



# Western Canada Medical Journal

A MONTHLY JOURNAL OF MEDICINE  
SURGERY AND ALLIED SCIENCES

WINNIPEG. CANADA

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FRACTURE OF THE PATELLA

HYDRAMNIOS MONSTROSITIES

EDITORIAL

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## ORIGINAL COMMUNICATIONS

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### THE OPEN OPERATIVE TREATMENT OF FRACTURE OF THE PATELLA

BY

AIME PAUL HEINECK, M.D.

CHICAGO, ILL.

Professor of Surgery, Reliance Medical College, and Surgeon to Cook  
County Hospital, Chicag.

As yet, there is no uniformity of opinion, no uniformity of practice, as to what should be done, as to what is done, in the treatment of fractures of the patella.

For the fractures of this sesamoid bone, the largest in the human body, many different operative methods have been devised, suggested, advocated and practised; numerous are the observations that have been collected and published, descriptive, condemnatory and commendatory of these various methods. However, by far the greater number of the methods proposed have been abandoned, have been superseded by a few less objectionable, more preferable methods. Operative and clinical experience have led to the omission, to the elimination from the operative procedure of such steps as were found to be needless, of such steps as were found to be harmful, and to the introduction, to the general employment, of some of great desirability.

This diversity of methods employed by men of recognized surgical attainments suggested questions to my mind. It is of

practical importance that these questions be accurately answered. These answers, we think, should be determined, should be arrived at, partly by theoretical consideration, partly by the study of the pathological anatomy present (as revealed at the operating table or at the autopsy room) in knee joints whose patella have been fractured, and, largely and mainly, by the clinical observation and clinical comparison, from the anatomical and functional standpoints of the results obtained, by the employment of the various methods of treatment advocated and practised.

Among the questions calling for a definite answer are the following:

1. Is the patella essential to the functional integrity of the knee-joint?
2. Are permanent displacements of the patella, in whole or in part, congenital or acquired, deformities significantly impairing the functions of the knee-joint?
3. Are there other traumatic lesions, simulating from the symptomatic standpoint, by the functional disturbances which they entail, fractures of the patella? What are these conditions? How are they best treated?
4. Which is the treatment of choice for fracture of the patella?
5. Is operation, at times, contraindicated? If so, when?
6. If operation is not always indicated, when is it indicated?
7. How should the treatment of old fractures differ from that of recent fractures, or is the same treatment applicable to both? If not, why not?
8. Which of the principal various open operative procedures that are now in vogue for the treatment of fractures of the patella, is the most universally applicable, the most satisfactory from the standpoint of early and of late results: transverse or longitudinal osseous suturing, looping of the patella (cerclage Berger,) hemi-cerclage (Quenu,) or suturing of the peri and para-patellar fibrous tissues (suture des ailerons, Vallas, retinaculæ patellæ, B.N.A.) (reserve extensor apparatus, Mickulicz)?

Questions of operative technique, concerning equally all the different open operative methods, for fractures of the patella,

must also be decided. Among them, are the following:

a. Should one, if he be an advocate of the open operative treatment, operate on the day or on the morrow of the infliction of the injury, or should he wait till the soft tissues have recovered from the immediate effects of the traumatism?

b. What should be the nature of the anaesthetic employed? Local, lumbar, or general anaesthesia?

c. Should the operative field be rendered bloodless by the employment of an Esmarch bandage?

d. By what type of incision is the operator best enabled to perform the repair work which he deems appropriate and necessary?

e. It is advisable in operations for fractured patellæ to irrigate the articulation? If so, with what fluid, an antiseptic solution, irritating or non-irritating, or merely a cleansing agent, such as normal salt solution? Or is the mere sponging out of the extravasated liquid and clotted blood, from the synovial cavity productive of the most satisfactory results?

f. Should non-absorbable, or absorbable, suture material be used? Are there any valid reasons for discarding non-absorbable suture material?

g. Shall the completely detached bony fragments be removed?

h. Shall the articulation be drained?

i. Shall the peri-articular tissues be drained?

j. What should be the duration and the nature of the post-operative treatment?

"Is the patella essential to the functional integrity of the knee-joint" can be answered as follows:—

A careful study of the reported cases, amply justifies the statement that congenital absence, unilateral or bilateral, of the patella, is always associated with some impairment of the functional integrity of the anatomically defective knee-joint or joints (I a, b, c, d.). This impairment in some cases is very slight; in other cases, it is considerable. In some of the reported cases we find mentioned, as contributory factors to the disability, one or more of the following conditions:—Faulty insertion of the patellar tendon, subluxation of the knee, hyperextension of the leg on

the thigh, other associated congenital deformities or anomalies, etc.

*Acquired Absence of the Patella.*

The patella has been removed for inflammatory affections, osteomyelitis, chronic (2 a, b, c.) or tubercular in nature (3 a, b, c, d.); for fractures, transverse (4 a, b.), or comminuted (5 a, b, c.) in type; for primary malignant disease (6.) A cursory study of the collected cases shows, among other things:—

a. That the removal of the patella can be successfully performed under spinal or under general anæsthesia.

b. That though the patella seems under certain conditions to be unessential for locomotion; nevertheless, its removal is invariably followed by impairment of power, by some functional loss. I have personally examined some of these cases, and though, as in Prof. J. B. Murphy's (3 c.) and in Dr. Cassius.

c. Rogers (4 b.) cases, the patients have very serviceable knee-joints, it cannot be gainsaid that as a general rule, knee-joints without patellæ are impaired joints. To preserve the continuity of the extensor apparatus of the leg, to conserve, after removal of the patella, the stability of the knee-joint, the gap left by its extirpation must be obliterated, by suturing the tendon of the quadriceps to the ligamentum patellæ, and by such operative measures, plastic or other, as may be indicated in the individual case. The extirpation of the patella is always a sacrifice. Its loss deprives the knee-joint of the protective influence which this bone affords to the articulation, this sesamoid bone being an important factor in the distribution over a considerable area of any force applied to the front of the knee. The patella provides considerable leverage for the quadriceps muscle and its removal is followed by a weakening and an impairment of the action of the quadriceps extensor tendon upon the leg. All sesamoid bones are mechanical accessories of the tendons in which they are partially or completely embedded. By this sesamoid bone, the tendon of the quadriceps is kept spread out and prevented from being gathered up in a round cord. The patella forms a much more suitable pulley for movements round the condyles than the tendon itself, and in addition, serves a minor purpose in keeping

the upper end of the patellar ligament in a plane well in front of the axis of flexion and extension. In uncomplicated transverse fractures of the knee-cap, the extirpation of the patella as a form of treatment is to be condemned. In comminuted fractures, it deserves consideration only as a measure of last resort. In inflammatory and neoplastic disease of the bone, extirpation is a valuable resource. In primary malignant neoplastic disease, no one questions the wisdom of its removal.

Are permanent displacements of the patella, in whole or in part, congenital or acquired, deformities significantly impairing the functions of the knee-joint?

The patella, being a sesamoid bone, cannot undergo any upward displacement unless there be an associated relaxation or rupture of the ligamentum patellæ, cannot be dislocated downward without either an associated relaxation or an associated rupture of the quadriceps extensor tendon.

Our first statement was, that absence of the patella, congenital or acquired, is always associated with some impairment of the functional integrity of the knee-joint. This functional impairment may be slight, may be markedly disabling. Our second statement is, that any dislocation of the patella, be it intermittent or permanent, be it complete or incomplete, be it congenital or acquired, is also always associated with some impairment, slight or severe, of the functional integrity of the knee-joint. The fact that operations have been devised and performed for the remedying of congenital dislocations of the patella, is another proof that anomalous location of the patella entails disability (7 a, b, c, d, e.).

Are there other traumatic lesions, simulating from the symptomatic standpoint, by the functional disturbances which they entail, fractures of the patella? What are these conditions? How are they best treated?

All permanent upward or downward displacements of the patella as a whole, if dependent upon rupture of the quadriceps extensor femoris tendon, or of the ligamentum patellæ, will cause symptoms somewhat analogous to those which are caused by complete transverse, oblique, stellate or comminuted fractures of the patella. Violence of the same nature can determine a solution

of continuity of either the tendon, the patella or the ligament. The force that indirectly produces the solution of continuity is obviously exerted equally on the quadriceps tendon, on the ligamentum patellæ, on the tuberosity of the tibia and on the patella; but fracture of the patella is by far the most common result of such indirect violence.

Traumatic or pathological, open or subcutaneous ruptures of quadriceps extensor femoris tendon or of the ligamentum patellæ may, like fractures of the patella, be simple or complicated, be complete or incomplete, be unilateral or bilateral. They may be associated with, precede, or follow a fracture of the patella.

