less extensive attachment to Poupart's ligament (only to its outer third), passes inwards and arches downwards to join the tendon of the internal oblique, and to be inserted with it into the ilio-pectineal line forming the conjoined tendon, about which you will hear so much during the operation for the radical cure of hernia. The transversalis, passing above the internal ring, has no anterior relation to the inguinal canal, but in passing to its attachment as the conjoined tendon is in a position posterior to the inner half of the canal.

Internal to the transversalis muscle we have the general lining membrane of the abdomen just as an egg has its general fibrous lining. This membrane receives various names in various places; when lining the transversalis muscle it is known as the transversalis fascia. In the pelvis it is known as the pelvic fascia, and when lining the diaphragm would be known as the diaphragmatic fascia. The internal ring is an opening in this fascia caused by the bag-like pouch that is carried down by the testicle on leaving the abdominal cavity. The very term "hernia" is derived from the Greek word *ἕρως*, which means a branch, and it is this protrusion forwards through the abdominal wall by the testis that favours the subsequent protrusion of the peritoneal wall and the formation of hernia.

We are now completely in possession of the facts in the anatomy of these parts that relate to the operation, and we know that the canal has only in front of it external and internal oblique muscles and behind the internal oblique muscle and transversalis muscle as conjoined tendon, and behind this the transversalis fascia. You know also that the deep epigastric artery runs upwards and inwards from the iliac artery and passing between the transversalis fascia and peritoneum, skirts close to the inner margin of the internal ring. In operating you must always keep the exact position of the artery in mind.

An oblique inguinal hernia, then, is a protrusion of any of the abdominal contents through the entire length of the inguinal canal, and would have for its covering representatives of each of the normal layers of the abdominal wall in anterior relation to the canal. First, we should have skin, and then superficial fascia, the external oblique representative or intercolumnar fascia, then internal oblique or its representative cremasteric fascia, then transversalis or infundibuliform fascia, and lastly subperitoneal fat and peritoneum. The transversalis muscle, not being in anterior relation to the canal, escapes being pushed in front of the descending testis.

The few anatomical facts having just refreshed our memories we are now in a position to undertake the operation for the radical cure of hernia.

Now of the ten surgical procedures I foreshadowed to you all have the same object in view, namely, to get rid of the sac of peritoneum up to and as far as the internal abdominal opening, and to close the passage in the layers of the abdominal wall by readjusting these.

These objects are attained by various methods. [The lecturer then related and described the ten operations for the radical cure of inguinal hernia and expressed a predilection for Mr. Barker's operation.]

MASTOID ABSCESS AND ADENOIDS.

The next case that was exhibited was that of a boy, aged 18, with a discharging sinus in the right mastoid region in the site of a scar of a previous operation. It was a case of supuration in the tympanomastoid cavities that had been operated on some years ago. The trouble in the mastoid had recurred, and no wonder.

If those present would examine the patient they would see that the boy was afflicted with adenoids as well and most pronounced nasal occlusion, and it was quite hopeless to expect to cure the mastoid disease before clearing the post-nasal space and ventilating the nose. The *fons et origo mali* was still there. The antrum had been opened and drained, but it was quite impossible to clear out all the corners and recesses and bring the parts into a healthy condition, unless the passage of the Eustachian tube was freely maintained and the other tissues kept free from congestion.

PUNCTURE OF RIGHT VENTRICLE.

Mr. Collier next exhibited a heart with a punctured wound of the right ventricle. It was a case of malignant endocarditis where the heart had become suddenly acutely dilated. This state had not been without reason mistaken for inflammation in the pericardium. An aspirating needle had been used and the ventricle punctured. The curious point was

that through so small a puncture 24 oz. of fluid passed in one minute, filling the pericardium to distension and causing the immediate death of the patient.

TRAUMATISM AND HERNIA.

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A WORKING man becomes the subject of hernia.¹ He refers it to some antecedent injury, such injury being either "straining" the abdominal muscles as in lifting a heavy weight² or being a blow upon, or squeeze of, the abdomen. The man, as a rule, is not attempting to deceive: the association of cause and effect is a natural one to him, particularly when he is introduced to that unfortunate term "rupture" by the first doctor who sees him.

