-stones, and this diagnosis was accordingly made.

*Outcome.*—On May 15th laparotomy revealed on the anterior wall of the duodenum an ulcer the size of an ordinary ten-cent piece. Its base was very thin, almost on the point of perforating. The gall-bladder and ducts were normal. Infolding of the ulcer and posterior gastro-enterostomy effected a rapid cure. In three months she had regained twenty pounds.

Case No. 1197.	SIX.	Date, Aug. 20, 1914.
Miss D. T. _____		Address, L_____
Age, 23.	Civil State, single.	Nativity, Canadian.

#### CLINICAL HISTORY.

Miss D. T. \_\_\_\_\_, of L\_\_\_\_\_, 23 years of age. On August 20th I first examined this young lady. She was apparently well nourished, had a very rosy color, and did not present the appearance of one very ill. She gave a very clear previous history.

At the age of thirteen, just ten years ago, she had, while one day in school, been suddenly seized by a severe pain, as she said, in her stomach. She was then taken home and in some twenty or twenty-four hours it passed off immediately after a free vomiting spell. For six months there was no recurrence, then without warning there was a repetition of the old attack. For the following seven years she suffered every few months from such an attack coming on regularly in the spring and fall. During the past three years the attacks have been appearing much more frequently, in fact, for the past six months she has never gone more than three weeks at the most without an attack. Coincident with the greater frequency, the severity has also increased, so that at the present time she is compelled to take to bed for at least two days at each seizure. The pain continues unabated, in fact, gradually increases in severity from the commencement of the attack until its culmination in a vomiting spell, when it completely disappears. On the culmination of the attack she can eat anything and everything without the slightest discomfort, and enjoys the best of health until the next attack. This seizure has never appeared to be precipitated by a meal or any indiscretion in diet. Immediately after the attack she loses a few pounds in weight, but invariably regains it rapidly. The pain commences in the epigastrium, piercing like a knife to the back, at a point midway between the shoulder blades. She never vomits, or, in fact, never has even the slightest epigastric discomfort between attacks.



On making a careful examination I found the pulse and temperature normal. The heart and lungs were perfectly free from even the suspicion of disease. Urinalysis revealed nothing abnormal in the genito-urinary system. The body was plump and well nourished. Abdominal palpation revealed great tenderness in the epigastrium and also a tender spot just above McBurney's point. By detracting her attention, fairly deep pressure could be brought to bear on either of these points without producing pain. Furthermore, by drawing her attention to the left side of the abdomen and suggesting tenderness, the pain on the right side at once disappeared. It looked to me on the first impression like a typical case of neurasthenia.

Feeling the necessity of keeping her under observation for a short time, I sent her into the hospital and had a complete gastric analysis made on three different occasions. They were perfectly normal, and no hint could even be obtained from them as to the seat of the lesion. While in the hospital she appeared perfectly well, and at the end of a week returned to her own home town.

On September 2nd she returned in apparent great distress, and I sent her into the hospital at once. I now had the opportunity of examining her in one of the attacks. The pain was entirely epigastric, sharp, severe and lancinating in character and radiated through to the back. The epigastrium was very tender, though no other tenderness was apparent in the abdomen except in a minor degree just above the usual site of the appendix.

The pain increased in severity until six hours after her admission, when immediately after a very free attack of emesis, it suddenly ceased. The vomitus on examination showed bile, free hydrochloric acid and some particles of undigested food. The instant she vomited she appeared perfectly well. There was no jaundice, there was no indication of clay-colored stools, there was no hemetemesis, there was no melæna.

#### PHYSICAL EXAMINATION.

**HEART**—Normal.

**LUNGS**—Normal.

**ABDOMEN**—Great tenderness in epigastrium. Tender over McBurney's point.

#### CLINICAL EXAMINATION.

**URINE**—

Amount in 24 hours, 40 ozs. Color, pale straw. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1.014. Albumin, none. Sugar, none.

**Microscopical Examination**—

Pus, none. Blood, none. Crystals, none.