The following table shows the symptomatic resemblance existing between these three conditions:—

Complete Rupture of Quadriceps Extensor Femoris Tendon.	Complete Rupture of the Ligamentum Patella.	Complete Transverse Fracture of the Patella.
1—May be bilateral.	“	“
2—More common in males.	“	“
3—May be due to direct, to indirect violence, to muscular action, or to a combination of two or of all of these different forms of violence. It is frequently stated that the disabling lesion occurred during an effort on the part of the individual to avoid a fall (9). Quenu says that in the great majority of cases, rupture occurs during a contraction of the quadriceps extensor initiated to avoid flexion of leg on thigh.	“	“
4—Inability to extend leg on thigh. Patient is unable to elevate heel from surface of bed.	“	“
5—Distinct sulcus can be felt between the margins of proximal and distal portions of the divided tendon.	Distinct sulcus can be felt between the margins of the proximal and distal portions of divided ligament.	Distinct sulcus can be felt between fragments of the fractured patella

<p>6—Flexion increases, extension lessens width of sulcus.</p>	<p>“</p>	<p>“</p>
<p>7—Joint involment frequent. “Out of 21 cases treated operatively in 10 the joint capsule was found opened” (Walker 10). If the site of rupture be at or near the patellar attachment of the tendon, the knee-joint is usually opened, owing to the anatomical relations of the latter.</p>	<p>More frequent (11). In 20 cases of ruptured lig. patellae treated operatively, Walker 10) states that the joint capsule was involved in 12 cases,</p>	<p>Almost constant</p>
<p>8—Open operation gives by far the best results. Out of 21 cases treated by the open operation previous to 1897, 19 made a complete recovery (Walker 10). Since then, the result of operative treatment have improved.</p>	<p>“ In 23 cases treated non-operatively, the recovery was complete in only seven (Binet). Out of 20 cases treated by this open method previous to 1896, complete recovery followed in 16 (10).</p>	<p>“ It is the treatment of election</p>

The quadriceps extensor femoris muscle, the patella and the ligamentum patellae are the main structures by which extension of the leg on the thigh is effected. The integrity of each of the main constituent parts of this extensor apparatus is indispensable for the proper performance of the functions of the knee-joint. The restoration of the continuity of a completely fractured patella is just as essential for anatomical and functional recovery of the affected extremity as is that of a complete derided quadriceps extensor femoris tendon or that of a completely torn ligamentum patellae. The careful approximation of the divided ends of the quadriceps extensor femoris tendon, the exact co-aptation of the separated ends of the torn ligamentum patellae can be done effectively only by the aid of sight, that is, through an open operation (8 a, b, c, d, e). The same applies to the fractured patella, the exact apposition of the fractured surfaces of whose fragments is frequently prevented by obstacles removable, only by an open operation. The ideal function only exists when each and all of the aforementioned elements are anatomically and functionally

absolutely normal. The study of the subject conclusively demonstrates that the absence of any single one of these elements (patella, ligamentum patellæ or quadriceps extensor femoris tendon) or the presence of a pathological state of any single one of them manifests itself by impairment of function. It leads to the conclusion that perfect function presupposes and demands anatomical integrity.

*Treatment.*

In fractures of the patella, the following indications have to be met:—

1. The fracture must be reduced.
2. The bony fragments must be maintained in intimate apposition until organic union has been effected.
3. The continuity of the divided soft tissues must be re-established.
4. The functional integrity of the knee-joint must be restored.

The value of any form of treatment is dependent upon its ability to meet the above indications. All forms of treatment can be classified into one or the other of two main classes:—The non-operative and the operative. The latter admits of further subdivision into the subcutaneous and into the open method.

It is evident, that in each individual case, the adoption or rejection of any form of treatment is to be determined largely by the nature, the type of fracture at hand. Each method has advantages and disadvantages, indications and limitations.

The numerous non-operative methods of treatment that have been employed; the large number of percutaneous and subcutaneous operations for approximation of the fragments, that have been proposed, lauded, tried and then abandoned; the comparatively great number of patients, who, having been subjected to non-operative treatment, of themselves seek operative treatment in order to lessen or entirely overcome their disability, all these are proofs that all the non-operative, and the subcutaneous operative methods, as well, have deficiencies which debar them from ever being elective methods of treatment.

Occasional cases are to be found in the literature of the subject, in which, though the operator succeeded in restoring to the

patella its normal anatomical contour, functional integrity of the knee-joint was not secured. Our explanation for these cases is that some essential step in the operation has either been completely overlooked or unskillfully performed, or that the post-operative treatment has been injudicious. The extravasated blood may not have been removed from the synovial cavity; the lacerations of the soft tissue may not have been repaired, etc.

A distinction must be made between the shortcomings of the operator and the shortcomings of an operative procedure, as such.

A few, a very few cases, such as the following, can be found in the literature.

Sonnenberg, II, showed two patients, who, despite a separation of from 3 to 4 inches between the fragments of their fractured patellæ and noticeable atrophy of the quadriceps extensor femoris, had fairly good function. In one of these, the bone was in 3 fragments owing to a twice fractured patella. An explanation of these exceptional cases is to be found in the fact that the reserve extensor apparatus of the leg either was not injured or if injured that its integrity was restored and thereby the loss of continuity of the patella is fairly well compensated. Though in isolated cases good functional results may follow non-operative treatment of fractures of the patella, as a rule its employment is followed by very unsatisfactory results. Facts confirm what logic had led us to expect. Anatomical and functional integrity go hand in hand. In the treatment of fractures of the patella, we have come to discard all the subcutaneous and percutaneous operations. In scientific conception and in the practical results obtained by their employment, the inferiority of the various subcutaneous methods to the various open operations is manifest. We acknowledge that under exceptional circumstances, the operator may feel compelled to resort to them. The best known are Ceci's, Kocher's, Barker's, and Butcher's operations. Ceci's operation consists in subcutaneously drilling the fragments and inserting the approximation wire in a figure of eight pattern; Butcher's, Barker's or Kocher's methods consist of passing approximating metallic or non-metallic ligatures around or over all the fragments.

Why do we advise the abandonment of the various subcutaneous and percutaneous operations? Because

1. They do not enable the surgeon to accurately coapt the fractured fragments. After an arthrotomy, either by bone suturing, by circumferential looping or ligaturing, or by careful sewing of the torn soft tissues, the fragments can be closely apposed and held immovably together. This intimate apposition of the fractured surfaces lessens the liability to an excess, either in length or in width, of callus formation. Any change in the contour of the patella is liable to interfere with the normal adaptation of its articular surface to the femoral articular surface.

2. They do not enable the operator to freshen the fractured surfaces. In the repair of old fractures, the resection of the interfragmentary fibrous bond of union, the freshening of the fractured surfaces are among the essential steps of the operation.

3. They do insure against union of the bony fragments in a faulty position. Impaired function results from union in a faulty position. The open operation enables the surgeon to overcome any tilting of fragments, as well as any tendency to union in faulty position.

4. The subcutaneous methods make no provision for the toilet of the synovial cavity. The open operation allows of the early and complete removal of all articular effusions, of all extravasated blood, intra or extra-articular, liquid or clotted, of all completely detached bone fragments.

5. The tears in the capsule, the lacerations in the aponeurotic expansions of the vasti, demand repair. Only by means of an open operation can they be repaired. The extensor apparatus of the leg must be considered as one organ. Structural impairment of any of its constituent parts entails a corresponding impairment of function. The insertion of the vastus externus and of the vastus internus into the capsule of the knee-joint and the lateral prolongations of their insertions down upon the head of the tibia and fibula are of assistance in the extension of the leg on the thigh. Solutions of continuity in these tissues must be repaired.

6. None of the subcutaneous operations allow of the removal of the fibro-periosteal shreds which so frequently overlap the fractured surfaces and which in some cases have been found to adhere so tightly to bony projections that for their liberation it was necessary to use forceps and curette. These fibro-periosteal shreds are an obstacle to osseous union; they can be removed by an open operation.

7. The subcutaneously and percutaneous operations create openings which are inadequate for the escape of intra-articular and extra-articular-extravasates and exudates, but which are ample for the introduction of infection.

Before proceeding, let us determine the dangers, their nature and their gravity, to which patients are exposed by the employment of the open operative treatment.

The probability of ankylosis, joint suppuration or pyæmia following an aseptic arthrotomy, for practical purposes, can almost be disregarded. In none of Mullin's cases (12), was a rise of temperature worth mentioning. Stimson (13), between the years 1892-1906 performed the open operation for fractured patellæ over 200 times. During this entire period his only mishap was a slight suppuration which caused no subsequent difficulty. We concede that the general dangers inherent to other major operative procedures are also present in these cases. These dangers, anæsthesia, shock, and suppuration, are common to all operations. Shock can be minimized by rapid operating. The time consumed in the performance of any operation should be the shortest consistent with the careful and complete execution of the different steps of the operation. We will not, at this time, discuss the other two dangers.

Thiem (14), examined the official records for the years from 1895-1903, inclusive, of the German Workingmen's Indemnity Insurance Union. This is an official record and among the reporters are advocates and opponents of the open operative treatment. During this period, indemnity was paid for 283 patellar fractures; 223 of these were treated non-operatively; 6 deaths occurred; 60 cases were treated operatively, 2 deaths occurred. One of these deaths was from delirium tremens complicated by pneumonia; the other death was due to pyæmia, consecutive to

a suppurative arthritis.

In the 1100 consecutive cases analyzed by us, we note the following accidents. In 1898, in one case (15) following operation on an old fracture, some inflammation of the peri-articular tissues developed. It caused no permanent disturbance. In the same year, two cases of superficial suppuration and one case of suppurative arthritis are reported. In the latter case, ankylosis resulted. In 1898 (16), 5 cases of ankylosis followed operative treatment. In 1902, (17), Baerlowcher, reports having had, after open operative treatment, one case of ankylosis and two deaths. One of these deaths was due to delirium tremens; the other one was due to pneumonia.

This gives us in 10 years, 16 cases of ankylosis, 6 of which occurred either in or previous to the year 1898. Of the remaining 10 cases, 4 occurred in the hands of an operator, who, judging from his reports, has been unusually unfortunate with this operation. The 5 others occurred in the practice of enthusiastic advocates of the open operative treatment. (Baerlocher, Championniere, Trendelenburg, Ranzi, Rigby.) In one case, (21) owing to knee-suppurative and joint disorganization, a leg amputation had to be performed. During the period covered by the years 1898 to 1908 inclusive, we have, occurring after this operation, 6 deaths. Three of these, in our opinion, cannot be attributed to the operation (delirium tremens, pneumonia (17), apoplexy (18.) One death was determined by pulmonary embolism (19.) We must acknowledge two deaths (20 a, b.) from infection.

We believe we are fully justified in stating that the dangers of the open operation, if it be performed with due precaution by careful and skillful hands, are practically nil. There is always plenty of time to reach hands well able to perform the operation.

What are some of the advantages of the open operative method?

