How to account for the presence of peritoneal diverticula in the femoral region is, I admit, a difficulty. For my own part, I favour the explanation offered by Mr. Hamilton Russell, of Melbourne, which is that early in fetal life, when the bud-like processes appear from which the lower limbs are developed, a little pouch from the pleuro-peritoneal cavity is produced by the branches of the femoral vessels assuming a tortuous course, and so dimpling the peritoneum at this point. In this connexion it is interesting to note that in femoral, sciatic, and obturator hernia the sac is in close relationship with blood vessels leaving the abdominal cavity.

CONCLUSION.

Where absolute demonstration is impossible our opinion should be guided by what is most probable, and it seems to me that if, in view of the facts I have stated, the etiology of femoral hernia be considered in the light of common sense, the sacular theory offers the only satisfactory explanation.

The etiology of abdominal herniae is not merely of academic interest, but has an important bearing upon the question of treatment. A surgeon who believes that the chief factor in the production of the hernia is the presence of a preformed sac, would, in operating for a radical cure of the complaint, adopt less complicated measures than would be adopted by one who believes that the muscular and aponeurotic structures of the abdominal wall are primarily at fault.

Direct evidence as to the exact manner in which a hernia sac is formed in the femoral or other regions is not obtainable, "but the conclusion forced upon the mind by an unbroken train of circumstances pointing in the same direction is often more forcible than positive direct testimony, for witnesses may be mistaken, deceived, or deliberately false, while circumstances 'cannot lie.'"—(G. P. McNeill on Evidence.)

It appears to me that circumstantial evidence in favour of the sacular theory of inguinal, femoral, and umbilical hernia is so strong, so convincing, that I have every confidence in obtaining a verdict in favour of this theory from the general body of the medical profession.

PRELIMINARY NOTE ON A SIMPLE OPERATION FOR UNCOMPLICATED OBLIQUE INGUINAL HERNIA IN YOUNG ADULTS.*

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"The natural power of recovery is often so great that all that is needed is but to remove any unfavourable condition."—Mackenzie (Burnley): *Caledonian Medical Journal*, July, 1907.

MR. PRESIDENT AND GENTLEMEN,—Last month on mentioning the subject of this paper to a physician he remarked, "I thought you surgeons had said all there is to say about hernia"; yet Rigby,¹ in his review of recent literature on hernia, commences with the following sentence: "It seems extraordinary that a definite decision has not yet been arrived at as to the origin of the hernial sac."

The rationale of the operation which I wish to bring to your notice this evening depends upon the following hypotheses:

1. That for practical surgical purposes all oblique inguinal hernias are primarily due to a congenital or preformed sac.

2. That in young adults suffering from oblique inguinal hernia the valvular action of the muscles guarding the internal abdominal ring will regain its normal action if the cause of the dilatation of the canal be removed.

3. That if the neck of the sac be efficiently dealt with, it is quite unnecessary to interfere with the remaining portion in the inguinal canal or scrotum.

Two years ago I made various dissections of the inguinal region in the cadaver, and, as a result, devised a simple operation, the steps of which are the following:

OPERATION.

An incision is made half an inch above and parallel to the middle third of Poupart's ligament, the centre of

which corresponds to the position of the internal abdominal ring. This incision exposes the external oblique muscle, which is incised in the direction of its fibres and

Fig. 1 shows relation of incision to Poupart's ligament. A, The middle of Poupart's ligament.

Figs. 2, 3, 4, and 5 (actual size) show different stages of the operation.

retracted, thus exposing the lower portion of the internal oblique muscle and the upper portion of the cremasteric. The fibres of the latter are divided in the same direction

Fig. 2.—A, The middle of Poupart's ligament; B, retracted skin, fat, and fascia; C, external oblique muscle.

as those of the external oblique muscle. The lower edges of the internal oblique and transversalis muscles are then retracted upwards and outwards, and the transversalis

Fig. 3.—A and B as above; C, external oblique muscle retracted; D, fibres of internal oblique muscle; E, fibres of cremasteric muscle. (The ilio-inguinal nerve is not represented in the drawing.)

fascia exposed. This fascia is dealt with in the same manner as the external oblique and cremasteric muscles. The neck of the sac is thus exposed at the internal ring.