**Tube Casts**—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

**BLOOD**—

**Hemoglobin**—Dare (95%). Temperature, 98.4-5. Pulse, 78.

**Blood Pressure**—Systolic, 120 (Normal 100-120 mm.) Diastolic, 90 (Normal

75-95 mm.)

**Red Cells**—No. 4,200,000 per cu. mm. (Normal, Men 5,000,000. Women 4,500,000.)

**White Cells**—No. 5,800 per cu. mm. (Normal 7,500.)

**Differential Count of 490 Leucocytes**—

Small Lymphocytes, 20% (Normal 22-25). Large Lymphocytes, 4% (Normal 3-6).

Large Mononuclear Leucocytes, 1% (Normal 1-2). Transitional Forms, 1% (Normal 1-2).  
 Polymorphonuclear Neutrophils, 76% (Normal 70-72) Eosinophiles, 2% (Normal 2-4).

**GASTRIC ANALYSIS—**

Gastric Extract. Meal given, toast and tea. Quantity Removed, 3 ozs.  
 Food Remnants, slight. Blood, none. Tissue Bits, none.

**Chemical Examination—**

Reaction, acid. Total Acidity, 50. Free H.C.L., present. Combined H.C.L. . . . . Total H.C.L. . . . . Lactic Acid, absent. Altered Blood, none. Bile, none.

**Microscopical Examination—**

Micro-Organisms. B. Oppler Boas, none. Yeasts, none. Sarcines, none.

**X-RAY (FLUOROSCOPIC EXAMINATION).**

**HEART**—Normal.

**LUNGS**—Normal.

**STOMACH**—Position, Normal. Visible Peristalsis, marked. Filling Defects, none. Incisura, none. Hypersecretion, not visible. Mobility: (a) Stomach, greatly dilated and slightly fixed; (b) Pylorus, fixed; (c) Duodenum, slightly fixed. Tender Point, in epigastrium and over McBurney's point. Residue after six hours, marked. Empty in 14 hours.

**SMALL INTESTINE**—

Duodenum, empty in 18 hours. Ileum, empty in 28 hours.

**LARGE INTESTINE**—

Colon, empty in 42 hours.

**COLON**—Fluoroscopic Examination by Opaque Enema, normal.

*Discussion.*—My first impression of this illness being of a nervous origin was dispelled immediately I saw her in an attack. Her pain was indeed intense. Her facial expression was of one who was suffering real agony. The epigastrium alone appeared rigid, throughout the remainder of the abdomen the muscles were soft; there was no rigidity. It would appear that the seat of the pathological lesion, whatever it may be, would be found in the immediate epigastric region.

Now, what lesion would likely be responsible for the symptoms here produced? Is it intestinal, is it pancreatic, is it stomach, is it gall-bladder? Is this an enterospasm due to periodical contraction of some portion of intestine in the upper abdomen? Should this be the case, it is likely to be secondary to a chronic intestinal obstruction, one in which the lumen of the gut is not completely occluded from an anatomic point of view, yet sufficiently contracted to chronically interfere with the passage of feces. Should such a condition become acute, the clinical picture presented would be one such as has been described here.

In chronic intestinal obstruction we have most obstinate constipation which may have existed for a long period. A purgative may frequently have to be given, the patient discovering that a bowel movement is very difficult to obtain without. It is frequently the case that this severe constipation will alternate with diarrhœa. If the stenosis is situated in the large intestine, constipation is an early symptom, if in the small, it is usually quite late in appearing.

This girl has never had any constipation, she has never had any diarrhœa. Her bowel movements have always been quite normal.

One of the earliest symptoms of stenosis in the bowel is vague indefinite colic. These spasms gradually become more severe and definite in location, and almost invariably are accompanied by vomiting, which

immediately gives relief. In the present instance this condition is marked.

Visible peristalsis is a frequent symptom in chronic obstruction of the intestine. Should the stenosis be low in the bowel, though not necessarily low in the abdomen, these peristaltic waves are quite visible. When present they are always accompanied by colicky pains. In the case of this young woman they were not discernable.

Abdominal distention to a greater or lesser degree is almost invariably present. It depends entirely upon the location and degree of the constriction. In the present instance the abdomen was soft, and at no time was it ever distended.