1. Refracture of the patella is more common after massage and other forms of non-operative treatment than after the open operative treatment. Refracture is more frequent in the patella than in any other bone, Lauper, (22.) By more closely restoring the bone to perfection, the open operative treatment lessens

to a considerable degree the tendency to refracture.

2. In any fracture, the union between the fractured fragments which is considered the most desirable, is osseous union. Modern surgeons do not expect to obtain osseous union in fractures of the patella which are treated non-operatively. Its occurrence under such conditions, though possible, is so rare that it is considered a pathological curiosity. One of the main justifications of the open operative treatment is the frequency with which osseous union follows its employment.

It being a demonstrated fact that osseous union can be obtained, it behooves us to employ that method of treatment which most frequently secures it.

It cannot be contested that the solidity of the patella contributes, in a great measure, to the stability of the knee-joint. Fibrous union of the fractured bone imparts to the articulation a weakness, an uncertainty, an instability, as a result of which patients with fibrously united patella, frequently fall. This lack of stability, this impairment of control predispose to refracture of the fibrously united patella. It is exceptional for fibrous union to be associated with absolute functional recovery. A fibrous union has a tendency to elongate under use.

3. The open operations enable us to obtain a more rapid, a more complete recovery. Koerte, considers that the climbing of stairs after fracture of the patella, is a criterion of functional recovery. In 25 cases of fractured patellæ, treated by the open method, Koerte (14) later examined 23. These 23 had all become able to climb stairs within four and one-half months subsequent to the operation. The more active the patient is, the more his occupation involves work on different levels, the more is operative treatment indicated.

4. The open operation enables the operator to mitigate all and to remove most of the conditions that tend to cause imperfect union and its consequence, impaired functional integrity. Let us enumerate and briefly discuss the most important of these unfavorable conditions.

1. Separation of the fragments.
2. Tilting of the fragments. Either or both fragments, often, are or may be, everted or inverted. In the presence of

ing, the fragments can never be maintained with the fractured surfaces exactly towards each other either by bandages or by retentive appliances, or by any subcutaneous operative method.

3. Rupture of the tendinous expansions of the vasti and of the lateral portions of the capsule of the joint.

4. Prolapse of the prepatellar tissues into the breach caused by the separation of the fractured fragments.

5. Atrophy of the quadriceps femoris due to disuse, arthritis, marked contusions of the muscle, extravasated blood from the joint through the rent in the upper part of the capsule, etc.

6. Arthritis of the knee-joint.

7. Adhesions of the patella.

The upper fragment has been found adherent to the femoral condyles. (18, 23.)

8. Union of the fragments in bad position, mechanically interfering with proper function of joint.

The open operation enables the operator to void inflammatory exudates, to make the toilet of the synovial cavity:—

If a loose spicule of bone be found between the fragments, its removal is easily effected (24.) The open operative method allows us to completely overcome the tilting of the fragments and to coapt them with a nicety unattainable by any other method.

If, shortly after a fracture of the patella, the knee-joint is opened, it will be found that the articulation contains blood. The quantity of the extravasated blood is not the same in all cases. In some cases, it is small; in others, considerable, filling the joint to distention. The blood may be liquid, clotted or semi-organized. Not infrequently, it originates intra-articular adhesions or loose foreign joint bodies. It is easy to conceive how a large intra-articular liquid collection, can, in transverse or oblique fractures, rotate the upper or lower fragment, or both, about a transverse axis. Baerlocher (17), in reporting his cases, states: "In every case, there was hemorrhage into the joint."

*Rupture of the Tendinous Expansion of the Vasti and of the Lateral Portions of the Capsule of the Joint.*

In fractures of the patella, as in other fractures, in addition to the lesion of the bone, we have co-existing injuries of contiguous soft tissues.

When one recalls the intimate relations with the patella of the fascia, muscles and ligaments which surround it, no stretch of the imagination can possibly conceive a fracture of this bone without some associated damage to the surrounding structures. The more extensive that damage, the greater the separation of the bone fragments, the less the liability to spontaneous functional recovery. From the diagnostic standpoint, it is important to determine, if after falling, the patient got up, or if he made any attempts at walking. Attempts on the part of the patient to arise, determine further lacerations of the parapatellar ligaments and consequently further separation of the fragments. Vallas holds that a bad result following a transverse fracture of the patella is due not so much to non-union and wide separation of the two fragments as to unrepaired lacerations of the anterior and lateral portions of the capsule of the knee-joint. Vallas advocates strongly the suturing of all rents in the fibrous investment of the knee. Mikulicz, Baerlocher, Lejars and Stimson emphasize also the importance of restoring the continuity of the torn reserve extensor apparatus.

Upon the proper repair, upon the proper reunion of these soft tissues is dependent, in an important measure, the functional integrity of the knee-joint. E. W. Andrews states that the patella union is only an incident in the ligamentous and tendinous repair by suture. So important is the approximation of these torn tissues, so essential is the restoration of the continuity of the aponeurotic fibres of the vasti, of the rectus femoris and of the deep fascia of the leg and thigh, that many operators in the treatment of fractured patellæ limit all their suturing to the torn soft tissues.

*Prolapse of the Prepatellar Tissues into the Breach.*

This prolapse of the prepatellar fibrous tissues between the fragments of the fractured bone, is one of the important obstacles to non-union. The prevention by these intervening soft tissues of the exact apposition of the fragments is one of the most valid reasons for resorting to the open operation. When present, these interposed soft tissues constitutes an obstacle to osseous union, removable only by the open operation.

This fibro-periosteal curtain may overlap the frac'ured sur-

face of either fragment. In some cases, both fractured surfaces are either partly or completely covered by this prolapsing prepatellar tissue. These prolapsed tissues may be easily removable, may be hooked to the underlying bone. When hooked to the fractured surfaces, their removal is, at times, attended with some difficulty. In many fractures of the patella, be they tear or blow fractures, or due to both factors, the prepatellar bursa is contused. Blood and portions of the prepatellar bursa can enter into the formation of the prolapsed prepatellar curtain, being superimposed upon the aponeurotic tissues.

By the aid of the open operation, all interfragmentary soft tissues are easily removable. Bony union presupposes an exact apposition of the osseous surfaces. Blood interposed between the fragments, we do not consider as a foreign body, it being well known that between fractured surfaces, the presence of blood is constant. Intervening tissues of other description act as foreign bodies and are productive either of fibrous union or of non-union. We concede that massage relieves pain, promotes the circulation and aids in the removal of exudates, but can it accomplish anything towards the removal of the soft tissues that have prolapsed in the breach between the fragments? The attempt to remove the inter-fragmentary soft tissues by rubbing the fractured surfaces one upon the other is illusory. Interposed soft tissues can be removed only by means of the open operation.

*Atrophy of the Quadriceps Femoris Muscle.*

This atrophy is due, partly, to disuse, partly to extravasation of blood in the substance of the muscle, partly to associated injury to the muscle and to its contained nerve filaments. By the aid of the open operation, all blood extravasation can be removed, fascial tears can be sutured.

The patients regain the use of their limbs in a comparatively short period of time; the period of immobilization is markedly shortened. Active use prevents and overcomes atrophy attendant upon disuse. It is said that "an ounce of voluntary exercise is worth a ton of massage in the treatment of muscle atrophy" (25.) Atrophy of the quadriceps extensor femoris is recorded in many cases of old fracture (26 a, b, c, d.,) etc. The early removal of all extravasated blood, liquid or clotted, from the

articular cavity and from the peri-articular tissues, limits the liability to the formation of adhesions, intra and extra-articular in nature.

By the employment of the open operative treatment, all the above mentioned obstacles to restoration of functional integrity can be more rapidly, more effectually overcome than by resorting to non-operative methods of treatment, separate or combined. The open method makes possible the removal from the joint cavity of detached bony fragments; it enables the operator to absolutely prevent the union of the fragments in a faulty position, that is, in a position mechanically interfering with the proper function of the joint; the tendency to adhesion of the upper patellar fragment to the femoral condyles is lessened. Increase in the dimensions of the patella following the open operative treatment is a rarity. Any increase in the dimensions of the patella is very liable to interfere with the adaptability of the patellar and femoral articular surfaces.

In fractures of the patella, as in other fractures, the closer the apposition of the fragments, the greater the probability of osseous union, of osseous repair, and consequently, the more probable the restoration of functional and anatomical integrity. We know that the patella is a bone of feeble regenerative power, having only one periosteal surface, nevertheless, if the conditions requisite in other bones to obtain osseous union are secured in fractures of this bone, the same satisfactory results will be obtained.

Is operation at times contra-indicated? If so, when?

Under what conditions is the open operative treatment of doubtful propriety or not indicated?

In formulating indications and contra-indications for the open operative treatment of fractures of the patella, we give only slight consideration to age, sex and occupation. Individuals of either sex, at all periods of life and in all walks of society, need a good patella. However, in this, as in all other operations, the state of the tissues and of the viscera must not be ignored. Such anatomical and physiological deterioration of the tissues may be present, as to compel us to regretfully substitute inferior therapeutic measures to operations of election. The facts can be

stated to the patient and he can select between functional integrity and functional disability. Thiem (14) gives only two conditions as contra-indicating operations:

1. Absence of separation of the fragments. (No diastasis.)
2. No loss of extension.

We do not advise open operation:

I. In fractures of the patella that occur in a diabetic patient.

The tissues of diabetics offer very little resistance to infection. They are tissues of impaired regenerative power. Nevertheless, an absolutely bad prognosis need not be given in these cases.

