

OBLIQUE INGUINAL HERNIA

with special reference

to the

Reducible Variety

and its

TREATMENT --CASES.

George Hanson, M.B., C.M.--

New Cumnock, Ayrshire.

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Definition of:-

Hernia THE term Hernia, in its widest sense, is used to denote the displacement of an organ from the cavity in which it is naturally contained, by being protruded through an abnormal, or accidental opening in its walls.

Inguinal Hernia Inguinal Hernia denotes the protrusion of a viscus into, or through the Inguinal canal.

Oblique Inguinal Hernia Oblique Inguinal Hernia is that variety in which the hernial sac enters the canal through the deep abdominal ring. A protrusion into the canal occupying part of, or the whole canal, is said to be incomplete—a Bubonocoele— A protrusion through the canal, passing out by the External ring, is said to be complete. When such protrusion descends to the Scrotum the Hernia is called Scrotal. A Hernia is reducible when, the supine position being assumed, it slips back of its own accord, or upon gentle manipulation.

Structure A Hernia is composed of a sac and its contents. It is only in congenital, or accidental herniae, that the sac, as such, is absent.

a. The Sac The sac is the prolongation of that portion of the peritoneum which corresponds to the aperture through which the hernia protrudes. It is in all cases composed of two parts—the neck, and the body.

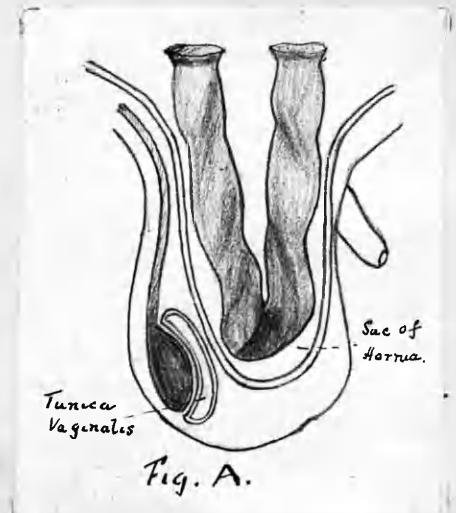
1. Neck The neck as a rule is narrowed. In older hernia, however, it may be wide and expanded. Usually, it is short, being as it were a constriction of the sac. It may, however, be elongated and narrow

Generally, in course of time, the neck of the sac becomes thickened, and opaque.

2. Body. The body is round or pear shaped. It varies greatly in size. In recent cases it is thin; in old standing cases it becomes much thickened.
- b. Contents. The contents of the sac vary widely. Most frequently, the protusion consists of bowel. As a rule it is the small intestine, and a portion of the Ileum at that, which is found in the sac. Such portion may vary in size, from a small piece of the circumference of the bowel, to a coil several feet in length. The large intestine is seldom found in the sac. Occasionally the Caecum is met with. A Hernia, whose sac contains bowel, is called an Entero-cele. Omentum found alone in the hernial sac, gives to the hernia the term Epiplo-cele. When bowel and omentum exist together in the sac, the condition is designated Entero-Epiplocele.

ANATOMY.

In Oblique Inguinal Hernia, the intestine escapes from the abdominal cavity at the internal ring, pushing before it a pouch of peritoneum, which forms the hernial sac--Fig. A. As it enters the Inguinal canal, it receives an investment from the subserous areolar tissue, and is enclosed in the Infundibuliform process of the



Transversalis Fascia. In passing along the Inguinal canal, it displaces upwards the arched fibres of the Transversalis and Internal Oblique muscles, and is surrounded by the fibres of the Cremaster. It then passes along the front of the cord, and escapes from the Inguinal canal at the external ring, receiving an investment from the Intercolumnar fascia. Lastly, it descends into the Scrotum, receiving covering from the superficial fascia and the integument. The coverings of this form of hernia, after it has passed through the external ring, are from without inwards--the integument, superficial fascia, intercolumnar fascia, cremaster muscle, infundibuliform fascia, subserous areolar tissue, and peritoneum. This form of hernia lies in front of the vessels of the spermatic cord, and seldom extends below the testis on account of the intimate adhesion of the coverings of the cord, to the tunica vaginalis. When the intestine passes along the spermatic canal, and escapes from the external ring into the scrotum, it is called Complete Oblique Inguinal or Scrotal Hernia. If the intestine does not escape from the external ring, but is retained in the inguinal canal, it is called Incomplete Inguinal Hernia or Bubonocele. In each of these cases, the coverings which invest it will depend upon the extent to which it descends in the inguinal canal. There are other varieties of inguinal hernia depending on some congenital defects in the Processus Vaginalis. Thus the testicle, in its descent from the abdomen into the scrotum, is accompanied by a pouch of peritoneum, which about the period of

birth, becomes shut off from the general peritoneal cavity, by a closure of that portion of the pouch which extends from the internal abdominal ring to near the upper part of the testicle; the lower portion of the pouch remaining persistent as the tunica vaginalis. It would appear that this closure commences at two points viz. at the internal abdominal ring, and at the top of the Epididymis, and generally extends until, in the normal condition, the whole of the intervening portion is converted into a fibrous cord. From failure in the completion of this process variations in the relation of the hernial protrusion to the testicle and tunica vaginalis are produced, constituting distinct varieties of Inguinal Hernia which have received separate names and are of surgical importance.

CONGENITAL HERNIA- Fig. b.



Where the pouch of Peritoneum which accompanies the cord and testis in its descent, remains patent throughout, and is unclosed at any point, the cavity of tunica vaginalis communicates directly with the Peritoneum. The intestine descends along the pouch into the cavity of tunica vaginalis, which constitutes the sac of the Hernia, and the gut lies in contact with the testicle.

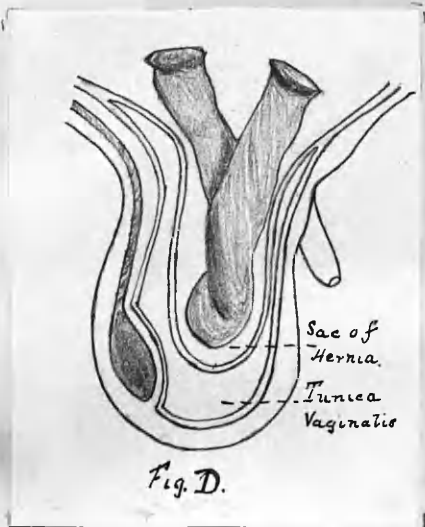
INFANTILE and ENCYSTED HERNIA.

Where the Pouch of Peritoneum is occluded at the internal ring only, and remains patent throughout the rest of its extent, we have two varieties of Oblique Inguinal Hernia produced, which have received the names of Infantile, and

Encysted Hernia.

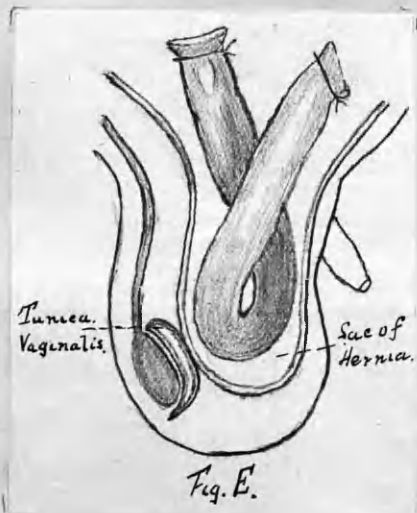


In the Infantile form-Fig. c.-the bowel, pressing upon the septum and the Peritoneum in its immediate neighbourhood, causes it to yield and form a sac, which descends behind the Tunica Vaginalis; so that, in front of the bowel, there are three layers of Peritoneum, the two layers of the Tunica and its own sac.



In the Encysted form-Fig. d.- pressure in the same position-namely, at the occluded spot in the pouch-causes the septum to yield and form a sac which projects into and not behind the Tunica Vaginalis, as in the preceding variety, and thus constitutes a sac within a sac, so that in front of the bowel there are two layers of Peritoneum, one layer of the Tunica, and the Hernial sac.

HERNIA INTO THE FUNICULAR PROCESS. Fig. e.



Where the pouch of Peritoneum is occluded at the lower point only, that is, just above the testicle, the intestine descends into the pouch of Peritoneum as far as the testicle but is prevented from entering the sac of the Tunica Vaginalis by the septum which has formed between it and the pouch, so that it resembles the congenital form in all respects,

The following prints, photographed from Morton's Plates, illustrate the general anatomy of the structures concerned in Inguinal Hernia.