Can a hernia result suddenly from a single trauma? and what are the conditions which must be fulfilled to associate the hernia with the trauma? If the hernia is wholly acquired (sac and contents), one cannot imagine it resulting suddenly from a single trauma, because the peritoneum will not stretch suddenly—it tears. This statement hardly requires amplifying. "Abrupt stretching of the membrane leads to certain rupture of it."³ Every abdominal surgeon knows how readily the peritoneum tears when traction has to be made upon it in closing a laparotomy wound. I have tested peritoneum from the living and dead body in various ways and find it very inextensible. Professor Haycraft has kindly tested its extensibility for me in the Physiological Laboratory, University College, Cardiff, on an apparatus of his own devising,⁴ and his conclusion is that peritoneum will not stand sudden extension.

Those, therefore, who regard a hernia as wholly acquired naturally agree with Tillmanns's view when he says: "The supposed sudden development of a true hernia is in my opinion always due to a mistake in observation."⁵ Even on the supposition of a wholly acquired origin there is, I think, one possible exception to this view, although a direct hernia would be a more likely result than the form under discussion, namely, sac and contents resulting suddenly from a "strain" in an individual who has been losing flesh rapidly and in whom there is weakness and atrophy with bulgings of the muscles of the lower part of the abdominal wall. Then, lax peritoneum and weakened abdominal wall might conceivably permit a portion of the peritoneum to be carried into the inguinal canal, probably not by a localized bulging but by a slipping down of the parietal peritoneum all round the widened internal ring. Such an event, however, would be impossible in an ordinary healthy adult with a normal musculature.

Under ordinary circumstances, then, the only explanation of the initial sudden appearance of a hernia lies in the existence of a preformed sac. Is this preformed sac congenital or acquired? As regards hernia in infants the view is gaining ground (Hamilton, Russell,⁶ Stiles,⁷ Deanesly⁸), that the hernia takes place into the processus vaginalis, which has become obliterated below, but not above. This view is borne out by the fact that the majority of these herniae in infants are on the right side,⁹ the side on which the funicular process is later in closing. Russell and Deanesly go further and consider that all oblique inguinal herniae (and in a later paper¹⁰ Russell extends the proposition to femoral herniae) depend for their existence upon the presence of a congenital sac. Other writers support this view, but not with the same thoroughness. For example, "Inguinal hernia . . . is due either to the congenital patency of the vaginal process . . . or to a secondary protrusion of the peritoneum."¹¹ "This hernia—that is, hernia into the funicular process—possibly forms the majority of the cases of inguinal hernia."¹²

Can we distinguish a congenital from an acquired sac? In my opinion, with a congenital sac the relations of the cord to the sac are more intimate than when the sac is acquired, and this appears to me to be the only difficulty in regarding the sac of an ordinary hernia as arising from the unobliterated funicular process. Sachs, however, quoted by Macready,¹³ says that there is so much variation in the relation of the vas deferens and the spermatic vessels to the posterior wall of the processus vaginalis that the position of these structures cannot be used as a test for hernia into the funicular process.

It is, however, I think, accepted—and such is my own experience—that in the ordinary "congenital" hernia, where the gut occupies the tunica vaginalis, considerable difficulty

is experienced in separating cord from sac, and not infrequently a portion of the sac has to be left behind with the cord. Another point against the sac being derived from the funicular process would be the occurrence of an ordinary hernia lying in front of one of the congenital type. These considerations make it somewhat difficult to accept the view of the origin of the sac from the funicular process. There are other possible explanations of the preformed sac which may now be considered.

The view that there is a difference in origin between the hernia of infancy and that of adolescence and later life is supported by the fact that there is a gap in the ages between infancy and early adolescence during which hernia is very infrequent. Macready¹⁴ writes:

The extraordinary frequency of hernia in the first year in males, and to a less degree in females, is in strange contrast to the small number which develop in the years immediately succeeding.