2. In fractures of the patella, occurring in patients having advanced tubercular disease.

3. In fractures of the patella, occurring in patients suffering from well developed cardiac, renal or hepatic disease.

4. In closed longitudinal fractures, with no displacement or with but slight lateral displacement.

In fractures of this type, recovery almost invariably follows the combined use of such measures as massage, immobilization, full extension of leg on thigh, co-aptation of the fragments by retentive apparatus. "Osseous union is constantly obtained in longitudinal fractures of the patella" Macewen (27.) This statement of Macewen admits of very few exceptions. Meyer (28) used non-operative treatment in all his cases of longitudinal fracture (the diagnosis in each case had been verified by X-rays.) He obtained excellent functional recoveries in all of them.

5. Fractures of the patella in which the separation of the patellar fragments is so slight as to be barely detectable, do not call for the open operative treatment. The same applies to fractures in which the injuries to the accessory patellar ligaments are unimportant.

6. Do not operate on patients who prefer to pass their lives partly disabled rather than to run the minimal dangers of an operation.

If operation is not always indicated, when is it indicated?

The popularity of the open methods is increasing. In care-

ful and skillful hands, the dangers formerly incident to their employment can now be said to be non-existent. Kocher himself has become an earnest advocate of the open operative treatment. In von Bergmann's clinic, it is regarded since 1893 as the routine treatment for transverse fractures of the patella.

With increasing familiarity with the successive steps of the operation and a better appreciation of a judiciously carried out after treatment the results attending open operation are becoming more and more satisfactory.

For this very important addition to our surgical resources, we are chiefly indebted to Lord Lister (29.) Lucas-Championniere, one of the pioneers and also one of the most enthusiastic advocates of the open operative treatment for fractures of the patella, states that the first antiseptic operation of patellar suturing was performed by Cameron, of Glasgow, in 1877. Lister reported his first case in 1877. In 1883, he reported six more cases and then showed clearly that this new method of treatment was followed by perfect recovery, while previous to that time the condition had been looked upon as being, of necessity, followed by lameness. The adoption of this form of treatment, among German-speaking surgeons, is largely due to the efforts of Hackenbruch, Trendelenburg, and Koenig. Trendelenburg performed the first open operation in Germany, in 1878. Among the French speaking surgeons, the following are some of the ardent and most prominent supporters of the open operative treatment:—Chaput, Berger, Lejars (Paris,) Mayer, Lambotte (Brussels,) Vallas (Lyons.)

It was Berger (Paris), who introduced cerclage.

Our analysis shows the following results:—

Miscellaneous methods—33 cases. Good results, 32 cases; deaths 1, from apoplexy.

Circumferential Looping—28 cases. Good results, 28 cases.

Apposition of the Bony Fragments and Suturing of the Soft Tissues, 240 cases—good results, 230 cases, fair results, 3 cases. In one case (30) though the fragments are 8½ cm. apart, patient walks with but little difficulty.

Bone Suturing—809 cases. Good results, 730. Bad results, 10. One of the patients had syphilis. One had diabetes mellitus

Not definitely stated, 50. Ankylosis, 10. Moderately good, 20. Deaths, 5. 1 Infection (20a.) Patient at time of accident was in bad general condition. 1 Delirium tremens, 1 Pneumonia, (17) 1 Pulmonary embolism, (19). 1 Infection incident, 20b to the operation.

It is our belief that, after ample preparation of the patient and of the operative field, the open operative treatment is positively indicated:

1. In all fresh fractures of the patella in the absence of contra-indications:

a. If the surroundings are favorable.

1. An aseptic operating room.

2. Skilled surgeon, and assistants having "an aseptic conscience."

3. Dependable suture material, rubber gloves, etc.

b. If the patient is in the best possible condition.

c. If the fracture be of such a nature that a disabling defect is to be expected if one resorts to non-operative treatment.

d. When the bony fragments cannot be returned exactly by manipulation to their normal position and retained therein by retentive apparatus.

2a. In all compound fractures. 2b. In all comminuted fractures.

3. In all cases associated with considerable intra-articular effusion. The separation and tilting of the fragments is partly produced and partly maintained by the intra-articular effusion, be the latter hemorrhagic or inflammatory in nature.

4. In all cases associated with marked laceration of the peri-articular tissues (silerons, reserve extensor apparatus.) After fractures of the patella, a great distention of the joint capsule is suggestive of peri-articular lacerations.

5. In all cases in which the inter-fragmentary space or diastasis has at any time exceeded 3 cm. This extent of separation cannot occur without laceration of the accessory patellar ligaments, without rupture of the overlying fibro-periosteal tissues. Chaput (31,) as a result of experiments on dissecting-room subjects came to the conclusion that the interposition bet-

ween the fragments of the prepatellar fibro-periosteal tissues does not occur if the diastasis fails to reach 3 cm.

6. In such fractures as are very liable to cause serious functional joint impairment; among such may be cited, cases in which bony fragments have escaped into the articular cavity (32 a, b.). Loose pieces of bone must be removed from the joint. Cases in which lower or upper fragment or both are completely inverted, or other such anomalous cases (33 a, c.)

7. In all fractures of the patella occurring in individuals upon whom at one time or other a leg or thigh amputation has been performed. To such individuals complete integrity of function in the remaining limb is of the highest importance.

8. In all fractures of the patella occurring in individuals having some permanent functional impairment of the opposite knee, as for instance, in a case reported by Mayer (33 b.). In early life, this patient's left knee had been resected. At the age of 35, she fractured her right patella. It was circumferentially looped by the open method. The co-aptation was perfect. Result "very satisfactory."

9. In all individuals, who, having sustained a partial amputation of the leg, can for flexion and extension of an artificial limb derive benefit from the preservation of the integrity of the extensor apparatus of the leg. In a case reported by Charters (34,) the lower third of the leg had been removed. Two months later, while walking on crutches, patient fell and fractured the patella of the same limb. It was wired. Complete restoration of the knee-joint movements resulted.

10. In all bilateral fractures of the patella, be they of simultaneous or of successive occurrence. In bilateral patellar fractures, it is reasonable to assume some risk in an attempt to transform an almost certainly dependent individual into a self-supporting one.

11. In all refractures, in the absence of contra-indications.

12. In old fractures of the patella, associated with marked impairment of function, if the functional loss be dependent, wholly or partly, upon one or more of the following factors:

a. Long fibrous union.

b. Union in a faulty position, in a position that mechanically interferes with the proper function of the joint.

c. Absolute non-union.

d. Ankylosis of the upper patellar fragment to the femur (18, 23.)

In the case reported by Erdmann (23,) the quadriceps had contracted to such a degree that without operation, the fragments could not have been brought into apposition.

e. Extensive non-repaired lacerations of the aponeurotic capsular and other fibrous tissues. These lacerations hinder restoration of function, increase the fragmentary diastasis.

The patella is only a part of the extensor apparatus of the leg; an important part, we admit, but not the sole part.

f. In all cases in which non-operative treatment has been followed by unsatisfactory results. In operating on old fractures of the patella it is imperative previous to the apposition of the fragments, that the fractured surfaces either be freshened or that a thin slice of bone be sawn off from each of the surfaces.

In old, as well as in all other fractures of the patella, we must in addition to repairing the tears in the soft tissues, endeavor to obtain osseous union of the fractured bone. This desideratum can be effected only by securing an exact, an accurate apposition of the freshened fractured surfaces. Consequent to the fracture and to the disability which it entails, there develops a retraction and an atrophy of the quadriceps extensor femoris. This muscular contraction, this muscular atrophy, is the most important cause of the great difficulty, a difficulty at times almost insurmountable, which we encounter in our endeavors to approximate, to appose, to reunite the bony fragments. As easy as in the primary suture of a fractured patella, just as difficult can be the suture of an old fracture of the patella. It is convenient from the operative standpoint to classify old fractures of the patella into:

a. Those in which the fragments can be approximated with but little difficulty.

b. Those in which owing to the co-existing atrophy and unusual retraction of the quadriceps extensor femoris muscle, the

approximation or rather the exact apposition of the fragments is a difficult feat to accomplish.

In cases in which the fragments can be approximated with but little difficulty, the operation will differ from that performed in recent fractures only by requiring two additional steps.

1. The resection of the interfragmmentary fibrous callus.

2. The freshening of the fractured surfaces. It is essential that the interfragmmentary gap be overcome. To approximate the fractured surfaces pre-operative massage, position and traction, at times suffice. Z-shaped incisions for lengthening of the quadriceps may have to be performed. If these measures fail to secure the relaxation, the lengthening of the quadriceps necessary to obliterate the interfragmmentary gap, a plastic operation is indicated.

Which is the most universally applicable of the three main types of operation that are now in vogue for the treatment of fractured patellæ?

The results obtained by the employment of any of these three dissimilar operations, osseous suture, cerclage, suture des ailerons, have been, when the operation was performed by competent hands, so gratifying, that it is embarrassing to suggest that one of them be abandoned. With each of these different methods, excellent functional and anatomical recoveries have been obtained. Osseous suture has given satisfactory results. Cerclage has secured excellent recoveries. As to the third method, it has been truthfully said "in fractured patellæ, absolutely perfect results from the standpoint of contour, solidity and function have been obtained, in a relatively short period, in cases in which all suturing was limited to the prepatellar and paratellar fibrous tissues (Peyrot)." Whichever method be employed, the repair of the soft parts is all important. The importance of this step is emphasized by most of the advocates of osseous suturing. Baerlocher (17,) Bockenheimer (19,) Mik licz (35,) Oehlecker (36,) Trendelenburg (37,) and others though they suture the bony fragments, never fail to supplement the latter step by suturing of the soft tissues.

In recent fractures of the patella, I have abandoned osseous suturing. I have not yet seen a case of old fracture of this same

bone, in which I felt that a good result could not be obtained without the employment of osseous suturing.