We have here the presence of constipation alternating with diarrhoea, of visible peristalsis, of tympanites. There has never been either blood or pus in the stools. There has been no loss of weight, and, furthermore, there is no history of syphilis or tuberculosis, two common diseases likely to produce such a stenosis. We have only the severe, intense pain relieved by vomiting, and although in itself very typical of stenosis, we must in the absence of at least some of the foregoing symptoms, look elsewhere for the seat of the trouble.

Pancreatic disease need only be mentioned to be passed by. Although the character of this pain would simulate exactly that produced by a chronic pancreatitis, yet there is wanting some of the most vital symptoms, such as wasting, jaundice, the typical ague-like seizures, etc. There is evidently no lesion of the pancreas.

Is this lesion in the stomach? Is it gastric or duodenal ulcer? The history of the case is not typical of ulcer. This woman would go for weeks enjoying the best of health, eating anything and everything with absolutely no discomfort. Food did not produce pain. The pain she suffered was apparently in no way related to the partaking of food. During all these years there had never been any hematemesis, there had never been any tarry stools. The pain was not of the character produced by ulcer, it was more intense, sharp and lancinating. Vomiting gave immediate relief, when she could at once eat anything without the recurrence of the pain. The picture is not that of ulcer.

With the exception of the loss of weight we would naturally expect to find with gall-stones producing as much trouble as here experienced, this is a picture we would likely see produced by cholelithiasis. She has the typical gall-stone colic, the intense pain shooting from the epigastrium straight through to the back. Like gall-stone colic, it has no relation to food. Like gall-stone colic, it appears suddenly, without warning, and leaves just as abruptly. Like gall-stone colic, too, it usually passes off with a free attack of emesis. After weighing and sifting

the evidence carefully, we are forced to the conclusion that the biliary tract is the seat of the trouble, and gall-stones the cause.

*Outcome.*—On September 7th laparotomy revealed a normal gall-bladder and biliary tract. A large partly-healed duodenal ulcer one inch beyond the pylorus was present, and its cicatrix had so contracted as to narrow the lumen of the bowel at this point to the size of an ordinary lead pencil. The stomach was greatly dilated. Posterior gastro-enterostomy afforded complete relief.

Case No. 1116.	SEVEN.	Date, Feb. 17, 1914.
Mr. F. W. _____		Address, J. _____
Age, 26. Civil State, single.		Nativity, Canadian.

#### CLINICAL HISTORY.

Mr. F. W. \_\_\_\_\_, of J. \_\_\_\_\_, age 26. On February 17th. I saw with his physician, this young man, who was evidently very ill. On first sight his appearance was striking. His face was pale and his expression anxious. His eyes seemed to pierce you through, as though to divine your opinion. There was a nervous twitching of the mouth and eyelids, and his hands twitched restlessly on the white counterpane.

His previous history is short. He had been ill but three months, before which time his health had been the best. Just three months before my seeing him, while driving in a buggy, his horse having become frightened and unmanageable, had run away, throwing him heavily to the side of the road, where, on falling, he struck his abdomen on a large stone. From that moment he was never free from pain at a point just above the umbilicus. He continued to work for another month, though oftentimes complaining much of severe epigastric pain. One month after the accident a distinct lump was discovered just above the umbilicus, which on pressure was tender. It was apparently smooth and rounded. His temperature when taken at that time was 100.1-5, and pulse 88. There were no chills, and the fever appeared to be transient, for on several consecutive days thereafter it was never found to be normal.

Two weeks after the discovery of the lump, or six weeks after the accident, he was compelled to take to his bed on account of the constant pain when he walked around. His temperature was now running about 100 F. in the morning and 101 degrees at night. The mass steadily increased in size and tenderness, and general abdominal distention began slowly to appear.

At the time of my seeing him careful physical examination revealed a distended tympanitic and tender abdomen. A distinct mass could be clearly felt just above the umbilicus. It was very tender to the touch, but not nodular. Examination of the chest revealed nothing. Urin-

alysis was normal. Temperature 104 F., pulse 132. Careful enquiry revealed no history of tubercular or malignant trouble on either his father's or mother's side.