May not hernia in infancy be due to the presence of a congenital sac, not, however, derived from the funicular process, but being a second peritoneal sac formed in connexion with the gubernaculum testis? This would not, of course, explain the preponderance of hernia on the right side in infants unless the appearance of the second peritoneal sac has any connexion with the later closure of the canal on that side.

With regard to hernia in later life, is it not possible for there to be an acquired preformed sac? Such an idea seems to be in Ziegler's mind when he writes, as quoted above, of a "secondary protrusion of the peritoneum." One knows the readiness of the peritoneum to form little pouches. On occasions possibly these may be attributed to the dragging influence of small sub-serous lipomata. May not the peritoneum become engaged in the top of the inguinal canal, over which it is normally depressed, and form a small pouch in the canal? Some time ago I operated on both sides of a patient. On the left side there had been no protrusion, but the canal appeared slightly larger than normal. I found there a small empty peritoneal sac, the size of a large marble, lying in front of the cord and easily separable from it. The operation did not show (and one notes the same fact in operating on small buboneceles) any obvious widening of the musculo-aponeurotic boundaries of the canal. Similar observations have been made by others,¹⁵ who have looked upon these small sacs as patent funicular processes. I think that the possibility should also be entertained of their being acquired preformed sacs.

Having now arrived at the conclusion that, granted a preformed sac, hernia may occasionally result suddenly from traumatism, we must by no means think that the simple *post hoc* line of argument is correct. Certain conditions must be fulfilled before the trauma can be regarded as the cause of the hernia. These conditions may be thus tabulated:

1. The trauma must be of a certain character, either a sudden general muscular contraction compressing the abdominal contents, as in lifting too heavy a weight or in resisting a blow, or possibly a general abdominal squeezing as in a buffer injury. A localized blow on one part of the abdomen (as by the end of a stick) cannot cause a hernia.
2. The hernia must be quite small at first.
3. The hernia must appear immediately after the accident.
4. The development of the hernia must be accompanied by acute pain and tenderness at the site of the hernia and by the formation of a small tender lump there.
5. The symptoms must be so acute as to compel the patient at once to leave his work and seek medical aid.

These are the grounds for associating hernia with trauma which I have given when consulted recently on the medico-legal aspects of certain cases of hernia. Subsequently I have found corroboration of my opinions in at least three quarters:

1. The German "Manual of Accident Insurance"¹⁶.—To justify the payment of insurance the hernia must be developed suddenly and be accompanied by intense pain. . . . The sudden development of a hernia invariably causes pain of a character so intense as to be almost unbearable, to which the affected individual involuntarily gives expression, and which obliges him to interrupt his work and to consult a physician at once. . . . If no proof of this kind is forthcoming it is to be presumed that the work during the performance of which the descent of the hernia occurs furnishes the occasion for the same but does not act as its cause, and is therefore to be regarded as the cause leading to the discovery of the condition not as the cause of the hernia itself.

2. Carless¹⁷ quotes Sultan,¹⁸ who will only admit the title of traumatic hernia in cases (a) where there is definite evidence of the occurrence of a sudden effort which would raise the intra-abdominal pressure; (b) where it is certain that no hernia existed beforehand; (c) if the onset of the trouble was associated with pain so great that the patient had to

leave work, and where examination by a surgeon elicited tenderness and pain.

3. Dr. Sole¹⁹ suggests that the following points should be borne in mind in determining the association of hernia with violent muscular effort—(a) Past history, particularly any recent illness calculated to reduce strength; (b) nature of effort, muscular effort in a constrained or unnatural attitude being particularly liable to produce hernia; (c) accidental hernia, always very small and the pain not vague, but sudden and so intense as to immediately unfit the patient for any other effort.

We have therefore a collection of independent opinions all pointing in the same direction, and want of fulfilment of the conditions indicated should make it clear to every medical man that the hernia he has under consideration has not been suddenly developed from a single traumatism.

A few other points require mention. If the case is one of hernia into the tunica vaginalis, the hernia may reach the scrotum as the immediate result of the traumatism. The existence of a double hernia is against traumatism. This opinion is confirmed by Golebiewski²⁰ and Carless.²¹ Apart from other considerations, it is most unlikely that the gut will enter the two inguinal canals at the same moment as the result of a single "strain."