To my mind, osseous suturing, as a method of treatment for fractures of this bone, has the following shortcomings:

a. It calls for special instruments.

b. The perforating instrument may break and the broken portion remain embedded in the patella. Annequin (38) reports a case of this nature. The drill broke and a fragment of it was left in the patella.

c. It is a procedure not universally applicable:

1. It is unsuited to the treatment of comminuted fractures.

2. It cannot be used to advantage, in cases in which there is great inequality in the size of the fragments; one very large and one very small fragment. The lower or upper fragment may be that small that they could only afford an insufficient hold to the sutures. In cases of this description, many of the advocates of osseous suture resort to Quenu's hemi-cerclage operation. In this operation, hemi-cerclage, the larger fragment is perforated transversely and the binding ligature is passed through this perforation and either through the ligamentum patellæ or through the quadriceps extensor femoris, through the latter if the lower patellar fragment be perforated; through the former, if the upper patellar fragment be the one perforated. Longitudinal suturing of the fragments, frequently, owing to the unequal volume of the fragments or to their multiplicity proved to be a very difficult operation.

d. In cases of abnormally friable fractured patella, attempts to perforate the fragments, may provoke further splintering of the same (39.) The slow elimination of splintered fragments prolongs convalescence, retards recovery.

e. In cases of secondary operation, the fragments may have become so atrophic that they are incapable of holding the sutures.

f. The proper boring in the patella, from before backwards, of channels for the introduction of the sutures, demands experience. At times, it is difficult of execution. The perfora-

tion of the bony fragments always complicates and always lengthens the operative procedure.

g. It is needless. It adds injury to injury. Equally good if not better results are obtained by less difficult and less laborious methods.

Open circumferential looping was introduced by Berger (40) of Paris. It is employed by the advocates of osseous suture of fractured patella. In cases:

1. In which one of the fragments is too small, to admit of perforation previous to the introduction of the silver wire, steel wire, or other employed suture material.

2. In which one of the fragments is too small to be directly sutured to the larger fragment.

3. In fractures with many fragments or with comminution.

4. In cases of abnormal friability of the patella.

It has been and is still extensively employed in the treatment of fractured patellæ, as (a) a supplementary measure to osseous suture; (b) as a preliminary, or as supplementary, measure to suture of the prepatellar and paratellar tissues. By many, it is employed as the only operative step in the treatment of fractures of the patella.

The advantages of circumferential looping or cerclage are (a) that its employment inflicts no additional traumatism upon the periosteal and osseous tissues. The osseous and cartilaginous surfaces are uninjured by the passing of the circumferential ligature. It respects the skeleton. (b) That the ligature material, which loops the patella, is totally extra-articular. It is introduced and embedded in the peripatellar tissues. Should a metallic ligature, such as silver wire, be used and its presence subsequently cause real or imaginary disturbances, the removal of the real or supposed offending agent can easily be effected without opening the articulation. It respects the articulation. (c) The method is of easy and of rapid execution. The maneuvers incident to its introduction are extra-articular. It can be used as a preliminary or as a supplementary step to any of the various open operative methods in vogue. It no doubt contributes to the exact coaptation of the bony fragments. As far as it goes, this procedure (cerclage) is safe, logical and serviceable. No special

instruments are required for its performance. To our eyes, circumferential looping as a method of treatment, has the shortcoming of insufficiency. We use cerclage as a preliminary, or as a supplementary measure to suture of the prepatellar and parapatellar tissues.

Study of the literature of the subject, surgical experience and clinical observation have led me to consider that the following are the most universally applicable operative steps to be conjointly employed in the treatment of such fractures of the patella as demand operative intervention.

1. The torn prepatellar fibro-periosteal tissues must be carefully sutured. E. Wyllis Andrews, instead of uniting these torn prepatellar tissues, end to end, sutures them in such a way that they overlap one another, that is, they are imbricated one within the other, "shingled" as it were.

2. All tears in the parapatellar tissues must be sewed up. It is imperative that all capsular rents be carefully repaired. The suturing of the peri and parapatellar soft tissues has the approval of all clinicians.

3. To contribute to the maintenance in apposition of the fragments, the patella is circumferentially looped by a ligature passed close to its periphery. This ligature is passed so as to be close to the periphery of the bone, so as to hug it as it were. It is inserted in such a way that it lies imbedded in the substance of both quadriceps tendon and ligamentum patellæ midway between their anterior and posterior surfaces. If deemed necessary, two such looping ligatures may be used. These different maneuvers are all extra-articular. In some comminuted fractures in which the interfragmentary diastasis was slight and in which the prepatellar tissues were practically untorn, I have often limited the operative procedure to looping the patellar fragments and to fortifying the prepatellar tissues with a few V-shaped Kangaroo-tendon-sutures, not exposing the articular surfaces to inspection.

Should one, if he be an advocate of the open operative treatment, operate on the day, or on the morrow, of the infliction of the injury, or should he wait until the soft tissues have some-

what recovered from the immediate effects of the traumatism?

In all compound fractures of the patella, the time allowed to elapse between the injury and the operative intervention, should be the shortest consistent with the modern surgical preparation of the operative field.

In compound fractures of the patella, our practice is to have the patient conveyed at once to a well equipped hospital. Operation is performed soon after admission to the hospital.

The wisdom of operating immediately in compound fractures is, I believe, unquestioned. It is only in simple or subcutaneous fractures that there is great divergence of opinion among surgeons as to the elective time of operation; not only that, but many individual operators do not, as to the time-interval between injury and operation, observe a uniform practice. In subcutaneous fractures, ample time should always be taken for the preparation of the patient and of the surroundings for operation.

It has been our practice in fresh subcutaneous fractures of the patella, to defer operation for from 3 to 5 days after the injury, being guided somewhat by the patients' general condition and also by the evidence of local trauma. The congestion and inflammatory exudate consecutive to the injury, have usually by this time begun to retrogress. Our results having been satisfactory, we are averse to change.

The time interval between the day of injury and the day of operation enables the surgeon to become better acquainted with the patients' general condition, to better familiarize himself with the type of fracture which confronts him, and to better asepticize his operative field. Owing to the wrinkled, thickened nature of the skin of the front of the knee, its surgical purification presents some difficulty.

Should the operative field be rendered bloodless by the employment of an Esmarch bandage? What should be the nature of the anaesthetic employed? Local, lumbar or general anaesthesia?

As a prophylactic measure against hemorrhage, or as an aid to secure a bloodless operative field, it is rare for surgeons to make use of the Esmarch bandage, or band, in their operations for fractured patellæ. Thienger (41) and Oehlcker (36) em-

ploy it. Its general non-use is evidence enough that clinicians do not consider it of any great assistance in these cases.

The Esmarch's band, applied according to the ordinary rule, interferes, while in position, with the normal elasticity of individual muscles and of muscle groups, may hinder the bringing down of the extensor muscles of the thigh, and consequently render difficult the approximation of the patellar fragments. The oozing into the articulation and tissues, that follows its use, is another undesirable feature attending its employment. We know of no valid reason for its preliminary use in operations for fractured patellæ.

Chaput (31,) Lotheisen (26 c.) and Stimson (13) have each with success, operated fractured patellæ under local anæsthesia. Chaput and Stimson used cocaine; Lotheisen employed Schleich's infiltration method. Ranzi (42) in one case resorted to anæsthesia obtained by lumbar puncture and subarachnoid injection. Mikulicz in several cases used lumbar spinal anæsthesia. Mayer (33 b.) also resorted to lumbar anæsthesia.

In Chicago, in operations of this nature, in the absence of contraindications, we almost invariably use general anæsthesia. General anæsthesia enables the operator to more thoroughly protect the patient from pain, to better guard against accidental septic contamination, to secure a more complete muscular relaxation, to proceed more deliberately, to modify his procedure so as to better adopt it to the needs of the case at hand.

Perusal of the literature shows that in these operations the employment of general anæsthesia is in accord with the practice of European and American surgical centers.

By what type of incision is the operator best enabled to perform the repair work which he deems appropriate and necessary?

Large, methodically carried out incisions are infinitely less dangerous than small openings. The latter fail to fully expose the operative field, do not enable the operator to satisfactorily cleanse the joint and do not facilitate the careful repair of the lateral capsular and aponeurotic tears.

The single median vertical incision, unless it is made very long, does not admit of easy manipulation of the fragments. The

freshening of the old cicatrized surfaces on both the upper and lower fragments either with saw or chisel, is not easily accomplished through it; it does not admit of easy cleansing of the joint. During kneeling, the scar is in the line of pressure, and, therefore, remains tender for an indefinite time. The H-shaped incision has objections. The scar lies directly across the patella.

In operating for fractured patella, I generally employ for the exposure of the parts, a flap having its convexity downwards. The incision commences on a level with the upper margin of the patella, about one inch to one side, from here it passes downwards to a point a little below the apex of the bone, from where it is continued across the limb, and carried to a point corresponding to that from which it started. This incision does not interfere in any way with healing. (W. Jacobson and Rowland. 43.) It is thought that an incision with the convexity downwards, better secures the vitality of the flap than one with the convexity upwards.

These convex incisions afford a good exposure of the parts, facilitate the removal of intra and extra-articular exudates and extravasates, give good access to the bony fragments and allow of careful repair of all capsular pre and parapatellar tears. If drainage of the peri-articular tissues is necessary, it is easily secured. With a longitudinal incision, drainage is somewhat difficult.

Is it advisable in these cases to irrigate the articulation; if so, with what fluid, an antiseptic solution, irritating or non-irritating, or merely a bland, non-irritating cleansing agent, such as normal salt solution; or is the mere sponging out from the synovial cavity of the extravasated liquid and clotted blood, productive of the most satisfactory results?

Joint irrigation with irritating antiseptics, such as carbolic acid and bichloride of mercury, we condemn. Any agent acting as an irritant upon joint endothelium, lowers its resistance to infection, predisposes it to inflammation. In flushings or irrigations of the joint cavities with normal salt solution, which solution is in itself unobjectionable, we fail to see much value. Of what advantage can it be to waterlog the tissues?