I



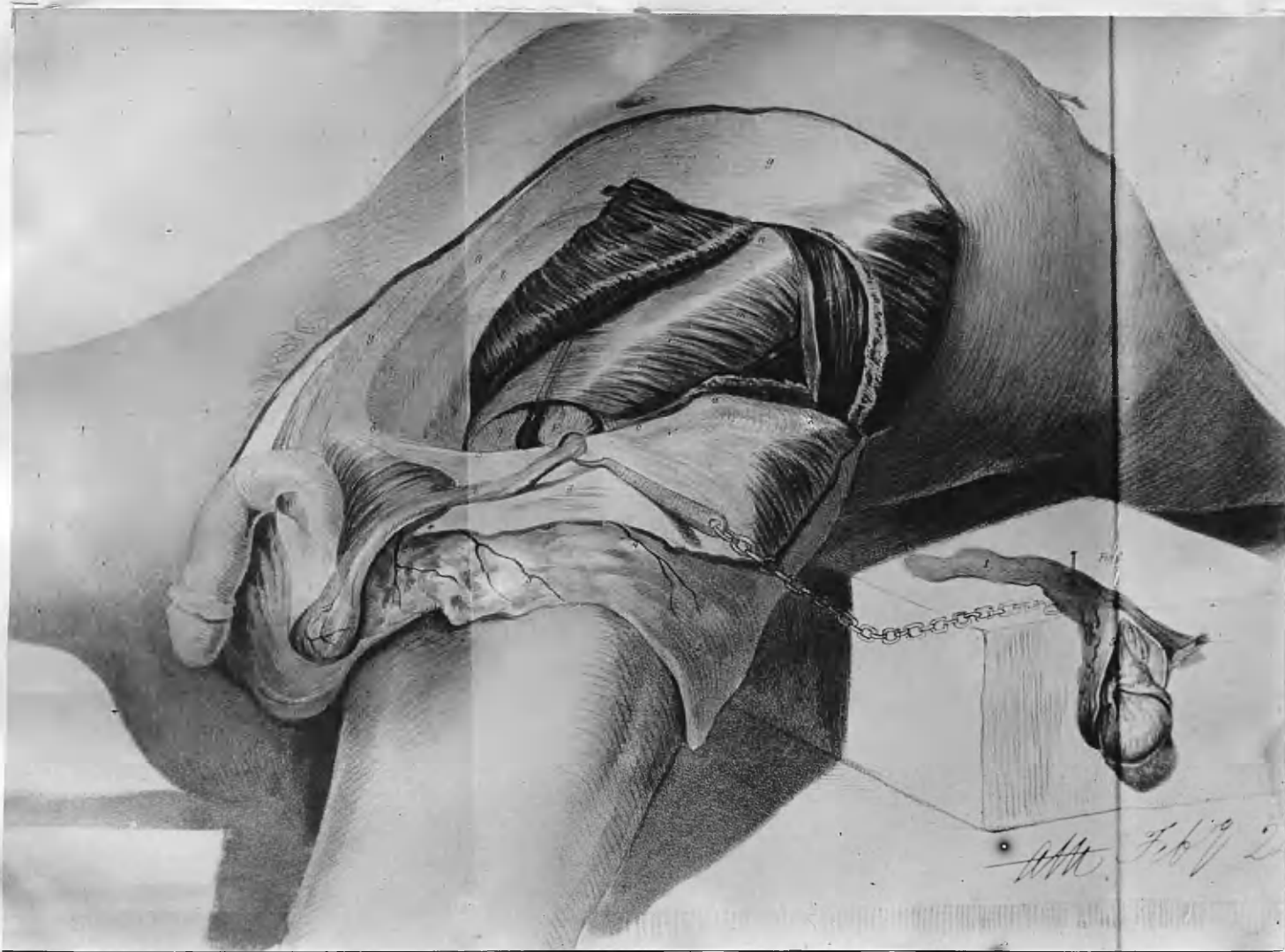
I. Shows the first stage of the dissection of the anatomy of the structures concerned in Inguinal Hernia. Skin and superficial fascia are reflected, in order to show aponeurosis of Ext. Oblique muscle, External abdominal ring, Spermatic cord, and testicle, etc.



II Represents the second stage of the dissection of the inguinal region, in which the tendon of Ext. Oblique muscle has been reflected, in order to display the lower part of the Int. Oblique muscle, with the fibres of the Cremaster covering the front and sides of the spermatic cord and testicle.

G. c.

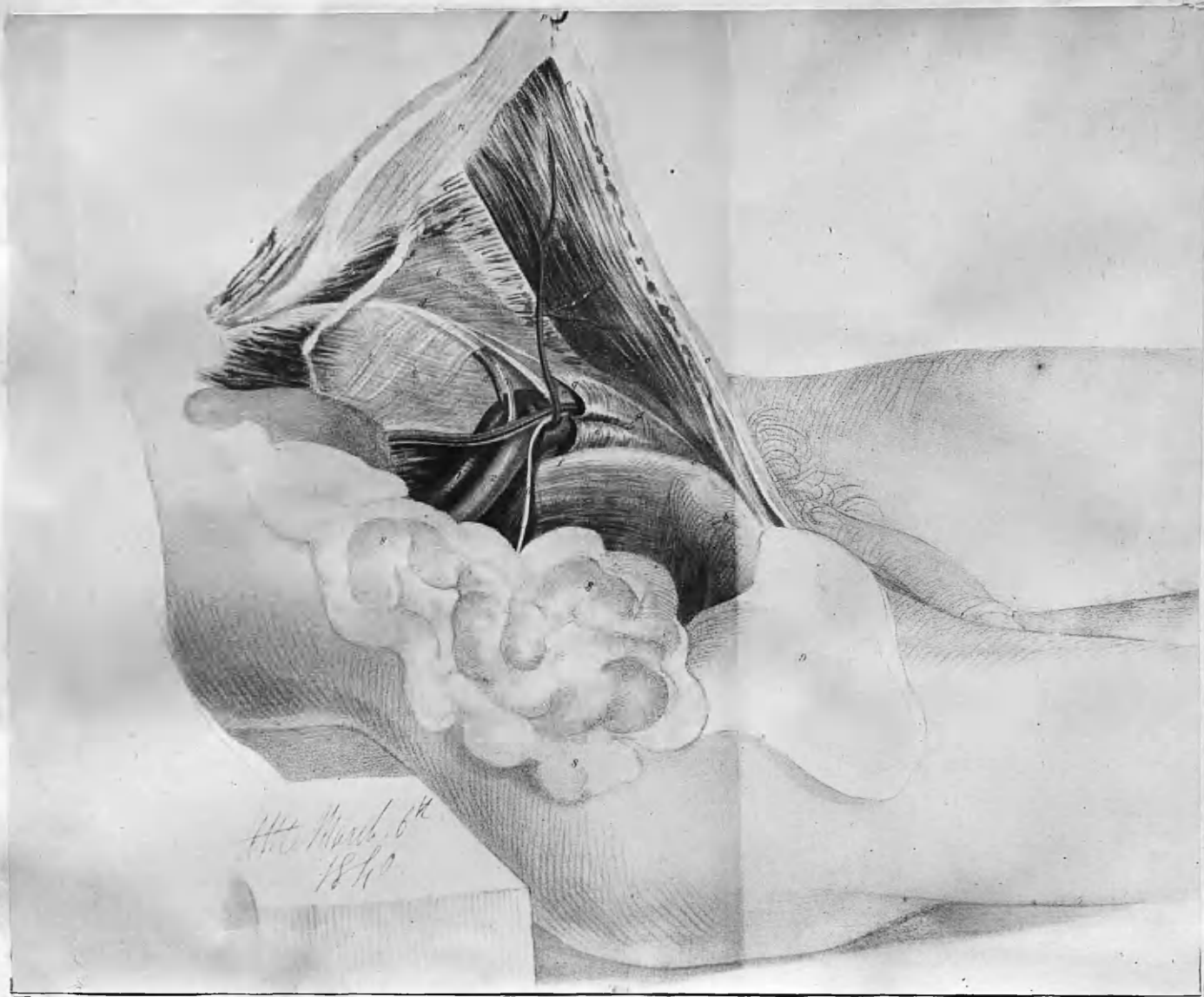
iii



iii. The first figure, represents the lower portion of the transversalis muscle, and the posterior wall of the inguinal canal, as they appear when the Cremaster muscle has been removed from the spermatic cord, and the Internal Oblique detached from its connexions with the spinous process and crista of the ilium. The spermatic cord is held aside, in order that the structures which form the posterior wall of the inguinal canal may be more clearly seen.

B.2.

IV.



IV. Represents a view of the internal surface of the abdominal parietes, in the left inguinal region of the male subject; the peritoneum and subserous cellular tissue having been removed, so as to expose the other structures which are immediately external to them.

V. Represents the coverings of the sac of an Oblique or External Inguinal Hernia on the left side. It also shows that the obliquity of the inguinal canal is destroyed by the yielding of its posterior wall, under the long continued pressure of the protruded viscera. It will likewise be observed, that the epigastric artery has, from the influence of the same causes, ~~has been removed~~ from its natural course, and driven inwards as far as the outer edge of the Rectus. muscle, where it must almost inevitably be wounded, should the Surgeon while operating on a strangulated Inguinal Hernia, direct the edge of his knife inwards, towards the Linea Alba, when enlarging the constricted neck of the sac.



except that instead of enveloping the testicle, that body can be felt below the rupture.

PATHOLOGY

(A) Of the Sac. (B) Of the Contents. (C) The Relations.

(A) THE SAC. This is composed of Peritoneum. It may be small, it may be of considerable size. In recent cases as already noted, it is thin and transparent, but in old standing cases it is usually thickened. It may be laminated. Blood vessels, sometimes of considerable size, may be noted ramifying in the walls. This thickening is the result of inflammatory action, which action has been called into being by (a) the irritation of the sac and its contents in their new position; or (b) the irritation of the pad of a truss, if such an instrument has been worn. Atrophy of the sac may exist, such atrophy being caused by the increased growth of the contents.

Adhesions. Adhesions may exist (1) outside the sac, or (2) inside the sac.

1. Outside the sac. These are caused by the agents mentioned above under thickening—viz.—Pressure of a truss, or by the irritation of the hernia itself.
2. Inside the sac. Adhesions may be found, bridging across from one side to the other enclosing a portion of the viscera, or, they form between the wall and its contents. In recent cases the adhesions are soft and easily broken down. In older cases they are dense and especially firm about the neck of the sac.