Fig. 4.—A, B, and C as above; D, internal oblique muscle retracted upwards, after cremasteric muscle has been split; E, split cremasteric muscle; F, split infundibuliform fascia; G, neck of sac freed from cord; H, position of cord which is not represented.

* Read at a meeting of the Edinburgh Medico-Chiurgical Society on November 6th.

It is freed from the cord, opened, and divided. The neck is ligatured and fixed to the under surface of the abdominal wall, above and external to the internal abdominal ring, the rest of the freed portion being cut off. This concludes what is sometimes termed the "first stage" of the operation.

The second stage consists in suturing the split fibres of the external oblique by the overlapping method and closing the skin incision. In some cases the fibres of the

Fig. 5.—A, B, and C as above, showing the overlapping of the divided external oblique muscle. The dotted line shows the lower edge of the upper fibres drawn under the lower fibres and retained by three interrupted mattress sutures, the upper edge of the lower fibres fixed by a continuous blanket suture.

cremasteric muscle are drawn together with a single stitch, but in the majority they will fall into apposition naturally.

It will be noted that the internal oblique and transversalis muscles are left untouched, also that the sac, with the exception of a small portion at the internal ring, is left *in situ*.

The reasons for my belief in the hypotheses on which the operation is founded are as follows.

ANATOMY OF HERNIA.

With regard to the first—that for practical surgical purposes all oblique inguinal hernias are primarily due to a congenital or preformed sac—it is necessary that we understand exactly what is meant by the word "congenital" when used in relation to inguinal hernia. Originally the term was confined to that variety of hernia in which the sac was in direct communication with the tunica vaginalis; modern textbooks, however, include under this heading not only the variety mentioned, but also the varieties termed funicular, infantile, encysted, and interstitial. Any one who has had the opportunity of operating on a fairly large number of inguinal hernias in children will have recognized that only a minority of the cases dealt with come under the heading "congenital" as originally defined.

Stiles,² in a consecutive series of 360 cases in children, found that in only 5 per cent. did the sac communicate with the tunica vaginalis; other writers on inguinal hernia in children have noted similar results. Russell³ maintains that the term "congenital," which, he says, "has been the source of endless obscurity and confusion in the past," should be confined to those cases in which the hernia is present at birth. Without further elaboration of this point, it will be sufficient to say that I believe all oblique inguinal hernias to be due to a preformed sac, whether partial or complete.

As already indicated, most authorities now admit this to be the case in children. What proof is there that it is not so in adults also? The textbooks divide oblique inguinal hernias into congenital and acquired, but when we search for a definite statement which will lead us to recognize the acquired variety we are grievously disappointed. Murray⁴ says he has been quite unable to distinguish between the congenital and the so-called acquired inguinal sac, for the very good reason that, in his opinion, they are one and the same thing.

Russell³ for eight years has advocated what he now terms the "saccular" theory of hernia, and has stated his opinion that this theory will be either universally accepted or universally rejected in the near future.

Stiles² in 1904 wrote: "It is more than probable, therefore, that the majority of oblique inguinal hernias which are met with during adolescence and in young adults are essentially congenital."

Recent papers by other authors (Bull and Coley,⁵ Ologg⁶) admit the probability of a preformed sac in adults.

Keith⁷ opposes Russell's theory, but brings forward no

evidence to show that the preformed sac is not the essential cause of that variety of hernia we are at present discussing. Murray,⁴ on the other hand, produces positive evidence in support of the saccular theory. Lockwood⁸ and Langton⁹ draw attention to the fact that in many instances a preformed sac is present without there being any evidence of hernia.