In operations interesting the pleural cavity, we do not irrigate that chamber to secure the outflow of any effusion collected in the pleural space. To accomplish this, reliance is placed upon the elasticity of the chest-wall, the inspiratory expansion of the lung, the ascent of the diaphragm, and the use of a drainage tube. In operations upon the peritoneal cavity, we do not flush this space to remove contained exudates and extravasates; we simply gently swab and mop.

In arthrotomy for fractured patellæ, we do not irrigate either the joint or the surrounding tissues. All liquid and clotted blood are removed by gauze swabs mounted on artery forceps. The swabbing is done with great gentleness, the object being to minimize the trauma inflicted. Scrupulous care is taken to keep the fingers out of the articular cavity. In formulating, our conclusion we repeat that though we are aware that many clinicians, for instance, Ranzi, etc., prefer irrigation of the articular cavity to sponging of the articulation, we urge the discarding of joint irrigation and firmly advise dry sponging of the joint. Dry sponging for the removal of liquid and clotted blood from the articular cavity, is in these cases, productive of more satisfactory results. The sub-quadricepital synovial cul-de-sac is not to be overlooked, and all liquid and clotted blood therein contained must be removed.

Should non-absorbable or absorbable suture material be used? Are there any valid reasons for discarding non-absorbable suture material?

We refer here only to buried or irremovable suture material. If the suture material be so inserted as to be removable, once organic reunion of the divided tissues has taken place, it matters little (owing to the removability of the suture material) whether absorbable or non-absorbable material be employed.

In fractures of the patella, it is not necessary that the fragments be held together with great firmness. Mere apposition is ample. Forceful tying of metallic sutures to some extent defeats its own purpose, as a suture drawn tight can cause in a bone, as well as in other tissues, a local pressure necrosis and absorption.

We consider it unwise to abandon non-absorbable suture material permanently in the articulation or in the peri-articular

tissues, because:

a. Clinical observation has shown that metallic sutures frequently irritate the tissues (19,) lower their vitality, increase chances of infection, and may require subsequent removal. In longitudinal suturing of bone, the twisted ends of the suture being almost immediately subcutaneous, kneeling is painful. To avoid this post-operative annoyance, some operators perform transverse suturing of the patella.

b. Metallic sutures may become loosened, may break, and fragments escape into the articular cavity by which they are poorly tolerated.

c. The embedding of wire sutures in the patella does not add to the solidity of the patella.

d. Non-absorbable sutures, be they inserted transversely or sagittally, cannot be considered permanent splints.

Von Brunn (44,) as a result of his investigations came to the following conclusions:

1. Silver wire has not sufficient resistance to guarantee bony union of the fragments.

2. Even when fragments are healed together, the wire may break.

3. Parts of the broken wire may wander into the articulation, or into the peri-articular tissues and can excite disturbances at point of lodgment. It has been claimed by Thiem, etc., that metallic sutures suggestively hinder, in some patients, the cure of the subjective troubles.

Shall completely detached bony fragments be removed? If completely detached bony fragments be present, their removal is one of the essential steps of the operation. It has been repeatedly done, and satisfactory results have ensued. The escape into the articulation of completely detached patellar fragments and their non-removal therefrom, leads to all the functional and anatomical articular disturbances inseparably associated with mobile foreign joint bodies.

Shall the periarticular tissues be drained? In order to allow the escape of excessive wound secretions, many clinicians, Hackenbrusch and others, though they did not resort to tube or gauze drainage of the periarticular tissues, always left the ends of the

skin incision open. It did not unfavorably influence the ultimate results. In clean cases, subcutaneous drainage is needless. Its employment serves no useful purpose. It retards the healing of the skin wound. Why complicate an operative procedure by a useless step?

Shall the articular cavity be drained? In simple fractures, no. In compound fractures, yes. Articular drainage should be discontinued as soon as the surgeon's fears as to the development of a suppurative arthritis have been dispelled.

The modern tendency is to employ drainage only in the presence of absolute indications; and to discard it, when in doubt, as to its utility in the case at hand. When unneeded, drainage instead of contributing to rapid aseptic healing, has a tendency to act as an irritant. In the etiology of inflammation, irritants are considered predisposing and exciting factors.

What should be the nature and the duration of the post-operative treatment? As yet, the practice of the different operators as to nature and duration of post-operative treatment is most dissimilar. We proceed as follows: Immediately after the operative procedure and the application of the protective dressing to the wound and while the patient is still anesthetized, moulded plaster of Paris splint is applied to the injured extremity. This splint should be amply padded, should cover the posterior and lateral surfaces of the limb and should extend from about 10 cm. above the external malleolus to the gluteal fold. The object of this splint is to immobilize the extremity in the position of full extension of the leg on the thigh, and of slight flexion of the thigh on the abdomen. The slight flexion of the thigh on the pelvis has for its purpose the relaxation of the *rectus femoris* muscle. During the patient's confinement to bed attention must be given to the heel and to the toes. So as to avoid the development of a pressure-sore upon the former, the heel should be protected by a doughnut pad or other means. By the use of a "cradle" the toes will not be subjected to the weight of the bedclothes and talipes decubitus will not ensue. In the absence of a marked elevation of temperature, of intense pain, of saturation of the dressings, the protective gauze dressings on the joint remain undisturbed for from 10 to 15 days; then, if indicated, the removable sutures

are ablated. The immobilizing splint is kept in position for about a month.

As to the duration of immobilization, the practice of the various operators is far from being in accord.

The first motions of the patella should be lateral motions. We do not begin flexion of the leg upon the thigh previous to the expiration of one month from the day of the operation. The first attempts at flexion should be cautiously made. With use, the range of motion gradually increases; in many cases, the restoration of joint function is complete. When flexion to a right angle has been removed, the patient is discharged from further observation.

AIME PAUL HEINECK.

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## HYDRAMNIOS WITH MONSTROSITY

BY

H. G. NYBLETT, M.D., C.M.

MACLEOD, ALTA.

Mrs. E. J. B., aged 34, married eleven years, 10 para, 7 months child herself, weight 95 lbs., first labour normal with living child, second and third miscarriages at three months, four and fifth normal living children, sixth supposed miscarriage about three months, seventh and eighth hydramnious with extreme distension, in one of these (labour came on of itself prematurely about seventh month.) There was some difficulty in delivering the foetus on account of its being an ancephalous monster; treatment was advised at the time, alteratives and curettage as the placenta was extensively diseased. There was severe post partum hemorrhage. This, however, was not carried out. She then again became pregnant. She had hydramnious again, and my father, Dr. J. Algernon Temple, saw her in consultation, and, as he could not make out anything abnormal about the foetus, he advised me to wait until it was viable, as there were no urgent symptoms. However, inside of a week she enlarged very rapidly and suddenly and had convulsions. I immediately ruptured the membranes and dilated the cervix and delivered a dead

fœtus with hydrocephalic head. Her recovery was normal. Extract from letter from Dr. C. A. Temple.) Ninth labour was normal, with living child.

Tenth labour. In the early stages of pregnancy there was nothing abnormal. I was called in to see the patient for the first time shortly after the sixth month. At this time she said she was as big as she ought to be at full time. On examination I found a very prominent abdomen but not much higher in situation than a normal pregnancy. She complained of oppressive sensations in breathing and was very nervous about herself. I considered the breath oppression due more to indigestion with a large amount of gas, probably caused by pressure and gave her a digestive mixture which relieved this somewhat. There was no indications of œdema of the ankles. I saw her again in a few days and she felt rather better. At this time she measured thirty-nine inches round the abdomen when in the upright position; urine was normal, in sp. gr. and appearance and no albumen, also in quantity. I again saw her about a week later when she complained of a burning pain in the left epigastrium which shot round to the back and was fairly continuous. I advised light mustard application, which, however, she could not stand. I may say I had advised her to wait as I wished to get past the seventh month if possible and there were no urgent symptoms to make interference advisable. She felt life but very slightly and the child could not be palpated. On Sunday, the 6th December, I received a hurry call about 4.30 p.m., as she had fainted. I went over and found her propped in a chair. I immediately removed her to bed and noticed nervous twitchings and a weak fast pulse running over 100. Owing to the fact of previous convulsions I did not care at this stage to give strychnia which was really indicated, so I gave morphia, quarter grain. I examined and found the cervix sufficiently dilated to pass one finger and decided that labour would either come on or else have to be brought on. The abdomen was very much stretched, measuring thirty-nine and a half inches in the recumbent position. I could on auscultation hear the placental souffle, but no fœtal heart beat. I could not palpate the fœtus, although occasional kicks indicated life. At 7.30 p.m. there was no more dilation, so I dilated man-

ually to admit two fingers. By 10 p.m. I had sufficient dilatation to admit three fingers and as no pain came on I ruptured the membrane. There was a large quantity of amniotic fluid—about four quarts by measurement. After the escape of fluid a few pains came on. The uterine and abdominal walls were very thin, so much so that I could pick up a foot and outline it distinctly. I should judge the walls of the uterus and abdomen were not much over a quarter of an inch thick. Although the pains were fairly severe, there was no further dilatation. This I suppose was due to the weakness of the uterine walls. On examination my finger passed into the mouth. I could feel the eyes, nose and ears, thus giving a face presentation. I could also feel a bony projection at the back of the head. I tried to flex the head and thought I had done so, but on later examination I found no progress and still a face presentation. As I could not change position I thought that I could deliver with forceps but could not get the blades in place. After trying for some time I decided to do aversion. I dilated sufficiently to pass my hand in and when I got it in found I could hook the finger into the axilla and brought down an arm, thus converting it into a shoulder presentation, and on traction found the foetus descended. The part that surprised me was the close proximity of the axilla to the face and it was this induced me to bring down the arm. I again passed my hand in and grasped the face which seemed small with my fingers over the forehead and one of my fingers seemed to pass into a hole and on traction I delivered the foetus. I then got a surprise. The body was perfectly formed, well nourished and developed, and the weight was probably three and a half pounds; the limbs were normal, but the face was set directly on the shoulders. There was no skull, no posterior part of the head, so that if the body was laid down on the stomach the face looked ahead. The forehead practically joined the back; there was no chin and no neck. At the junction of the back and forehead there was a large hole rather larger than a 50 ct. piece from which escaped a membranous sack which had been ruptured during delivery. The eyes were exceedingly prominent and the size of an American nickel and covered by the lids, almost resembling those of a fish. The nose was very flat. The posterior part of the ears almost rested on the