(B) CONTENTS. As already noted, the variety of Hernia, Enterocoele, is the

1. **Enterocoele.** most common. The quantity of intestine within the sac varies from a small knuckle to a coil several feet in length and with mesentery attached. Once a portion of the bowel has descended, the protrusion tends to increase until as in some large, old herniae, the greater part of the bowel lies in the sac. In a patient of mine measurement of the hernia gave the following result: Vertically, eleven inches; transversely, nine inches. The sac in this instance contained a very large portion of bowel. When the intestine has been long protruded it usually becomes thickened, narrowed, greyish on the surface, and more or less deranged in function. The corresponding mesentery becomes thickened, hypertrophied and vascular.

2. **Epiplocoele.** In the variety Epiplocoele, the omentum in old standing cases, becomes thickened, brawny, laminated, losing its ordinary texture and becoming indurated. Its veins usually assume a somewhat varicose condition. The mass becomes pyramidal in form, apex upwards at the abdominal aperture, the base below, broad and expanded. In some cases it can be unfolded. In others it is matted together to form a solid mass. Occasionally apertures form in it through which a coil of intestine may protrude and become strangulated within the sac. Cysts containing fluid may be found in the omentum.

3. **Enteroplocele.** In the variety Enteroplocele, the omentum descends in front of and occasionally envelopes the bowel. The changes found in the two foregoing varieties may also be noted here. Besides these, the ordinary contents of a hernial sac, the

Stomach(a),Caecum(b),Ovaries(c),Uterus(d) Appendix(e),have all been found. Thus

4 Stomach.

(a) Professor Tallemand found nearly the half of the stomach in an Inguinal Hernia of the right side. Dist.de Med. et de Chir. Tom.ix,p.577.

5.Caecum.

(b) Camper found the Caecum in an Inguinal Hernia of the left side. Demonstr.Anat. Pathol. part ii.,p. 17.

6.Ovaries.

(c) In Potts works,vol.ii,p. 329,there is recorded a case of double Inguinal Hernia in which each sac contained an ovary. Sir Astley Cooper placed in the museum of Guy's Hospital a specimen of an External Inguinal rupture containing the Ovary and Fallopian Tube. A.K.Hesselbach saw a case in which the Ovary Fallopian Tube and broad ligament were drawn into such a rupture so as to constitute part of the sac.

7.Uterus.

(d) Chopart and Desault record a case where the contents were Uterus and left Ovary,and,M.Leroux describes one,where the contents were Uterus,Fallopian Tubes,Ovaries,and part of the Vagina. In a case described by Scanzoni,the gravid Uterus and Ovaries were enclosed in the sac of an Inguinal Hernia.

8.Appendix.

(e) The Appendix was found in one of my own cases-see Table v. case 98.

9.Fluid.

Fluid. In every Hernial sac there is a certain quantity of fluid,which fluid is secreted by,and lubricates the interior of the sac. It is usually small in quantity,but in some instances as where the Hernia is inflamed or strangulated,the amount may be considerable.

10. Cysts. In some instances a sort of Cyst exists within the sac. The Cyst is formed by the omentum contracting adhesions to its upper part, leaving a space below in which the fluid collects. This rare condition is called Hydrocele of the Hernial sac.
11. Ascites. Accumulation of Ascitic fluid in the sac. This may occur when the Hernia is complicated by Ascites.
12. Hydrocele. Accumulation of fluid in a Hernial sac which has become obliterated at its neck, is occasionally met with. Erichsen quotes a case in which he operated and found the old Hernial sac distended by clear, serous fluid; but without solid contents.

(C) The RELATIONS.

1. The aperture through which the Hernia protrudes generally assumes a circular shape. It becomes thickened and rounded at the edge and considerably enlarged. In the Hernia we are particularly considering, it becomes displaced in old standing cases, dragged down, towards the middle line.
2. The subserous areolar tissue always becomes thickened and frequently indurated, forming a dense investment to the sac.
3. The superficial structures, e.g., skin and fascia, are much elongated and stretched, often tense, but frequently hanging in folds. They are usually thinned, but should a truss be worn, they may be thickened by pressure of the pad.
4. The muscles in the immediate neighbourhood of the Hernia may be thinned and atrophied.
5. The normal contents of the canal i.e. veins and spermatic cord, may be varicose, or atrophied, respectively.
6. The testicle by interference with the spermatic cord, or direct pressure, may be inflamed, tender, or atrophied.

VARIETIES

The varieties of Oblique Inguinal Hernia, may be classified as follows:-

i. According to the nature of the contents of the sac.

- (a) Enterocoele.
- (b) Epiplocele.
- (c) Entero-Epiplocele.

ii. According to the mobility of the tumour:-

- (a) Reducible.
- (b) Irreducible.
- (c) Incarcerated or Obstructed- where there is irreducibility plus symptoms of Intestinal obstruction.
- (d) Strangulated- where there is irreducibility plus incarceration plus complete obstruction of the bowel plus interference with the circulation, and therefore the vitality of the bowel affected.

iii. According to the relations existing between the organ and its covering or sac:-

- (a) Acquired- in which a process of peritoneum is pushed before the viscus.
- (b) Congenital- Here the testicle has descended, but the canal or Processus Vaginalis Testis remains patent in its whole length. The bowel therefore lies directly against the testicle.
- (c) Funicular. In this case the Processus Vaginalis Testis

has become closed in proximity to the testicle, but otherwise remains open, so that the Hernia does not come into contact with the testicle.

- (d) Encysted Hernia. In this case the canal has closed at its upper extremity. The Tunica Vaginalis extends from this point to the testicle. A Hernia of this variety has its covering of peritoneum and, pushing the enclosed end of Tunica Vaginalis before it, invaginates it as it descends.
- (e) Infantile. The anatomical condition is the same as in the encysted variety, but the hernial sac descends behind the Tunica Vaginalis.

iv. According to the relation of the tumour to the External Abdominal Ring:-

- (a) Complete-when it passes through the External Abdominal Ring.
- (b) Incomplete-where it occupies a position on the proximal side of the ring.

It is the Complete Reducible Oblique Inguinal Hernia, which more intimately concerns the purpose of this paper.

CAUSATION

- i. Predisposing.
- ii. Exciting.

i. Predisposing.

- 1. Sex. Men are more liable to Hernia than women in the proportion of four or five to one. (Erichsen). Especially is this so in the case of Inguinal Herniae where the proportion of males to females is eleven to one. (Lawrence). Lawrence took his stat:

istics from the records of the City of London Truss Society for the years 1860-67. Berger, quoted by Dr. Georg Suttan, states that ninety six per cent of all male individuals who have single or multiple Herniae are afflicted with the Inguinal variety. In females the percentage is 44.3. M. Cloquet, quoted by Lawrence, found, out of 289 cases-male 247; female, 42-or, practically, 9 to 1. Wharton and Curtis give the proportion as 6 to 1, and state that Inguinal Hernia is twelve times more common than Femoral. Lucas Championniere stated at the Moscow Congress that, out of 556 Inguinal Herniae all, save 49, were male patients-roughly, 11 to 1. M'Creedy, quoted by B. J. A. Moynihan in the Encyclopaedia Medica, 1900, vol. iv, says that in all male Herniae the percentage of Inguinal is 83.5, in all female Herniae the percentage of Inguinal is 8.5. Dr. Robert Kennedy, Glasgow-in a paper to the British Medical Journal, Oct., 1st. 1904-found that in 103 cases 96 were males and 7 females, or 13 to 1. In 200 cases operated on by Dr. Knox in the Glasgow Royal Infirmary 162 were males, 38 females, or about 5 to 1. Lastly, in my own series of cases, of 97 patients 91 were male, 6 female, or 15 to 1.

2. Age.

Age exercises a material influence upon the frequency of Hernia. It is common in very young children owing to congenital defects either acting directly, e.g. patent Processus Vaginalis or indirectly as phimosis. The frequency decreases after the first year till the age of thirteen is reached. After this the frequency rises, and increases progressively till the close of life. Malgaigne. It is to be remembered that in the aged the tissues are lax and that fat is often absorbed. On the

other hand the aged are less subject to strain or violent muscular effort.

3. Heredity. The tendency to Hernia is often hereditary. Congenital Herniae are common in the children of parents afflicted with this disease. According to MacCready ruptures in the grandparents are of more importance than those in the parents.
4. Race. With the exception of Ventral Hernia, all Herniae are more frequent in white races.
5. Occupation. Occupations causing straining, or violent muscular exertion predispose to Hernia, as mining, carting, labouring &c. It is probable that occupation is largely responsible for the disproportion in the frequency, noted under sex. In many classes of workmen a tight belt is worn, and this, constricting the abdomen about the centre, throws the pressure of the abdominal contents on the lower part of the abdomen, and so predisposes to rupture. Hernia is also common in men subject to much jolting e.g. cavalry men and railway drivers. Inhabitants of mountainous countries show a predisposition to this disease. Thus in Switzerland the frequency has been noted long ago. Blumenbach found cases of Hernia particularly numerous in a district of Apenzelle, and ascribes this prevalence to the practice of violent gymnastic exercise by young lads (Lawrence).
6. Position assumed in defaecation, according to Erichsen, is a probable predisposing cause.
7. Constipation. Chronic constipation with consequent straining at stool.
8. Emaciation. Rapid emaciation from disease is frequently followed by rupture.
9. Pregnancy. In pregnancy we find stretching of the muscles with subsequent

atrophy. The strain of labour, or strain from other cause may therefore in the female induce a protrusion. In one of my cases the patient was six months pregnant. When she was lifting a weight from the floor the Hernia first made its appearance. In another case the patient developed an Inguinal Hernia in the course of her first pregnancy. After labour was completed the Hernia disappeared and did not return until the patient was pregnant the second time. The patient is now pregnant for the fifth time and it is only during pregnancy that she has this Hernia. In the intervals there is no rupture whatever.