## PHYSICAL EXAMINATION.

**HEART**—Normal.

**LUNGS**—Normal.

**ABDOMEN**—Great pain at point in midline just above the umbilicus. Mass present at this point. General abdominal distention.

## CLINICAL EXAMINATION.

**URINE**—

Amount in 24 hours, 44 ozs. Color, pale straw. Odor, none. Sediment, none. Reaction, acid. Sp. Gr., 1016. Albumin, none. Sugar, none.

**Microscopical Examination**—

Fus, none. Blood, none. Crystals, none.

**Tube Casts**—

Epithelial, none. Blood, none. Granular, none. Hyaline, none.

**BLOOD.**

**Hemoglobin**—Dare (96%). Temperature, 104. Pulse, 132.

**Blood Pressure**—Systolic, 118 (Normal 100-120 mm.) Diastolic, 86 (Normal

75-95 mm.)

**Red Cells**—No. 4,600,000 per cu. mm. (Normal, Men 5,000,000, Women 4,500,000.)

**White Cells**—No. 7,600 per cu. mm. (Normal 7,500.)

**Differential Count of 620 Leucocytes**—

Small Lymphocytes, 23% (Normal 22-25). Large Lymphocytes, 2% (Normal 3-6).

Large Mononuclear Leucocytes, 1% (Normal 1-2). Transitional Forms,

2% (Normal 1-2).

Poly morphonuclear Neutrophils, 74% (Normal 70-72). Eosinophiles,

2% (Normal 2-4).

**GASTRIC ANALYSIS**—

Gastric Extract. Meal given, toast and tea. Quantity Removed, 4 ozs.

Food Remnants, none. Blood, none. Tissue Bits, none.

**Chemical Examination**—

Reaction, acid. Total Acidity, 62. Free H.C.L. present. Combined H.C.L. . . . . Total H.C.L. . . . . Lactic Acid, absent. Altered Blood,

none. Bile, none.

**Microscopical Examination**—

Micro-Organisms. B. Opples Boas, none. Yeasts, none. Sarcines, none.

## X-RAY (FLUOROSCOPIC EXAMINATION).

**HEART**—Normal.

**LUNGS**—Normal.

**STOMACH**—Position, normal. Visible Peristalsis, present. Filling Defects, none. Incisura, none. Hypersecretion, not visible. Mobility (a)

Stomach, normal; (b) Pylorus, free; (c) Duodenum, free. Tender Point, in middle just above umbilicus. Residue after six hours, none. Empty in 6 hours.

**SMALL INTESTINE**—

Duodenum, empty in 12 hours. Ileum, empty in 20 hours.

**LARGE INTESTINE**—

Colon, empty in 36 hours.

**COLON**—Fluoroscopic Examination by Opaque Enema, normal.

*Discussion.*—The condition now presented is evidently one of great acuteness, but whether an acute disease from its commencement, or an acute exacerbation on an old chronic condition, is the question.

Should it be an acute exacerbation of a chronic trouble we would immediately think of an echinococcus cyst, pancreatic or retroperitoneal, simple proliferative peritonitis, cyst tumor of the mesentery, and although the age of the patient would speak against it, yet we could not help but consider carcinoma, either primary or secondary.

If the condition is one acute from the onset, the diagnosis must lie between abscess and acute tuberculous peritonitis.

While echinococcus cysts constitute the most frequent variety of cystic tumors, yet this may be readily ruled out, as the tumor is evidently of a solid variety. For the same reason we may speedily dispose

of cysts, both pancreatic and retroperitoneal. Furthermore, this tumor appears to be adherent to the abdominal wall, while a cyst of the pancreas lies behind the inflated stomach and colon. A retroperitoneal cyst is immovable and lies directly behind the inflated colon.

Seventy-five per cent. of all tumors of the mesentery are cystic. The larger ones usually appear in the region of the umbilicus, and though not adherent to the abdominal wall, are not freely movable. Symptoms of stenosis or even intestinal obstruction are frequently caused by their pushing the intestines aside. Though not adherent anteriorly, they often become adherent to their neighboring viscera. The sense of fluctuation is sometimes very doubtful, and it is extremely difficult to differentiate between them and one of a solid variety. The tumor in this case is evidently quite adherent anteriorly, and has every indication of being solid, therefore the presence of a cyst of the mesentery may be ruled out.