shoulders. The foetus gave one kick after birth and died. The nurse, who had followed the uterus down as I was much afraid of hæmorrhage, now drew my attention to it. It was very large and irregular. I kneaded it for fifteen or twenty minutes and then expressed the placenta by the Crede method. The placenta was double the normal size, very much diseased and very friable, so much so that between finger and thumb it would all break up. A good part of the membrane was stripped of placenta, so I had to pass my hand to clean out the uterus and brought away a handful which was unattached. The uterus was now triangular in shape. I gave an intra uterine douche of one per cent. lysol solution. The patient came out of the anæsthetic with a good full pulse. There was hardly any hæmorrhage, and, at the time of writing this, after five days, the patient has progressed as though from a normal labour. I have been giving one per cent. lysol vaginal douches twice a day. The lochia is normal and no headache, and patient asking when she can get up, for which I am devoutly thankful. There is one thing peculiar about this case. There is absolutely no history of specific disease on either side, although on the maternal side there is tubercular. The miscarriages and monstrosities have been sandwiched between normal labours. The living children are nice looking healthy children. One thing, however, I may mention, about the oldest girl aged ten. She has a tumour which comes and goes on the breast under the nipple and swells to the size of a walnut and is tender. I am very grateful to Dr. C. A. Temple for giving me the history of the cases in which he attended her, as it gave me a great deal of help.

A few notes may not be amiss, as I intend bringing a report of this very interesting case at the first medical meeting at which I am present, in the hope that it may bring forth discussion and throw more light on the handling of these cases. When a doctor meets a case like this his medical school training is of very little use. He has forgotten his lectures, and, as each case is a law to itself, he has to act entirely on his own initiative and fight his way through as best he can, and it is no easy matter to decide what is best to do.

There are various theories as to the cause of hydramnious

and I have not been able to find much literature on the subject.

First, it is said to be caused by disease of the amnion.

Second, by obstruction to the foetal circulation.

Third, by spina bifida, or else by an imperfect skull, allowing pressure on the spinal cord or brain, which stimulates the foetal kidneys to increased action.

Of these, from my experience with one case and the history of the other two cases with the same patient, I should favour the latter cause, as, with the exception of the head, the body was well formed, nourished and developed. We have also to consider the cause of such foetal-deformities and again we only have theory to go on. It is supposed that syphilis is the cause, but in my case there is no history of it, although there is a family history of tuberculosis. Another feature that opens a way for discussion is the fact that the placenta was twice as large at seven months as a normal full term one. Can the size of the placenta, and its friable condition, be caused by the rapid stretching of the uterine walls? It is evident in this case that the placenta had been doing its work thoroughly, as evidenced by the well nourished condition and vitality of the foetus. Again, why should she have healthy children with no sign of hereditary syphilis in between the monstrosities?

About four months after I wrote this report she again became pregnant and miscarried at three months. This time it was a case of missed conception. The sac was unruptured, but on opening it there was no sign of a foetus.

## EDITORIAL

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*Western Federation* During the Conference recently held at Banff, an equitable plan was mapped out for presentation to the respective councils for ratification. At their annual meeting, held Oct. 13 and 14, the Manitoba Council unanimously adopted the resolutions. The rapidity with which the profession in the West has come to an agreement is a matter for congratulation. Our Eastern contemporaries, judging from editorials and correspondence, assert that, in this respect, the West is ahead, and are calling on their councils to follow our good example. This is certainly a big step in the march of Reform, which will result in bringing closely together the representatives and also the men who sit for the central exam. Many friendships are formed during exam. week and as time goes on this cannot fail to have a beneficial effect in uniting the Western profession. The *Western Canada Medical Journal* has always advocated medical unity, and as the first step towards that WESTERN UNITY. Of all callings, ours should be united, for despite any differences of environment and achievement we are all working earnestly as best we can for the public weal, therefore, the closer we are brought together, the greater our use to humanity.

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*Is it Right to Receive Commission for Performing Our Duty?* We are always glad to publish correspondence that shows mistakes into which any of us may fall. Considering the importance of the subject brought up, it is only fair to endeavour to discuss it from both sides. It is possible that a surgeon of ability might also be commercially minded and honestly ask a medical man in a country place—situated where proper skill and attention are not attainable—to send such patients to him for operation promising the physician a commission in return. One hears that this manner of obtaining patients has been much in vogue in the States.

At the same time the true leaders of the profession on the other side in their addresses and writings always deprecate such arrangements and point out that the result is inevitably the lowering of the prestige of the profession in any district in which it is indulged. Without doubt, it is the duty of the teachers in medical schools to instil in their students that the profession they have chosen is an ideal one and can only be truly followed by sacrifices for which a commercial career does not call. The responsibility of the medical teacher is great and any teacher using his position to get practice in this way, whatever his skill, is doubly blameworthy. There can be no doubt that scattered throughout the West are several gifted surgeons, men that are constantly attending post graduate schools and keeping up-to-date. The big cities have not here, anymore, than elsewhere, the monopoly of skill though they have better facilities and equipment. The first consideration for any medical man is *his patient* or he should leave the profession (remember the oath of Hippocrates.) The possibility that a follower of Hippocrates would first consider his commission and then his patients, makes one agree that, in truth, it is our noble selves who are our enemies and not the public.

## CORRESPONDENCE

*We do not hold ourselves responsible for the opinions of our Correspondents—Editor.*

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*To the Editor of the Western Canada Medical Journal.*

Extract from letter received :

Dear Sir,

The following is an extract from a letter which I recently received from a legally qualified medical practitioner.

"I have been in the habit of sending my surgical cases to —— I shall find it more convenient to send patients to —— if satisfactory arrangements can be made. The Winnipeg men allow me 25% of the fees collected from my patients and of course I shall expect the same for any I send to ——."

I replied as follows:—

"With reference to that part of your letter suggesting an arrangement allowing you a commission for patients sent me I wish to say that notwithstanding the action of Dr. —— or any other Winnipeg surgeon along these lines, I believe such an arrangement unprofessional and will not do it. I will take the liberty of referring your proposal to the Western Canada Medical Journal and will ask the Editor to discuss in an impersonal way the ethics of your proposal. I take it that you are but a beginner in the practice of medicine and that being a university graduate (in Arts) as well, you are not only willing but anxious to be guided by the accumulated experience of our profession in your professional relations, and I believe that a reconsideration, more especially from the point of view of your patients, will change your view on this question."

A perusal of the above will have made it apparent why I write you. Since receiving the letter I have learned indirectly that another practitioner has a standing offer from a Winnipeg surgeon of 25% "rake off." How would it do to have a symposium of the views of Winnipeg surgeons on the subject.

Yours fraternally

Medicus

## GENERAL MEDICAL NEWS

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### SOCIETIES

On Oct. 13 and 14 was held the annual meeting of the council of the college of physicians and surgeons of Manitoba, the two-days' session being held in the medical college library on McDermot avenue. A financial statement was submitted by Dr. James Patterson, treasurer, and Dr. J. S. Gray, registrar, reported the number of registrations during the year, the amount of fees collected and of fines from prosecutions. The election of officers resulted as follows: President, Dr. T. M. Milroy; vice-president, Dr. J. J. McFadden, Neepawa; registrar, Dr. J. S. Gray, re-elected; and treasurer, Dr. James Patterson, re-elected. As representatives on the council of the university of Manitoba, Drs. C. W. Clark, T. M. Milroy, A. W. Moody and J. H. Hutcheson, were re-elected. Dr. T. M. Milroy was elected as the representative of the college on the board of studies of the university.

After the meeting of the council a general meeting of the college took place with the new president, Dr. T. M. Milroy, in the chair. It was decided, among other things, to raise the registration fee from its present figure of \$75 to \$125, to take effect on Jan. 1, 1910. The annual fee of \$2 it was decided to abolish. There was also submitted and considered in detail the report of the delegates who met recently at Banff in convention to discuss the formation of a federated board of examiners for the four western provinces. The report was adopted by the council with a few minor changes.

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### VITAL STATISTICS

NANAIMO.—Births 19; marriages 6; deaths 13.

VANCOUVER.—Births 3684; deaths 2537; marriages 2142.

Among the specific causes of death, heart failure would appear to have claimed the greatest number, 8 victims, 118 having been set down to heart disease and 110 to heart failure, besides 20 from valvular disease of the heart, 20 from myocarditis and 27 from endocarditis besides a number from minor heart complaints. Next in order come pneumonia and pulmonary tuberculosis. These are the only specific causes. It takes three figures to record, though some of the children's diseases come very near.

MOOSE JAW.—Births 28; deaths 15; marriages 21.

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### MEDICAL NEWS

Dr. Brandon has had conferred on him, by the Emperor of Japan, the 6th Order of the Sacred Treasure. After the Japanese-Chinese war, Dr. Brander was also decorated by the late Emperor of China, with the Third Order of the Double Dragon, for distinguished medical services to the Chinese wounded soldiers from Korea.—*Edin. Scotsman.*

The question up for discussion at a recent meeting of the Fulton Company (Ga.) Medical Association was "Is it Ethical for Physicians to receive Rake-offs" for business sent to drug stores. The answer was emphatically NO.

The following warning note has been sent by the Cincinnati Health Department in reference to the indifference of some physicians to comply with the law governing report of births:

\* \* \* "Physicians are again reminded that the Bureau of Vital Statistics is now a part of the States machinery and lapses are apt to be followed by prosecution."