The condition found in a patient, 30 years of age, on whom I operated is of interest in this connexion.

The operation just described was performed for an oblique inguinal hernia on the right side. Owing to the laxness of the canal on the left side the internal ring was cut down upon, although no signs of hernia had ever been present. A patent tube of peritoneum about an inch long was exposed and removed. Lockwood⁸ mentions a similar case.

An inguinal hernia which develops on the opposite side to that already operated on is probably due to a condition similar to the above.

Some surgeons believe that if a hernia in a young adult develops suddenly that is proof that there is a preformed sac; but if, on the contrary, the hernia manifests itself slowly, it is acquired.

This second deduction is, in my opinion, unwarranted. There is no reason why a hernia should not appear by degrees, even although there is a preformed sac. It is just as likely that the slow development of the hernia is due to the fact that the contents have to dilate the preformed sac, whose lumen may be small, as that the contents have to push a process of peritoneum in front of them, thereby forming a sac.

If we look back we find that discussions in the past centred round the question of rupture *versus* dilatation of the peritoneum. When the former was finally disproved, all interested turned their attention to the possible causes of dilatation, taking it for granted that, because rupture was disproved, therefore the alternative—dilatation—was correct. By no means a sound deduction.

If the "saccular" theory be admitted with regard to oblique inguinal hernia, the same principle which guides us in the operative treatment in children holds good in adults.

The second hypothesis is that in young adults, suffering from oblique inguinal hernia, the valvular action of the muscles guarding the internal abdominal ring will regain their normal action if the cause of the dilatation be removed.

It will, I think, be admitted that the weakness of the muscles in the region of the inguinal canal must be due to one of two causes—either a delay in their development or a weakening of normal muscles due to prolonged and increasing dilatation of the canal by the contents of the sac.

With regard to the former, writers on inguinal hernia in children have drawn attention to the fact that usually the muscular development in the inguinal region is exceedingly good. I maintain that this is also true of young adults in whom hernia is of recent appearance. One finds that even in children who at birth are muscularly poorly developed, and in whom both umbilical and inguinal hernias are present, the muscular weakness rapidly disappears as the child grows older. The second source of weakness is the important one in adults, and will become more and more pronounced as the patient grows older. After a certain time the muscles in the inguinal region become so altered that return to the normal is impossible. In long-standing cases in elderly men I admit that it may be necessary to perform that part of the radical cure usually known as the "second stage" of the operation, but in the majority of young adults it is not only unnecessary but harmful. No drawing together of the conjoint tendon and Poupart's ligament, however complicated the procedure, will ever be as efficient as Nature's method; and further, if this part of the operation is successfully carried out, it will prevent the normal valvular action of the internal oblique and transversalis muscles.

Those who have operated on recurrent cases of inguinal hernia, previously treated by "radical cure," will have noticed that the parts involved have lost all semblance to muscle structure, and have become a mass of fibrous tissue. If any one doubts the efficiency of the valvular action of the muscles at the internal ring, let him, if he has not already done so, when operating on an inguinal

hernia in a young adult, pass his finger through the ring when the patient is straining (should the opportunity occur). He will feel the vice-like manner in which the finger is gripped by the contracting muscles.

The present Professor of Systematic Surgery in Edinburgh has for long taught that the strength of the abdominal wall depends upon its mobility. Seaver¹⁰ advocates exercises which strengthen the muscles guarding the internal ring as a method of treatment for inguinal hernia instead of operation. I believe in this method, provided that the neck of the sac be first dealt with. A patent funicular process will always be a source of danger, and it must be remembered that hernias frequently occur in young adults whose muscular development is excellent. It is quite possible that the sudden appearance of a hernia in a young adult during excessive exertion is due more to faulty muscular co-ordination than to actual muscular weakness.

I now pass to the third hypothesis, that if the neck of the sac be efficiently dealt with, it is quite unnecessary to interfere with the remaining portion in the inguinal canal or scrotum.