10. Phimosiis. Phimosiis with consequent straining at micturition is a frequent predisposing cause in young children. Here the Hernia may be congenital, but, very frequently, I think it is acquired.

11. Phthisiis. Phthisiis Pulmonalis and allied chest diseases. Consumption here plays a double role in the causation. The constant coughing, and the emaciation produced, predispose to rupture. Again in the aged Chronic Bronchitis and Emphysema play a not unimportant part in the causation.

12. Mesentery. An abnormally long mesentery is sometimes found in cases of Hernia. It is a disputed point, however, whether this is the cause or the effect of the Hernia.

13. Testicle. Retention, malposition, or delay in the descent of the testicle favours the production of Hernia.

14. Defects. Congenital defects as patent Processus Vaginalis invite to a rupture.

15. Clothing. Tight clothing, and tight lacing, by constricting the abdomen, impel the viscera downwards and thereby raise the intra abdominal pressure against the inguinal rings.

16. Lipoma.



Subperitoneal Lipoma at the inguinal ring, by growing outwards, makes traction on the peritoneum, and, forming thereby a pouch, predisposes to the formation of a Hernia. These pouches may exist without Hernia and the efficiency of the cause is doubtful. (Wharton and Curtis).

- a. *Hernial sac.*
- b. *Spermatic cord.*
- c. *Subperitoneal Lipoma.*

17. Rings. The size of the abdominal rings and patency of the Inguinal canals, do not seem to specially predispose to rupture. Some men are born with large external rings and patulous canals, yet they are not necessarily the subjects of Hernia. For the past four years I have carefully watched three patients in whom these conditions obtain. One, formerly a miner, now a colliery manager was seen in consultation by Sir Hector Cameron. The other two are miners. These three men are all subject to strain and violent muscular effort every day of their lives, yet, so far, there is no evidence of rupture.

18. Side. This complaint is most frequent on the right side, on account no doubt, of the employment of that side in those offices of

life which require most powerful exertion.

In 360 cases of children operated on by Dr. Harold J. Stiles of Edinburgh, in males the right side was affected in 3 out of every 4. In females the right side was affected in 2 out of every 3 cases. In his paper, in the British Medical Journal, Dr. Stiles is of opinion that the preponderance of right sided cases in boys is accounted for by the late closure of the Processus Vaginalis on that side. Zinkerhandl examined the bodies of 100 infants up to three months old, and found the Processus Vaginalis patent on both sides 20 times, on the right side 12 times, and on the left side 5 times. The preponderance of the patent Processus Vaginalis on the right side is due to the later descent of the testicle there. The preponderance in girls for the right side is more difficult to explain. In Dr. Robert Kennedy's 103 cases—the Hernia was on the right side 60 times, on the left 29 times, and on both sides 7 times. In Dr. Knox's series of cases (200) the right side was affected in 159—the left in 33—and there were 8 on both sides. In the 97 patients whose record I have the Hernia was on the right side 65 times, on the left 24 times, and there were 8 double. Without attempting to decide what is the true reason, it may be safely asserted that particular subjects manifest an unquestionable disposition to this complaint.

EXCITING CAUSES.

Sudden increase of intra abdominal pressure from whatever cause cough or muscular exertion is the exciting cause. It is to be remembered that one cough or one exposure to violent muscular

exertion will not necessarily produce a Hernia. It only does so, in presence of one or other of the predisposing causes already mentioned.

Symptoms.

Swelling. The patient complains of a swelling or lump in his groin. He may, or may not, have local pain. In the more recent Herniae pain is more frequently complained of. In the majority of cases the patient complains only of discomfort. There may be a feeling of weakness. There is a tendency to constipation. In some cases, and I have come across several, the patient consults his medical attendant about abdominal pains. The pains are generally described as dull and aching; at times they are shooting in character, but they may be continuous and constantly present. The site is across the abdomen on a level with or below the Umbilicus. It is only on examination that a hernial protrusion is noticed. The patient may, or may not, know of his hernia. If he knows of it, he does not connect it with his pain, and may never make mention of his rupture to the doctor. A truss, or the radical cure, however, removes the pain.

SIGNS



Left. Scrotal. Hernia.

A swelling is present in the Inguinal region and may descend to the Scrotum. The swelling may appear only on standing, disappearing again when the recumbent position is assumed. The tumour, on palpation, is soft and compressible when bowel is the content of the sac. When omentum is present the swelling is firmer and

doughy to the touch.

Impulse on Coughing.

a. When the Hernia is reduced. Pass the finger into the Inguinal canal and to the internal abdominal ring if possible.

Direct the patient to cough. A distinct impulse and a tumour will be felt if Hernia exist.

b. When the Hernia is down. Grasp the tumour with the hand and direct the patient to cough. A distinct expansile distention of the swelling will be felt. Now, direct the patient to lie down. The Hernia may reduce itself. If not, grasp the tumour lightly with the hand and make gentle pressure in line of the Inguinal canal when the Hernia will slip back into the abdomen. The reduction in both cases is accompanied by a gurgling noise. Percussion over the tumour gives a dull note if the sac contain omentum or if the bowel be loaded. Should the bowel be distended by flatus, a resonant note is obtained.

Translucency of the swelling in cases of Hernia is only obtained in very young children and in them infrequently. A reduced Hernia, if of moderate size, is easily kept within the abdomen by digital pressure on the external abdominal ring. On allowing the Hernia to protrude, the swelling begins at the external ring and gradually extends downwards.

DIAGNOSIS.

The Diagnosis of Oblique Reducible Inguinal Hernia is generally easy. It may, however, be otherwise. There are several conditions with which it is sometimes confounded. For example - Enlarged lymphatic glands. A Lipoma situated over the Inguinal

ring. Hydrocele of the Tunica Vaginalis or cord, Hydrocele of an old hernial sac. In the female cysts of the Vulvo Vaginal glands.

Tumours.

Tumours generally. These are not reducible. There is no im:pulse on coughing. They are firm to the touch and feel heavy. There is no resonance on percussion. There may be considerable pain, and frequently, the patient gives the history that the swelling was first noticed in the lower part of the scrotum.

Hydrocele and Cystic Tumours.

These may or may not be reducible. When irreducible the symptoms are as just given above. In ad:dition translucency is generally to be obtained. Fluctuation can usually be made out. The percussion note is absolutely flat, a peculiar flatness obtained only over fluid, and easily recog:nised by experience. It is when the Hydrocele is reducible that a difficulty in diagnosis arises. On inspection a Hydro:cele appears to be a swelling distinct from the abdominal wall, whereas a Hernial protrusion appears to be continuous with it-see Fig^s,



Double. Hydrocele.



*Commencing Left
Hernia.*



Double. Hernia.

The Hydrocele on being reduced empties itself slowly into the abdominal cavity. The reduction is unaccompanied by gurgling. On the patient assuming the erect posture a Hernia can be retained in the abdomen by pressure of the finger on the inguinal ring. It is difficult to do this in Hydrocele because the fluid readily slips through under the finger. On being allowed to return a Hernia generally descends quickly, a Hydrocele slowly, the swelling in the case of Hydrocele being noted as beginning at the bottom of the scrotum. The history corroborates this sign. Hydrocele, unless after certain forms of treatment, is almost invariably translucent. A Hernia is very rarely so, and then, only in young children. Lastly, Reducible Hernia is common, Reducible Hydrocele uncommon.

Hydrocele of a Hernial sac is irreducible. It may be translucent. In cases of ~~doubt~~ of doubt, exploratory puncture secures the diagnosis.

Varicocele. The swelling of Varicocele may be reduced by pressure but without any distinct sense of slipping back. There is no gurgling. On assuming the recumbent posture, the swelling becomes reduced but very slowly. It is not easily kept reduced by pressure of the finger on the ring, when the patient stands. To the touch the tumour has the characteristic sensation of a bag of worms. No fluctuation is present. In certain cases there may be an impulse on coughing, but the response is not so characteristic as in Hernia. It is more of a thrill. The patient states that the swelling was first noticed in the scrotum. Varicocele is much more common on the left than on the right side.

Undescended Testicle may be recognised by the absence of that organ from the scrotum, and by the peculiar subjective sensation produced by pressure on the glands. One is able to grasp the organ, and therefore the whole swelling, between the finger and thumb. I saw a case recently in which both testicles were absent from the scrotum. They were found in the canal, but could be made to occupy any position between that and their normal position in the scrotum. Notwithstanding the simplicity of the diagnosis here, mistakes do arise. I was called several years ago to see a boy who was in great pain. He had been under the care of another medical man who was treating the boy for Hernia and had ordered and applied a truss. I found the boy suffering acutely from the pressure of the truss on an exquisitely tender undescended testicle.

TREATMENT

The treatment of this condition has, since the earliest years, occupied the minds of Surgeons. As already stated, Hernia is a common complaint, and its treatment today is therefore a subject of considerable interest, alike to the patient, to the general practitioner, and to the surgeon.

Treatment may be divided into two classes:

A. Palliative. B. Radical or Operative.

Palliative. Palliative treatment consists in the application of a truss or other appliance to the Inguinal region. Its aims are—
1. To keep the bowel within the abdomen

2. To prevent the Hernia from increasing in size.
3. By both the above aims combined, to minimise the danger of strangulation.

For the sake of simplicity I have in this paper included Circumcision as a palliative agent.