Madame Curie, who, with her husband, discovered radium, has been elected a corresponding member of the St. Petersburg Academy of Sciences. Mme Gaussel, M.D., has been appointed Director of a Clinic of Montpellier University. Mlle Sarah Broida has been appointed a ships physician on a packet boat of the Mixte Steamship Company. Mesdames Briand and Menard are also ship doctors on Mediterranean steamers.

A Western Association (U.S.A.), for the Preservation of

Medical Records, was organized in May, 1909, for the purpose of collecting the historial and biographical records of the profession of the West and South. Their object is to systematically arrange, catalogue and properly preserve the following material so that it can be available for research work: 1. Medical journals published West and South; 2. Medical books and pamphlets written or published in the West; 3. Manuscripts and autographs of early Western physicians; 4. Old diplomas and other documents of a medical character; 5. Proceedings of medical societies; 6. Reports of hospitals and other medical institutions; 7. Catalogues and announcements of Western medical Colleges of all "Schools"; 8. Biographies and photographs of Western physicians; 9. Information and material of any kind pertaining to medicine and medical men and affairs in the West; 10. Curios of a medico-historical character.

The objects of the Medical Library Association of which Professor Osler is President are (a.) To bring together those engaged in or interested in medical libraries and medical literature and for the discussion of matters associated with their fostering and care; (b.) To maintain an exchange for the distribution of duplicate books and periodicals; (c.) To increase the facilities for reference work; (d.) To encourage the study of the history of medicine; (e.) To issue publications dealing with medical library work; (f.) To form a library union amongst those of the medical libraries between which the exchange of books can be arranged.

Professor McKeever, of Kansas, is charging Westerners with neglect of children in their eagerness to produce amazing crops and thoroughbred cattle so he is sending broadcast bulletins to assist in producing a better crop of sons and daughters. These pamphlets have been printed mostly through the subscriptions of business men at Manhattan. This speaks well for the advance of Kansas. He states that no disaster can really dim the glory of a nation if the children are so safeguarded that means are provided for them to develop into well-rounded, magnificent specimens of manhood and womanhood.

News of the heroic and selfsacrificing work of Dr. Rymer,

(from England,) in far Northern Canada at Fort Resolution has been received. Soon after his arrival a malignant fever broke out and by his aid many lives were saved. All his work, last year was done at his own expense but this year it is hoped the government will assist.

Questions are asked as to obtaining paper bottles described in the Technical World Magazine. Apply the Liquid Paper Package Company, 719 13th St. N. W. Washington, D.C. These are found best for milk.

The Childrens Hospital, Winnipeg, had the honour of a visit from the Countess Grey during the vice-regal stay in Winnipeg. Lady Grey showed great interest in the hospital and expressed her admiration for the work. The Board of Directors hope soon to have a properly equipped institution.

The new hospital for the Insane of Coquitlam, B.C., will be a most modern building. There will be psychopathic wards, buildings for the sick and infirm, very fine epileptic building. The name of this Asylum will be Mount Helmcken, so-called after Dr. Helmcken, the Dean of the Medical Profession of B.C.

In a letter in the B. M. J., Oct. 2, referring to inaugural addresses, suggests that—in view of the present unsatisfactory financial state of the profession which the continued overcrowding will only increase—it would be just to the profession and intending members of the medical schools if inaugural addresses contained a few home truths instead of the usual "Medicine is its own reward" and that at present in no other calling are the results so meagre in profit or pleasure for the majority.

A Maternity Home in connection with the Provincial Royal Jubilee Hospital is to be established.

Several fraternal societies in Calgary have indicated their intention to furnish wards in the new hospital and several individuals have undertaken to furnish rooms.

PERSONALS

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Dr. M. Copps Costello, of Calgary, is attending a post graduate in Edinburgh.

Dr. Hopkins, of Prince Albert, has been taking a short course of post graduated work at Chicago.

Dr. Sharpe, of Winnipeg, has returned from a post graduate course at New York.

Dr. Berry will practise at Fort Saskatchewan, Alta.

Dr. English, of Rossland, B.C., has been visiting the coast.

Dr. Lafferty, of Calgary, has been visiting Vancouver and Seattle.

Dr. Lange, of Vancouver, is visiting East.

Dr. Welsh, of Ottawa, has started practice in Vancouver.

Dr. Harold McDermid will succeed his father as Head of the Deaf and Dumb Institute, Winnipeg.

Dr. Thornton, M.P.P., for Deloraine, has been visiting the Coast and Seattle.

Dr. and Mrs. Collison, Red Deer, have returned from the East.

Dr. Egbert has returned from a visit to various Ontario towns and cities.

The following coroners have been appointed: Dr. Peter Aylen, of Fort Saskatchewan; Harold Nyblett, M.D., of MacLeod; Benjamin Tughan, M.D., of Grassie Lake.

Dr. H. M. Robertson, of Vancouver, has returned from his holiday.

Dr. H. H. McIntosh has resigned his position as Medical Superintendent of the General Hospital, and Dr. Whitslaw succeeds him.

Dr. Whitelaw is at present visiting the large Eastern Hospitals.

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BORN

GILLIES--To Dr. and Mrs. Gillies, of Vancouver, a daughter.

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OBITUARY

Dr. Charles A. Elliot, Vancouver, aged 40, formerly of London, Ontario, died from injuries received in runaway.

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BOOK REVIEWS

Year Book for 1909 on the Eye, Ear, Nose and Throat. The Eye, by Casey Wood, Professor of Ophthalmology, Northwestern University, Ophthalmic Surgeon to St. Lukes and Wesley Hospital, Consulting Ophthalmic Surgeon to Cook Co. Hospital. The Ear, by Albert H. Andrews, Professor of Otology, Rhinology and Laryngology. Chicago Ear Nose and Throat College, Eye and Ear Surgeon to C. R. I. and R. P. R. The Nose and Throat by Gustavus P. Head, Professor of Otology, Laryngology and Rhinology, Chicago Post-graduate Medical School —A hand book, cloth, 360 pages, price \$1 00, Chicago Year Book Publishers. A good reference hand book of the year's progress in the Eye, Ear, Nose and Throat. Especially good is the section on the Eye, bringing out the place assigned to the Ophthalmia-tuberculin reaction and the progress in the bacteriology of trachoma. The author has devoted 20 pages to ophthalmic therapeutics, most of which is quite new including many of the "approved," "new and non-official remedies.

RAYMOND BROWN, M.D.

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NOTICES

Doctor needed at Leeville, Sask.

The Winnipeg Clinical Society meets at the Medical Library Tuesdays, Oct. 26, Nov. 8th, at 8.30 p.m. Any visiting medical men are cordially invited to attend.

The management will be greatly obliged if any men settling in new localities would forward particulars to the Editor.

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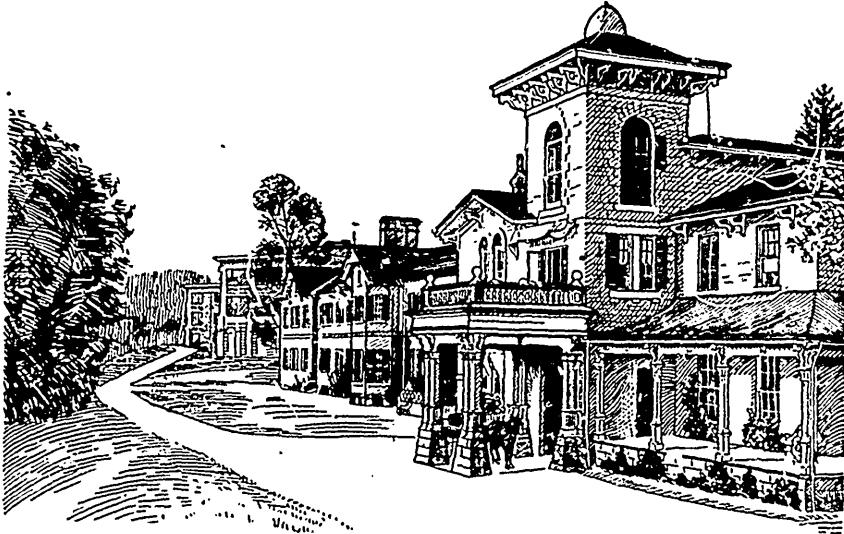
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## Synopsis of Canadian North-West' Homestead Regulations

Any even numbered section of Dominion lands in Manitoba, Saskatchewan and Alberta, excepting S and 26 not reserved, may be homesteaded by any person who is the sole head of a family, or any male over 18 years of age, to the extent of one quarter section of 160 acres more or less.

Application for entry must be made in person by the applicant at a Dominion Lands Agency or Sub-Agency for the district in which the land is situated. Entry by proxy, may, however, be made at an Agency on certain conditions by the father, mother, son, daughter, brother or sister of an intending homesteader.

### DUTIES:

(1) At least six months' residence upon and cultivation of the land in each year for three years.

(2) A homesteader may, if he so desires, perform the required residence duties by living on farming land owned solely by him, not less than eighty (80) acres in extent, in the vicinity of his homestead. Joint ownership in land will not meet this requirement

(i) A homesteader intending to perform his residence duties in accordance with the above while living with parents or on farming land owned by himself must notify the Agent for the district of such intention.

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Deputy of the Minister of the Interior.

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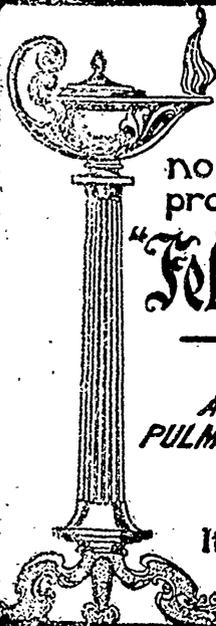
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