Carcinoma in a young man of twenty-six is uncommon. When present it is either primary or secondary. This could scarcely be primary. If on either of the colic flexures it would have produced stenosis, which is not apparent. If of the great omentum the tumor would be not only adherent to the abdominal wall, but would be distinctly nodular. This one is comparatively smooth. Furthermore, omental cancer is very rarely primary, but rather secondary, to pyloric involvement. There is no evidence of any primary focus anywhere. The question of cancer may confidently be dismissed.

This condition, evidently acute from the onset, is probably infective—is either an abscess formation or an infective peritonitis, probably tubercular. If of abscess formation, where is the focus of infection? The two most likely conditions would be either a huge empyema of the gall-bladder or a subdiaphragmatic abscess from an acute or subacute perforation of a gastric ulcer. The position of the tumor would not conform to the location of the gall-bladder, and as there has heretofore never been the slightest symptom of any gall-bladder disease, we may feel reasonably assured this organ is free from trouble. Subdiaphragmatic abscess is usually the result of an acute or subacute perforation of a gastric ulcer. This man has never had at any time even the faintest suspicion of stomach trouble. Until the time of his accident he had been perfectly well. At the present time his meals are taken without the slightest discomfort.

I wish to state here, however, that it is not absolutely necessary for a patient to exhibit any typical symptoms of ulcer, or even any symptoms of indigestion, in the presence of even extensive ulceration. I have on two occasions operated on acute perforation of a gastric ulcer, where be-

fore the moment of perforation no symptom whatever of stomach trouble had been present. In the case of ulcer of the duodenum I have on one occasion had the same experience. In one large subdiaphragmatic abscess I found the cause to be perforated gastric ulcer, and yet no indigestion, no dyspepsia nor stomach symptoms of any description had ever been present.

There is not present in the case under discussion the characteristic tenderness elicited on pressure of an abscess. He had never had the chills so frequently associated with abscess formation. It appears fairly reasonable to exclude pus.

Tuberculosis peritonitis presents itself in various forms. It may be present as a part of a general miliary tuberculosis, or it may be quite latent, as in the appendix or fallopian tube, and only discovered by accident, at operation for other conditions. In tuberculosis of the peritoneum without encapsulation, the disease is sometimes ushered in tempestuously. There may be initial fever of from 103 to 104 F., great abdominal tenderness, tympanites, rigidity, vomiting, constipation and leukocytosis. In these cases it is often difficult to find a cause for the peritonitis, but frequently an examination of the lungs will furnish the clue. These are also the cases which often have their origin in a chronic tuberculous condition in the appendix or fallopian tube.

A fourth variety is that in which there is definite encapsulation of the exudate forming a tumor, or the formation of a tumor from the rolling up of the great omentum, or the retraction, the thickening, or adhesions of adjacent intestinal coils. Tumors are occasionally formed by the enlargement of mesenteric glands, especially in children. There is also a fifth variety, in which a great quantity of free fluid is present in the abdomen. This is known as the ascitic form.

Is the case in point one of tuberculous peritonitis? The disease was ushered in apparently as the result of an accident, and from the first a steady augmentation of the symptoms were experienced. We have the slow formation of a tumor, no palpable ascites, but rather a somewhat tympanitic abdomen. We have a high temperature with fast pulse. There is no pulmonary tuberculosis, and no tubercular history. There is apparently no primary focus of cancer, and there is no cancer history. With the exclusion of all other possible conditions we are thus forced, even in the absence of so-called typical symptoms, to consider this a case of tuberculous peritonitis, with the formation of a tumor from either rolled-up omentum, or encapsulated exudate.

*Outcome.*—On February 20th I opened the abdomen. The great omentum was rolled up into a large hard mass. The peritoneum was studded with tubercle throughout its entire extent. There was present but a small quantity of ascitic fluid.