A truss, to be of service, must (1) fit accurately and well; (2) have a good spring of steel; (3) have a good pad, mounted on a universal joint, so that pressure may be brought to bear evenly on the inguinal canal no matter in what position the body may be. The varieties of trusses as regards shape and composition are endless. Historically, the knowledge of the application of the truss dates back to the time of Celsus, who employed a soft strap provided with a plate, and in this manner frequently succeeded in curing Hernia in boys. For a long time plates were employed which were fastened over the hernial orifice by a strongly adherent plaster. Gordon (1305) seems to have been the first to mention a spring truss, but this suggestion was very soon forgotten, and it was not until 1785 that the truss, practically as it is still in use at the present day, was rediscovered and introduced by the Dutch physician, Peter Camper. (Sultan). To get a truss to suit the patient is sometimes a matter of difficulty. I find that the best way is to measure the patient carefully, then send this measurement with details regarding the variety of the Hernia, its size, the side affected and the like to a reliable instrument maker.

The Hernia being reduced apply the truss to the patient and see that it fits well. A badly fitting instrument is worse than useless. Having satisfied oneself that the instrument is correct, one must then instruct the patient not to leave the truss off on any account whatever unless while at rest in bed. A vulcanite truss can be obtained for use in the bath. The patient is then directed to avoid heavy lifts, or severe muscular exertion, and to keep his bowels acting regularly and freely. Experience teaches that, given a young patient, this continual wearing of a truss becomes irksome, and in the course of time fails in its three aims—namely, more, the continued pressure of the pad would seem to increase the patency of the canal by causing more or less atrophy of its walls. Palliative treatment, then, may be said, for the most part, to fail in its aims. In Radical treatment the aim is to cure, and the result is usually successful. As a matter of fact both systems of treatment are necessary. There are certain cases in which the Palliative treatment brings about the desired result, and there are cases in which operative treatment is out of the question. In the majority, the vast majority of cases, Radical treatment is the only one of any use. It is this line of treatment which most patients should be advised to adopt. In short, granted there are no contra indications, I am convinced, and I think most medical men will agree in this, that operative interference is not only justifiable, but imperatively called for in this disease. Having the two lines of treatment before us what are the indications for their respective adoptions?

Palliative treatment should only be adopted when Radical treatment is (a) not called for; or (b) contraindicated.

(a) Not called for.

In young children, the subjects of Hernia, it has been found by experience that in some cases the application of a well fitting truss secures through time the permanent retention of the bowel within the abdomen. Further, as was pointed out under causation, Phimosi is a very prolific cause of Hernia in boys. It is an old established law in medicine, that the first thing to do in the treatment of a disease is to remove the cause. In the cases now under consideration circumcision may be all that is necessary. By this operation the cause is removed, and it is striking in what a number of cases this alone effects a permanent cure. Should this not prove sufficient the two treatments may be combined—first, Circumcision; then the application of a truss. I place them in this order because 1. Circumcision may do all that is required; and 2. in very young children there is great difficulty in keeping a truss properly adjusted. In older children one must be guided by circumstances whether one or both lines of treatment may be required. Such method of treatment is only of service if the Hernia is small. In the case of a young boy where Hernia and Phimosi coexist the sooner circumcision is performed the better. I have performed this operation on a child four days old. In this case there was a Hernial protrusion together with a considerable degree of Phimosi. Circumcision relieved matters completely and at once. There has been no return of the Hernia and the boy is now six years

oid. When a truss has to be worn I find that the instrument best suited for the purpose in children is one which has a pneumatic pad and the spring covered with rubber. This instrument though initially more costly than an ordinary one-pays in the end. It lasts longer and can be thoroughly cleaned. It is well then in young children with a small Hernia to adopt for a time Palliative treatment, because, such line of treatment in a goodly number of cases is curative. In the following twenty cases this treatment was carried out viz. First, Circumcision. Then, where necessary, the application of a truss. So far as my experience goes, the earlier the Hernia makes its appearance and thereafter the sooner treatment is adopted, the greater is the likelihood of a permanent satisfactory result.

TABLE i.

1. M.E. aet. 6months.	Circumcision.
2. A.D. -- 2 yrs.	--do.-- & Truss.
3. J.M'K. -1 yr.	----do.---- ----do.----
4. T. W. - 4 months	----do---- ----do----
5. J.F. -- 10 weeks	----do.-----.
6. W.B. - 4days	----do.-----.
7. A.M. --6 weeks	----do.-----.
8. W.B. -- 8 months	-----do.-----.
9 H.R. --2 weeks	-----do%-----%
10. R.T. --5 months	-----do.-----& Truss.
11. D.M. --16 months	----do.-----do.----
12. H.C. --8 weeks	-----do.-----.

13. D.S. aet. 20 months Circumcision & Truss.
14. W.S. -- 30 months -----do.---- --do.---
15. W.W. -- 3 weeks -----do_---- .
16. H.C. -- 7 months -----do----- .
17. rR.S. -- 10 days ----- do----- .
18. S.M. -- 9 months -----do----- ---do---
19. T.C. -- 3 months -----do----- .
20. M.M. -- 10 months -----do.---- ---do-- .

Of the twenty cases, Circumcision alone was found to be sufficient in eleven. Circumcision and Truss were sufficient in eight. In only one case out of the twenty was Radical operation called for. This case is given in detail later on. Should the Hernia be large, or should the procedure above mentioned fail, then the Radical treatment ought to be resorted to. The question naturally rises—what is the earliest stage at which the Radical operation may be performed. Formerly it was thought advisable to wait until the child was sufficiently old to keep its dressings unsoiled. It was then thought that aseptic results could not be obtained in very young children. Now, where the Hernia is small, and a well fitting truss keeps the protrusion in its place and prevents its increase in size, it may be well to wait till the child reaches the age of five or six. At the same time if the Hernia is large and in spite of trusses increases in size then the sooner the operation is performed the better. Thus M.M., aged 10 months—see no. 20 of previous list—was brought to me suffering from a Right Reducible Oblique Inguinal Hernia. When I first saw the child the Hernia was as large as an orange.

Phimosis was present, and Circumcision was practised two days after I first saw the child. A truss was ordered and fitted well. The condition, however, became rapidly worse until at the age of twelve months the Hernia was almost double the size it was when I had first seen it. The patient lived far from my surgery, and I had not seen him in the interval. I advised Operative interference. The Radical operation, Macewen's method, was performed in this instance by Dr. Dalziel in the Royal Hospital for Sick Children, Glasgow, with excellent results. It is now two years since the operation and there has been no return. This case is of interest because the Hernia was of considerable size when advice was first taken. It is a fair question—Would not Circumcision and a well fitting truss, if applied at an earlier stage, have cured this case? I think so. The age limit, therefore, in children for the Radical cure is only a secondary consideration. The main thing to attend to is the Hernia itself. If it increases in size in spite of palliative treatment, then operate at once. An interesting paper on the Radical operation in children was read by Dr. Stiles of Edinburgh at the Cheltenham meeting of the British Medical Association. He there spoke from the experience of 100 cases. (Brit. Med. Journal, 7, Sept. '01). To the same Journal, 1, Oct., '04, he contributes a paper, writing from the experience gained in 360 cases. The operation Dr. Stiles prefers is practically the operation introduced by Mitchell Banks. Further, he says—"It must be remembered that the walls of the Inguinal canal are not primarily at fault, that, as a rule, they are well developed, and should

should therefore be interfered with as little as possible. Bassinis' operation is to be condemned as a routine operation in children." The methods of dressing employed by Dr. Stiles are - in very young children, dust the wound over with boracic powder and leave it exposed. On its return to bed the infant is kept flat on its back by means of a strap passed behind the shoulders and through the armholes of a flannel band passing across the front of the chest. The ends of the strap are carried under the frame of the bed, where they are tied. A small draw sheet is folded into four layers and placed under the pelvis to receive the faeces. The legs are extended and abducted and fixed in that position. Over the child's body a metal cage is placed, at the lower end of which is hung a flannelette sheet. This receives the whole of the stream during micturition. The sutures are removed from the third to the sixth or seventh day and the child sent home in eight or nine days after the operation. In older children, say from three to five years of age, he still uses no dressings but applies a double long splint to keep the parts at rest. In still older children, say from five upwards, he applies an ordinary gauze dressing, fixes it with a bandage, and prevents any contamination by urine by fixing the penis in the neck of a urine glass by means of a plug of wool. It may be remarked in passing that, fixing the child to his bed in this way may do very well in hospital practice, in private practice it would never be allowed. In 300 of Dr. Stiles' cases the type of sac was noted. In only five per cent did it communicate with the Tunica Vaginalis Testis. It follows there:

fore that the sac resembles that of acquired Hernia in the adult. Of the 360 cases 4.2 were strangulated, the others reducible. Recurrences were four in number. Two were strangulated Herniae in which the structures at the neck of the sac required free division and the bowel could be returned. Both have since been cured by a second operation. The third return was in a child with Epispadias, and in whom there was separation of the pubes and imperfect development of the muscles of the abdominal wall. The fourth was a delicate infant aged five months who developed a bubonocoele six months after the operation. At the time of operation this patient suffered from Phimosi but his mother would not allow circumcision. On circumcision being performed six months after the operation the bubonocoele disappeared. What stronger proof could I want than this case for the rule I have already laid down: First, circumcise? Of deaths Dr. Stiles records five or a mortality of 1.4 per cent. One occurred in a child delicate from birth. Two were the result of damage to the bowel caused by taxis. In the fifth the wound suppurated and the child died from exhaustion. Dr. Stiles is to be congratulated on the result in his cases, both as regards returns and the mortality. He concludes by saying that the age at which an operation may be undertaken depends on the special circumstances of each case. In his series of cases 26 per cent were operated on under twelve months.