In dealing with that variety of hernia originally termed congenital, one has to divide the sac in the vicinity of the testicle. The level of this division varies with different surgeons.

In other varieties some surgeons purposely leave the lower portion of the sac *in situ*. Barker¹¹ divides the sac half an inch below the external ring, leaving the scrotal portion, the open end of which he ligatures. Maclaren¹² divides the sac at the same level. Neave,¹³ in concluding a paper on hernia, says: "Sometimes it is better to leave the sac *in situ*, and only clear and divide the neck." Kocher¹⁴ says if there is much matting the sac may simply be left alone as Wölfer recommends.

If a thickened and adherent sac can be left *in situ* surely there can be no harm in leaving the less abnormal ones. The first case in which I left the whole sac, having divided and ligatured the neck, was one on which I operated eighteen months ago. I have recently examined the patient and could not now tell that the sac had not been removed.

All the writers of the present day who advocate operation based on the sacular theory, emphasize the fact that the essential point of the operation is the complete removal of the sac. Clogg⁵ says: "It is difficult to believe that they (herniae depending upon the presence of a congenital sac) can be cured in any other way than by removal of this sac." I hold that obliteration of the neck of the sac is sufficient.

Why first attack the region of the external ring when it is really the internal ring we wish to get at? The only reason I can see for this is that, in the past it has been considered essential to dissect out the sac, or at least the greater portion of it.

If we closely analyse the operations at present in use we are struck by the fact that they have only one thing in common—namely, obliteration of the neck of the sac at the internal ring. Further, we note that in recent years the tendency has been to make the skin incision at a higher level than has been customary in the past, but, as far as I know, there is no operation in which the internal ring is cut directly down upon without interfering with the parts below, although the aim of all is eventually to get at the internal ring.

In the past too much importance has been given to the technique of the numerous operations in vogue and too little to the principles involved.

Last month, on looking through some of the older literature on the subject, I found that Bennett¹⁵ in 1893, having described the operation he recommends for inguinal hernia, mentions an operation somewhat similar to the one suggested this evening, but he limits its use to small bubonocoeles, and even then only in exceptional circumstances. In slight cases of incomplete inguinal hernia he says it is "as a rule unwise under ordinary circumstances to make any attempt at effecting the radical cure at all." He apparently takes it for granted that the sac in those cases is acquired. The incision is made over the most prominent part of the swelling; but if the hernia extends to the external ring he incises over that point in preference, strongly objecting to any division of the anterior wall of the canal.

RESULTS OF OPERATION.

I have purposely entitled this paper a preliminary note as I have only performed the operation during the last eighteen months, and therefore sufficient time has not elapsed to allow of definite statements being made regarding the ultimate results, nor can I bring forward a large number of cases. The results up to the present, however, confirm my belief in the theories on which the operation is based, and are so satisfactory that I have thought it advisable to make this preliminary communication. I have performed the operation 16 times—9 times in male adults whose ages varied from 19 to 40, the average age being 28; 5 times in male children; once in a woman aged 28; and once in a girl of 11. In 3 male adults local anaesthesia was used. I have either seen or obtained recent reports from all the patients; in every case the results are satisfactory. Without detailing the cases, I will mention four of the earlier ones.

J. D., aged 24, developed a right inguinal hernia three years ago. He wore a truss until he was operated on a year and four months ago. He plays golf, dances, etc., and has had no trouble since the operation.

A. S., aged 35, developed right inguinal hernia after running a race a little over a year ago. His work as a butcher involved lifting heavy carcasses, which did not improve matters. He was operated on ten months ago, got up in three weeks, and left hospital a week later. Since starting work, eight weeks after the operation, there have been no signs of recurrence.

J. W., aged 28, developed a left inguinal hernia after an attack of pneumonia eight years ago. He wore a truss at intervals until operated on ten months ago. He was up in three weeks, and started his work as a grate-fitter four weeks later. The part operated on is now, to quote his own words, "as sound as a bell."