In some cases deception is undoubtedly practised by the patient, as where a large irreducible scrotal hernia with thickened sac and adherent omentum is attributed to recent injury.

Operation at times may afford additional information of medico-legal value. The English courts of law hold that there is no obligation upon a man to undergo an operation to fit him for his occupation again, even if that operation is practically devoid of risk. An opposite view is taken by the Scottish courts.

When a hernia exists prior to the trauma, the trauma may determine such a change in the hernia as to unfit the man for his work. To determine the association of change in the hernia and trauma we must apply similar tests to those tabulated above for the initial onset of a hernia. Thus straining may determine strangulation in a hernia.

Care must be taken in examining a case to distinguish an oblique inguinal hernia from other forms. Carless²² quotes a case related by Guernonprez of Lille²³ in which a rupture formed in the right inguinal region as the result of a direct blow there. The hernial aperture was not identical with the inguinal canal, a bridge of tissue about 12 mm. thick separating them.

Finally, it must be recognized that the association of hernia with traumatism is exceptional. No exact rules can be laid down, and every case must be judged separately.

Considerations of space have prevented my quoting illustrative cases, and for the same reason no reference has been made to the association of traumatism with other forms of hernia.

CONCLUSION.

To sum up: Granting the existence of a preformed sac, oblique inguinal hernia may occur suddenly as the result of a single trauma, such trauma being usually an abdominal "strain." It is doubtful whether the preformed sac is congenital or acquired. For the trauma to be the cause of the hernia, certain conditions, which have been enunciated, must be fulfilled.

NOTES AND REFERENCES.

- ¹ The term "hernia" is used in this paper to mean the oblique inguinal form unless otherwise stated. ² "Excessive straining" must be regarded as an "accident." Vide Lord Macnaghten's judgement. BRITISH MEDICAL JOURNAL, August 29th, 1903, p. 479. ³ Treves, *Surgical Applied Anatomy*, 3rd Edition, p. 321. ⁴ An account of this apparatus will shortly be published in the *Journal of Physiology*. ⁵ Tilmanns, *Textbook of Surgery*, 1898, vol. iii, p. 180. ⁶ *Lancet*, November 18th, 1899. ⁷ BRITISH MEDICAL JOURNAL, 1901, vol. ii, p. 599. ⁸ *Ibid.*, 1903, vol. i, p. 1437. ⁹ Stiles, loc. cit. ¹⁰ *Lancet*, 1902, vol. i, p. 1519. ¹¹ Ziegler, *Special Pathological Anatomy*, 1897, Secs. ix to xv, p. 643. ¹² Moynihan, *Encyclop. Med.*, vol. iv, p. 509, Art. "Hernia." ¹³ Macready, *Treatise on Ruphures*, 1893, p. 40. ¹⁴ Loc. cit., p. 10. ¹⁵ Deanesly, loc. cit. ¹⁶ Quoted from Golebiewski. *Diseases Caused by Accidents*, translated by Pearce Bailey, M.D., 1900. ¹⁷ *Practitioner*, February, 1904, vol. lxxii, No. 2. ¹⁸ *Münch. med. Woch.*, February 3rd, 1903. ¹⁹ Quoted in BRITISH MEDICAL JOURNAL, December 5th, 1903, p. 1482, from *Presse Médicale*, October 20th, 1903. ²⁰ Loc. cit., p. 229. ²¹ Loc. cit., p. 260. ²² Loc. cit., p. 259. ²³ *Gaz. des Hôpitaux*, July 21st, 1903.

AMERICAN GYNAECOLOGICAL SOCIETY.—The American Gynaecological Society has amended its constitution in the direction indicated by the italicized words in the following sentence: "The objects of this Society shall be the promotion of knowledge in all that relates to diseases of women, to obstetrics, and to abdominal surgery."

THE Italian Obstetrical and Gynaecological Society will hold its tenth annual meeting at Palermo next October.