B. Contraindications to the Radical Treatment.

1. Age. As under A., age plays an important part in the contraindications to Radical treatment. Here, however, the age limit is at

the other end of life. How old must a man be when we decide not to operate? No fixed limit can be laid down as regards years, for some men are old at forty, older than others at seventy or even eighty. It is therefore necessary to decide the question for each case on the condition of each patient. It is also necessary to bear in mind the question: Is this operation of necessity or of choice? Generally speaking, evidences of senile decay, atheromatous arteries and the like are evidences which ought to make practitioners consider carefully before advising operative interference. This is so not only because of the senile decay, but because of disease incident to this decay.

2. Disease in old age. In old age we are confronted with Chronic Bronchitis and Emphysema, aided and abetted by weak heart and feeble circulation. In an operation which carries with it the confinement of a man to his back for several weeks these diseases form a very strong contraindication; for, given a weak heart, a tendency to Bronchitis, in a patient who is confined to bed for some weeks, passive Congestion of the lungs, acute or subacute Bronchitis is all but a natural sequela. Statistics of the Radical cure for Strangulated Hernia, prove what a scourge these diseases are.

3. Diseases other than those incident to Old Age. Generally speaking, the presence of disease which will in all likelihood terminate fatally and that at no distant date, precludes the idea of operating. Thus, Bright's disease and Phthisis Pulmonalis. Each of these diseases precludes operation for two reasons. Bright's

disease, if extensive or old standing, is sure to terminate fatally. Then again, as a result of Bright's disease, tissue changes have taken place. The vitality of the tissues is impaired; healing is delayed and there is increased liability to invasion by septic organisms. In Phthisis Pulmonalis the prognosis is bad. In this disease, cough, and very distressing cough, is a prominent symptom. Such cough produces increased intra-abdominal pressure. This pressure, frequently brought to bear on a newly stitched wound or on recent adhesions, cannot mean anything but disaster.

4. Habit.

The chronic alcoholic, a bad subject for any operation, is especially so for the Radical cure. As in Bright's disease the tissues are far from their normal state. The question of operation in these cases has therefore to be considered most carefully. In the same way abnormally fat people are bad subjects for this operation. Again, in the diseases just mentioned as in the alcoholic, the administration of chloroform is not without serious risk. The administration of the anaesthetic to my mind marries with it the greatest risk of all in this operation.

5. Acute Disease. The inadvisability of operating in the presence of acute disease need only be mentioned.

6. Size.

Lastly, large, old standing Herniae are not suitable for operation, because:-

- (a) The bowel and its intimate relations have accustomed themselves to their new situation.
- (b) The abdominal opening is large and difficult to close.
- (c) To reduce the Hernia completely is a matter of consider

able difficulty. The already large abdominal opening may have to be increased in size.

(d) Considerable manipulation of the bowel may be required to reduce it and such manipulation, if the quantity of bowel protruded is considerable, causes profound shock-so that ultimate recovery is doubtful. I have seen a Glasgow Surgeon take nearly three hours to reduce a large Hernia which had become strangulated. The shock to the patient, already suffering from the shock consequent on the strangulation, was too great, and he died a few hours after the operation.

(e) Such large Herniae generally occur in those advanced in years.

In such cases I fear Palliative treatment is the only one to be adopted.

B. RADICAL or OPERATIVE.

With the exceptions already mentioned and perhaps a few others which may crop up in individual cases-given a case of Oblique Reducible Inguinal Hernia-the treatment undoubtedly to advise is Operative. Now, why should I, why should my fellow practitioners be so confident in recommending Operation as the treatment?

(1) This treatment carries with it little risk. In Saunders Atlas of abdominal Hernias, by Dr. Georg Sultan, Gottingen, Prussia and edited by William B. Coley-the mortality in 5419 cases collected and operated on by different methods was .5 per cent. Lucas Championniere, already quoted, collected 8594 cases with

78 deaths, or a mortality of under 1%. Sir William Macewen records 65 cases without a death. Stiles gives the mortality thus. In his first 100 cases 3%. In his 360 cases, 1.4%. In Dr. Kennedy's 103 cases, one case died several weeks after the operation of Tubercular Meningitis—therefore, though returning his mortality at 1%, it should, so far as this operation is concerned, really be no per cent. In Dr. Knox's cases the death rate was 1%—while in my own cases the figure is similar, one death having occurred in the case of a child five years old. This child developed Pneumonia three weeks after the operation. The wound was perfectly healed, so that, but for this accidental Pneumonia, the record would have been no per cent. Mr. Robert Campbell, quoted by Stiles, gives, in the Lancet, 9 Jan., '04, a record of 114 consecutive cases without a death. The mortality therefore connected with this operation is insignificant.

(ii) It relieves the patient from the great danger of strangulation.

(iii) It effects for the most part a permanent cure. That there are returns after Radical cure is not to be denied for a moment, yet, after the operation, to be described later, the returned Hernia was much smaller than the original. In one of the cases a second operation put matters right. In the other, the patient preferred to wear an instrument. These two are all the returns I have been able to trace, a recurrence therefore of 2%. Sir William Macewen tabulates 65 cases without return—i.e. 0%. The recurrences given by other operators vary from 1.4% to 11%. Taking the largest return, 11%, even this result is satisfactory

* Section 221. of the code of Hammurabi, discovered by Sanel
Explorers, Dec. 1901. Jan'y 1902. and dated B.C. 2285-
2242. - has a reference to rupture. It states the fee
to be given to the doctor if he cures the disease.

and should encourage practitioners to recommend operative treatment. Sir William Macewen's example is worth following. He operates where possible on every case of Hernia. Let the patient's complaint be something else, if there be a Hernia present Sir William operates on it before the patient leaves the hospital, unless there is some very strong contraindication. Operation then being decided on we have now to face another difficulty and it is what operation is best suited to our case? This difficulty is the more pronounced the further the practitioner is resident from our hospitals. In the city, the question which faces the practitioner is, under what surgeon shall I place my patient? In the country, very frequently, the question to be answered is—What operation shall I perform? This question of treatment was forcibly brought to my mind because I was placed in such a position. The history of the Radical cure is interesting and I shall give a brief sketch of it in the first place, and then select the operation which seems to me to be best suited for the general practitioner to perform.

HISTORY. *

Celsus.

The earliest mention I can find occurs in the writings of Celsus. In the time of Celsus, A.D. 10-30, this affection was recognised and treated surgically, but it was only when the Hernia was reducible that "cure" was attempted. Then indeed the serious complication of strangulation, was taken as a sign that treatment was of no avail. Celsus describes the operation in the following manner. "Cure is brought about in this way. The

Ligature &
Cautery or
Caustic.

patient is made to hold his breath till the indecent tumour is prominent, when, the base of the tumour is marked off by ink. The patient is next placed in the supine position and the swelling reduced. Then a needle with a double thread is introduced at the base of the swelling and the thread tied on both sides. The ^{real} ~~disproportion~~ of the part ligatured is cauterised by medicines or by the actual cautery. The resulting wound is treated by lint."

Incision.

A simpler method is also recorded by Celsus in which the surgeon made a simple incision, exposing the parts, and treated the wound by lint or ointment, allowing it to granulate and thus to effect a cure. The testicle was preserved. This method indeed was advocated by a Glasgow surgeon within the last quarter of a century. This method by incision apparently failed, for we find that, at a later date, the surgeon had recourse to caustic or cautery, as did Celsus, but he went one step further and advised that the cauterisation should be carried to the bone.

Cautery.

Much diversity, says Lawrence, seems to have arisen as to the shape of the cautery. All were agreed, however, that the cauterisation should be carried to the bone. Here again the extent of the swelling was marked off by ink and the cautery applied and carried to the bone, either by one fell swoop or by successive applications. After the operation the patient was placed in bed. His diet was simple to a degree and a bandage had to be worn lest the Hernia should return. A still further use of the cautery was made by some. They exposed the Hernia, then, drawing it aside, cauterised the ring or even laid open the sac and touched the inside of it with the cautery. The treatment by

Caustic.

actual cautery was also a failure and was succeeded by the cure by caustic. This, though already mentioned as a cure, seems to have outlived that by the cautery. In it caustic was applied to the skin over the external abdominal ring to produce an eschar of the size of half a crown. The caustic was repeatedly applied till the Hernial sac was reached and as much of this destroyed as possible, without injuring the spermatic cord or vessels. Some went still further and applied strong escharotics to the inside of the sac. Lawrence says that the last to employ this treatment were Messrs. Gauthier and Maget, 1774. They used sulphuric acid, and applied it till the Hernial sac was destroyed. The resulting wound was treated as an ulcer. In three cases in which this treatment was carried out the result, which has been very neatly stated, was: one died; one suffered a relapse and one escaped with a swelling of the spermatic cord. It is interesting to note that as late as 1897 Lannelogue, in the Rev. de Ther. Med. Chirug., Aug., 1, 1897, reports a series of 51 operations for Hernia undertaken by the injection of a solution of chloride of Zinc into and around the Inguinal Canal. He claims to have cured all but two. None of the results were of longer duration than of one year. It was found that the testicle after any of the foregoing operations sloughed, and Galen and Scultetus removed that organ as a part of the operation. The aim in all these methods was to set up an adhesive inflammation causing a large firm cicatrix, and thereby to retain the bowels within the abdomen. They succeeded admirably in their efforts to excite inflammation, and in such patients as outlived the suppuration there would

undoubtedly be a large cicatrix, but, the retention of the bowel did not follow. The results from the first method i.e. ligature were so bad that the second method i.e. incision was tried. This was succeeded by the caustic cure but, all failing, operative interference was entirely given up by surgeons. In the beginning of last century Palliative measures were alone employed. This is proved by the writings of Scarpa and others.