J. F., aged 30, suffered from an oblique inguinal hernia on the right side, and had a patent tube on the left, although no hernia had ever been present. He was operated on eight and a half months ago. In six weeks he started light work as a "checker," and in another fortnight was playing three or four rounds of golf a week after working hours. Three and a half months after leaving hospital he renewed his work as attendant at the Step Rock, St. Andrews. He bathed daily, equalling his previous records for swimming short distances; "trick diving such as somersaults, back dives, etc., presented no more difficulty than before." The following month he swam from the Step Rock to the pier, a distance of over a mile. At present he is perfectly sound.

Notes of the after-progress of the other cases are similar to the above.

Although this operation was primarily devised for young adults, I have also used it in children. Dr. Tuke of Dunfermline, to whom I spoke of it some time ago, has operated in this manner on eight cases, three adults and five children, all of which have done well. He has kindly allowed me to mention his results, and states his opinion that it is the ideal operation in children. It is difficult to state the age limit at which it would be inadvisable to employ this method. The decision rests on the possibility of the power of the muscles to regain their tone, rather than on the actual age of the patient.

In future, even in complicated cases, I intend to begin by exposing the internal ring and, if necessary, enlarge the incision downwards later.

The operation is easily and quickly performed. It can readily be done under a local anaesthetic, much more so than the operations usually employed, the nerves involved being under direct control.

Other advantages are that the patient need not be confined to bed for more than ten days or a fortnight. Once union of the overlapped external oblique has taken place, the sooner the internal oblique and transversalis muscles are brought into play the better; not only so, but the greater their development the less chance there is of a recurrence. In patients in whom the muscular development in the inguinal region is questionable, definite exercises should be started during convalescence. The incision is further away from possible contamination than that usually employed, this is specially important in children; but, on the other hand, the parts are smaller in children, and, therefore, at first the operation is more difficult.

Complications due to extensive dissections of the sac and manipulations or displacements of the cord, are avoided, nor has hydrocele developed in any of the cases operated upon.

The overlapping of the external oblique, a method originally introduced by Lucas-Championnière,¹⁶ forms a firm pad over the internal ring without interfering with the action of the underlying muscles. Fixation of the

neck of the sac is unnecessary in children, but I have always done so in adults to prevent the possibility of any semblance of pouching at the internal ring.

If it be granted that oblique inguinal hernia in adults is primarily due to a preformed sac, then, from the clinical evidence we have in children, the operation which will deal with the sac with the least damage to the canal is what we must aim at. The operation I have suggested appears to me to carry out the above requirements in the simplest manner possible. Murray⁷ says, "Clearness of purpose and simplicity of method should be our aim." I think you will admit the simplicity of method. I can only hope that I have succeeded in making my purpose clear.

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THE MORBID ANATOMY AND PATHOLOGY OF INFANTILE AND ENCYSTED HERNIA.

WITH A NOTE ON ACCIDENT OF TAXIS.

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In this paper I purpose setting forth a view as to the morbid anatomy and pathology of infantile hernia, which in important respects is at variance with that which surgeons have come to regard as firmly established, and which is associated with the name of its author, Mr. Lockwood. Needless to say, this is not an undertaking that I should enter upon lightly nor without the pressure of very strong conviction; and if I should succeed in throwing an additional ray of light upon what is admittedly a very obscure subject, Mr. Lockwood, who probably realizes its obscurity better than anybody else, will be the first to recognize whatever is well founded in my reasoning. My experience of infantile hernia is limited to two cases that I have met with on the operation table.

CASE I.