Scarpa says "the treatment of Hernia lies in the application of a well-fitting truss. No operation should be performed unless under special circumstances where such a procedure would allow a truss to retain the bowel." So small a part does operation play in the treatment of Hernia in Scarpa's estimation that he relegates the description of it to the appendix of his book.

Chelius gives his opinion as follows. "The radical cure for reducible inguinal ruptures (especially inguinal ruptures) was attempted in ancient times in very different and in part cruel and barbarous ways, which had only the corresponding excuse in the ignorance of or bad construction of trusses."

While surgeons had given up operation as a treatment of Hernia and relied solely on trusses to cure the malady, quacks continued to practise excision of the testicle as a remedy. This was carried out on the continent more especially, perhaps, in Italy. To such an extent did this quackery go, and so much damage was being done, that the attention of the authorities was at length called to the state of affairs. It was felt that there was need of a radical cure and a competition was organised in order to provide a suitable operation. As a result a surgeon devised an operation which he dubbed the Royal Stitch because, by saving

Royal Stitch. the testicle, it gave subjects to the king.

The operation consisted in laying open the sac, stitching the edges together and allowing the wound to heal by granulation. Lord Lister reported in 1871 unsatisfactory results from two cases in which he had performed this, or at least a similar, operation. The operation of the Royal Stitch was followed by one

devised by Langenbeck in 1796. This surgeon cut down on the Hernial sac, separated it from the cord, and passed a ligature round the sac alone, allowing the fundus to adhere or slough as the case might be. Schmucker of Berlin performed a similar operation, the only difference being that, after ligature of the sac, he cut away the fundus. A still later operation, known as

the Punctum Aureum, is described by Pare'. In it a golden or leaden wire was passed behind the sac and spermatic cord. It was then tied or twisted so tightly as to close the Hernial opening but not to interfere with the circulation in the cord or testicle. One can well imagine that the precise amount of twisting necessary, would be difficult to estimate, and in consequence, interference with the circulation in the testicle would frequently accrue. This, according to the surgeons themselves, often occurred. As the mortality was high and these complications serious, the operation was discarded. At its best indeed all that this method could do was to convert the Hernia into a bubonocoele. From all these methods very unsatisfactory results were obtained and apparently operative interference was again departed from; recourse being had to trusses. As this was the only treatment for a time much latitude was given for surgeons

to devise new and improved instruments. They evidently made good use of their time for the number and variety of trusses is endless. We have them with strong springs, weak springs, large pads, small pads, circular pads, oval pads, or pads of a horse shoe pattern, conical pads or flat pads, soft pads, hard pads, pads containing various medicinal substances, contracting herbs or certain caustics.

Richter.

Richter originally recommended the plan of producing a radical cure by the application of a strong tight truss with a hard pad of wood. He hoped by this means to excite an inflammation and thereby close the inguinal ring. It certainly excited inflammation but that condition was more frequently observed in the testicle than in the canal. The result was rendered still more unsatisfactory by the fact that the conical pad, constantly pressing against the pillars of the external abdominal ring, had the effect of widening the aperture, and making matters worse than at first. Interest in the Radical cure again revived. Trusses were all very good so far as they went but no cure was effected by them.

Jamieson.

In 1828, Jamieson devised the following operation, which, originally intended for the relief of Femoral Hernia, was afterwards applied to the Inguinal variety. He incised the structures down to the ring, then cut a small flap, lancet shape, from the skin, having the narrow end in connection with the skin of the abdominal wall. He then placed the larger end into the Inguinal Canal and closed the external opening by means of sutures. This operation, though most unsatisfactory in its results, inasmuch as

return was a sure sequela, held the field for seven years.

Gerdy.

In 1835, Gerdy recommended that the skin of the scrotum containing some portion of the fundus of the Hernia be pushed up into the superficial ring by invagination upon the fingers of the operator. A curved needle armed with a strong "ligature thread" is then to be carried along the finger and thrust thro' to the surface of the groin on each side of the point of the finger. The ligature is then tied so as to hold the invaginated sac and skin in this new position till adhesion has taken place in the interior of the canal. Caustic ammonia is lastly applied to the sides of the invagination, and the mouth of the opening closed by sutures. This operation was performed in 36 cases and in 35 return of the Hernia occurred in a short time. Operations were now being devised right and left. A new one appeared every year or oftener.

Wurtzers.

Still in 1835 we have Wurtzer's method first mentioned. In it there is substituted for the finger of the operator, a wooden plug, intended to fill up the inguinal canal and to set up an adhesive inflammation on the serous surfaces all round the invaginated sac. The plug was held in position by one or two needles passing out at its extremity through the anterior wall of the canal in the groin and fixed externally to a grooved compress of wood. Between the plug and the compress, the folds of skin, fascia, and sac are then forcibly compressed by a screw arrangement, with the object of procuring their adhesion to each other. Wood states that the results were entirely unsatisfactor

With few exceptions the rupture redescended so soon as the plug was withdrawn; or as the use of the truss was discontinued.

Seton &
Pins.

The year 1836 saw the cure by Seton & Pins. The object of this treatment was to set up in the Hernial sac an inflammation with effusion of lymph. Bonnet of Lyons describes the use of the Pins. He introduced three or four or more pins through the integument and sac and twisted the point of the pin so as to compress the included parts between it and the head. He took precaution to keep clear of the spermatic cord. The pins, if sufficient inflammation was set up, were removed in from six to twelve days.

Signorini.

In 1837 Signorini performed a modification of Gerdy's operation. He inverted the skin over the swelling but the parts inverted were kept in position by a female catheter. Three half-lip pins were introduced superficially to the peritoneum so as to bring the sides of the opening together. This changed the circular openings into a slit. Wax threads were then wound round the needles to keep everything fast. Results were no better here than those recorded from previous methods.

Belmas.

About this time Belmas, a French surgeon, returned the contents of the sac, pierced the coverings by a trocar and canula, and introduced through the canula a bag of goldbeater's skin. This was inflated and kept in position for a varying time, till indeed inflammatory action had begun. It was then withdrawn. The results were highly unsatisfactory.

Lawrence.

In 1838 Lawrence published his treatise on Ruptures. He goes most fully and thoroughly into the question of treatment in

reducible inguinal hernia. On the whole his verdict is in favor of the palliative method or treatment by truss. We may thus conclude that treatment by operation had again fallen into disrepute. This is scarcely to be wondered at for all the methods yet brought to light carried great risks: risk of profuse suppuration with consequent debility or even death from Pyaemia. At the best, from any of the operations return of the hernia was almost certain to occur. Matters were allowed to remain thus for some years, certain surgeons operating for the relief of hernia by one or other of the methods enumerated, other surgeons preferred treating the disease by a truss of some shape or other. The palliative treatment, though comparatively safe for the patient, did not provide a permanent cure. Nay, more, it was seen that in old standing cases where an instrument had been worn for a considerable time, the hernia increased in size and the hernial aperture was made larger.

Woods. Woods, in his book, published in 1863, recognised this fact and at first he set himself to devise a truss to remedy matters. The chief difference in his instrument lay in the construction of the pad which was horse shoe shape, his idea being to compress or bring together the pillars of the ring rather than separate them as was done by the older instruments with conical pads. Woods, however, was not satisfied with the results obtained by these instruments. He grasped the fact that more was required than a mere pad on the outside. His study of the affection, the anatomy of the parts concerned, and the indications for treatment led him to devise an operation which most certainly super

seded all that had gone before, and which indeed acts as a basis for the operations of the present day. Too much honour, too much praise, cannot be conferred on Woods. His operation was the first founded on scientific principles. His operation was the first to yield satisfactory results. Its advent marked a new era in the treatment of reducible inguinal hernia. Its progress and utility watched with interest and appreciated, were hastened and enhanced by the employment of chloroform and by the use of antiseptics in surgery. The description of the operation as originally practised by Woods is taken from his own book. "An incision is first made in the skin of the scrotum over the fundus of the sac, if the rupture be large, and a little below it, if small. The most convenient direction of the incision, for the future steps of the operation is obliquely downwards and outwards, terminating a little on the outer side of the scrotum. It should be long enough to admit easily the point of the finger with the needle in addition. If the rupture operated on be a Bubonocoele, the point chosen for the scrotal incision should be one and a half inches below the spine of the Pubis. Then the knife being insinuated flatwise between the skin and fascia for about an inch is to be carried round the edges of the incision so as to separate the former from the latter over an area of at least two inches in diameter. More than this will be required if the rupture be a very large one. The thin end of the handle of the knife will suffice to separate the loose connections of the scrotal fascia to any extent that may be required in ordinary cases. Next, the knees of the p

patient should be brought together and bent up so as to relax the structures in the groin. The operator's finger is then passed with the nail directed backwards into the scrotal aperture and made to invaginate the detached fascia into the inguinal canal. This invagination should be commenced at as low a point as possible so as to force the finger as much as may be behind the hernial sac between its fundus and the spermatic cord. The latter may at this time be steadied by an assistant making gentle traction upon the testicle. The invaginating finger should be made to reach as high as possible in the canal towards its superior opening. The position of the cord and of Poupart's ligament should then be distinctly made out. Then by hooking forward the finger well towards to the surface the lower border of the internal oblique muscle will be felt raised upon it. This may be more distinctly recognised by placing the other hand upon the surface of the groin, when the thicker portion of the deep seated structures in front of the rupture will be felt between the fingers. By directing the finger inwards the operator will now feel at its thumb side the edge of the Conjoined Tendon raised with the muscles, and placed in relief on the posterior wall of the canal. A needle, unarmed and well oiled, is now passed along the same side of the finger, and pushed through the tendon at its most salient part, so as to take up a considerable portion of it. It is then turned towards the surface traversing the internal pillar of the ring obliquely upwards and inwards, till the point is seen to raise the skin of the groin. In these manoeuvres the point of the needle