A man aged 33; Alfred Hospital, May, 1902. Left inguinal hernia. The initial incision in the groin laid open a serous bag, which was found to be continuous with the tunica vaginalis testis. The posterior wall of the bag was incised to expose the structures of the cord and the hernial sac. The sac was separated from the cord up into the abdomen in the usual way after incision of the external oblique. The operation differed in no way from that which I habitually perform, except that both layers of the front bag were incised before the cord and hernial sac were reached, and that the incision of the external oblique necessarily involved incision also of the upper part of the front bag, which was thus virtually disregarded. The operation consisted in simple removal of the sac, after free exposure of the canal by means of incision of the external oblique.

CASE II.

A man aged 30; Alfred Hospital, November, 1906. In this case the hernia was right-sided, and the hernial sac bulged more markedly into the front bag when this was opened. In other respects the operation was identical with Case I.

Infantile hernia is a variety of inguinal hernia that has had a somewhat eventful history. It was first described by Hey, of Leeds, in 1764, and the pathology of it was the subject of the wildest and most erroneous theoretical speculation, until Lockwood in 1886 very carefully reviewed the subject by the light of much thought and no inconsiderable amount of research, and published his views in a paper entitled, *The Morbid Anatomy and Pathology of Encysted and Infantile Hernia*.¹ I shall offer no apology for commencing with a brief elementary description of the anatomy of infantile and encysted hernia, in order to show the great value of Mr. Lockwood's contribution to our knowledge of this subject, and

to make clear the relationship of infantile and encysted hernia, which he was the first to demonstrate.

The anatomy of these two forms of hernia is simply shown in the diagrams A, B, C, Fig. 1. The essential arrangement of the serous membranes is that of a hernial sac, which lies behind a long prolongation upwards from the tunica vaginalis; in B the sac is represented as bulging more markedly into the cavity of the serous membrane in front of it, with a slight tendency for its lower end to become enveloped, while in C the bulging and enveloping has been pushed to an exaggerated degree, so that the sac not only bulges into the front bag of serous membrane, but is actually enveloped by it to a large extent. Thus it is evident that C is merely a variant of the anatomical peculiarity that is displayed by A and B. A represents a typical case of infantile hernia, C encysted hernia. I have never seen a case of encysted hernia, and I doubt if it has even been seen in the exaggerated degree in which I have depicted it. In operating upon a case of infantile hernia, A, the surgeon will necessarily cut through three layers of serous membrane before the herniated bowel is exposed, namely, the front and back layers of the anterior bag, and the front wall of the hernial sac. In operating upon a case of encysted hernia, like C, on the other hand, after having opened the front layer of serous membrane, he will find what appears to be a hernial sac,

Fig. 1.

pendent and loose in the cavity. He will, of course, have to cut through just the same number of layers of serous membrane to reach the bowel as in operating upon A, but the naked-eye appearances will obviously be quite different; so different, indeed, that until Mr. Lockwood elucidated the subject, C was classed as a separate class of hernia under the title "encysted."

I have said that the wildest theories were indulged in to explain the occurrence of encysted hernia, and all presupposed the view, which we now, many of us, believe to be completely mistaken, that the typical mode of causation of hernia is that of becoming "acquired"; which means that sac and hernia together are pushed out through the inguinal canal by intra-abdominal pressure overcoming a weakened abdominal wall. Without going into further detail, suffice it to say that Mr. Lockwood made short work of all such theories by showing clearly that the sac is a congenital structure, and undoubtedly is developmentally associated with the descent of the testis. Furthermore, as the result of most careful research, he concluded that the sac is an abnormal structure that owes its origin to the tractive power of the gubernaculum testis. I may, perhaps, reproduce in his own words the conclusions at which he arrived as the result of his research; they were:

- That the London museums contain no specimen of encysted hernia such as is usually described.
- That the various specimens designated by that name belong to the infantile variety.
- That the latter owe their origin to the tractive power of the gubernaculum testis.

There the matter has remained. Mr. Lockwood's views gained immediate acceptance, and it was right that they should, for assuredly no investigator has either before or since studied the subject with such laborious care. My own opportunities for studying the matter have been limited to the two cases that I have described. Yet this