should be carefully preceded and covered by that of the finger. The skin is then drawn inwards and a little upwards as much as its deep attachments will allow, and the needle pushed through it. One end of the thread is then connected with the needle and the latter withdrawn with a quick motion leaving the other end in the puncture. The invaginating finger is then placed behind the external pillar of the superficial ring as close as possible to Poupart's ligament, opposite the internal hernial opening, in the groove which is there formed between the spermatic cord and the ligament. The finger being again raised towards the surface, the aponeurosis is well stretched upon it. The needle carrying the ligature is then passed along the finger between it and Poupart's ligament and pushed through the latter opposite to the point of the former. When its point is seen to raise the skin, the latter is drawn outwards until the needle can be pushed a second time through the puncture before made. A loop of the thread is then left in the puncture, and the needle withdrawn carrying the free end. The finger is next placed on the inner side of the spermatic cord, just above the pubic spine and pressed firmly upon the Conjoined Tendon pushing it backwards, and the cord outwards, so as to feel prominently the border of the Rectus tendon. Into the tendinous layer of the triangular aponeurosis covering this part of the Rectus the needle is then thrust so as to take up obliquely a considerable portion of that structure as near as possible to the pubic spine, which affords a good guide to the proper place for the puncture. The point of the needle is then turned obliquely upwards towards

the surface, and the skin drawn downwards and inwards over it, until it can be passed through the puncture for the third time. The needle is then freed altogether from the thread and withdrawn. The whole of the ligature thread is now found in the upper puncture, presenting two ends and an intermediate loop. The upper end encloses the Conjoined Tendon and the internal pillar of the superficial ring; the loop passes through the outer pillar close to the centre of Poupart's ligament, and the lower end through the triangular aponeurosis and the insertion of the internal pillar low down. Two portions of thread are thus placed across the hernial canal, invaginated fascia, and sac, closing ^{ly} embracing, but not including the spermatic cord, and connecting the posterior or deep wall with the anterior or superficial, perforating the aponeurosis in three places; but, escaping by the same aperture in the skin. A compress or pad is now applied over the canal in an oblique direction, with its centre opposite to the threads as they emerge from the groin puncture. The two ends of the thread are drawn over to the outer side and the loop to the inner, the latter crossing between the former. One end of the thread is then passed over the compress and through the loop, and tied back to the other end in a loop knot or bunch. This method of fastening the thread in one instead of two portions gives an equable adjustment to the pressure. When the thread is tightened up, direct evidence of its action upon the canal and rings, can be obtained by the finger. The posterior wall of the canal should be ascertained to be drawn forwards by the ligature and the pillars of the superficial ring closed in. If this

effect on the posterior wall is not recognised, it may be apprehended that the Conjoined Tendon is not properly secured in the grasp of the ligature. The lower end of the compress should reach as far down as the scrotal incision which is usually tucked up close to the superficial ring by the traction of the ligature invaginating the fascia and sac. Pledgets of lint are then placed at the sides of the compress and a fold of linen. The whole is retained by a spica bandage." In the operation above described a hempen ligature was used.

What a stride was made towards a thorough treatment by this operation! It was scientifically planned, carefully practised, and yielded what were then excellent results. Hitherto the prevailing idea among surgeons was to fill up the inguinal canal anyhow by cicatrix or by plug, but filled the gap must be. Woods aimed at assisting nature to restore the parts, and in this way his success. Many men would have been content with the success achieved by the operation, viz. that in twenty cases, one died from Pyaemia, four suffered a return, a modified return, the others were perfectly cured. Woods however was broadminded, a man of progressive inclination. Not content therefore with the operation mentioned he looked for some method to improve upon it. The first step in this direction was taken when he introduced wire (copper wire, silvered) to take the place of the hempen ligature. This method was tried in order if possible to lessen suppuration. This it did, for out of 273 cases he had only four deaths, one from tetanus, one from delirium tremens, and two from Broncho-pneumonia. His broadmindedness is shown by the fact

that he was quick to grasp the importance of work done by other men. Thus he early made use of chloroform finding it of great assistance and, latterly antiseptics were employed by him to avoid or lessen suppuration. Nay, more, his employment of antiseptics allowed him to improve the operation for in his last modification we find him use kangaroo tendon prepared by steeping it in carbolic oil and carbolic lotion, 1 to 40. In his Hunterian Lectures in 1885 Wood describes this last operation and emphasises the necessity of antiseptic precautions. Wood's operation was first performed in Glasgow by Dr. George Buchanan ex-Professor of Clinical Surgery in the University of Glasgow. By tracing Wood's operation in this manner history has been somewhat anticipated, yet it seemed to me better to place the three methods side by side. Shortly after Wood's first operation was published W. Dunnett Spanton devised an operation similar in principle to that of Wood's. He had an instrument made like a corkscrew, and, after invaginating the tissues of the scrotum and sac, he introduced the point of this instrument at the upper end of the inguinal canal. Guiding the point with the finger and rotating the handle, the instrument was made to pierce and draw together the sides of the canal. It was left in position for a week. Spanton operated on 50 cases without an accident.

With the advent of antiseptics the line of treatment in Reducible Inguinal Hernia return to the old fashion, viz. operation by the open method. In 1871 Lord Lister operated on two cases. He cut down on the Hernia, left the sac untouched,

Spanton.

Lister.

but sutured the abdominal opening. It was quickly found that this was not sufficient as the rupture soon returned.

Buchanan.

In the British Medical Journal, May 25, 1879, Professor George Buchanan, Glasgow described an operation which he had devised and performed successfully, on a number of cases. "An important feature of this operation is plugging the ring with ~~th~~ a ball formed of the rolled up sac." He describes his operation thus: "an incision was made from the external ring down over the front of the hernia, the bowel having been returned and retained by the finger of an assistant placed over the internal ring, layer after layer was divided till the sac was exposed. With a forceps and end of a director the sac was separated from the cord, was lifted up till it was like the empty finger of a glove coming out from the external ring. It was now pulled upon till its neck was accessible from the external ring, when a thin catgut suture was tied round it. When the tension was relieved the tied neck recoiled back into the end of the internal ring. "I twisted the sac and rolled it up into a ball, which I pushed up the canal beyond the epigastric artery, so that it was now a plug blocking up the side of the internal ring. The stitches were introduced thus: a curved Woods needle was passed through the external pillar of the canal from without inwards, opposite the site of the internal ring, was made to pass through the lower part of the rolled up plug, was pushed underneath the edge of the internal pillar, for at least one third of an inch beyond its lower edge, so as to pick up and pierce what could be included of the internal oblique border, and then made to emerge through

the aponeurotic pillar. A catgut ligature was then put through the hole in the needle's point and withdrawn so that the ligature was passed through the external pillar, the ball plug, some part of the internal oblique, lastly, the internal pillar. Two other stitches were introduced lower down, of course, not including the plug. A last stitch, to which I attach much importance, was introduced as low down as to close the external ring just over the cord. This I passed through Poupart's ligament, near where Gimbernats ligament is reflected from it, and on the upper side of the ring made it pass deep below the upper pillar gripping up what is accessible of the conjoined tendon, and then made it emerge far inwards, even through the tendon of the rectus to make it take a firm hold as a retaining suture. The catguts were now all drawn tight and tied, and so the inner ring was plugged. The walls of the whole canal were brought together and the external ring closed." Since Professor Buchanan's operation was published many operations have come to the front. Some of them are improvements on the older methods, and some of them, I fear, are not. Of the more modern operations we will consider in greater or less detail those of Mitchell Banks, Ball, Czerny, Macewen, Bassini, Halsted, Kocher, Kennedy.

Mitchell Banks. In this operation an incision is made over the hernial opening. The tissues are dissected down to the sac and any bleeding point is at once secured. On being reached, the sac is carefully dissected out as little damage as possible being done to the tissues. The bowel is now returned and the sac opened to ensure that the bowel is completely reduced. The sac is then pulled

down, ligatured as high up as possible and the fundus cut away. In congenital herniae the fundus or part thereof is left and formed into a Tunica Vaginalis. The ring is closed by sutures a firm hold being taken of both sides.

Ball.

Dr. Ball of Dublin after isolating and emptying the sac grasps the neck of the sac with broad catch forceps and gradually twists it up. At the same time he frees the upper portion of the neck of the sac with his left forefinger. The twisting is continued till it is felt to be quite tight, further torsion being apt to produce rupture of the sac. The torsion forceps are now transferred to an assistant to maintain the twist. A stout catgut ligature is placed round the twisted sac as high up as possible, tied tightly, and the ends cut off short. Two sutures of strong aseptic silk are now passed through the skin at a distance of about one inch from the outer margin of the wound, through the outer pillar of the ring, through the twisted sac in front of the catgut suture, and then, through the inner pillar of the ring and skin upon the inside. The sac is now cut off in front of these sutures, and if necessary, some superficial stitches are put in to close the wound completely. This operation was first described by Dr. Ball in 1884, and in 1887 he made a further communication to the British Medical Journal, illustrated by 22 cases. In the same Journal, Nov., 12, 1898, a modification of this operation is described by Dr. Ball as follows—"The sac is laid bare in the usual manner. It is then opened, and a finger introduced to examine the contents. The sac is now separated from its adhesions. When it has been cleared up the entire length

:th of the inguinal canal, it is caught in a T shaped forceps
 and slowly twisted, a finger of the left hand freeing the peri:
 :toneum from a round the internal ring at the same time. The
 finger is now passed up into the subperitoneal tissue for at
 least one inch, and a large curved needle threaded with a stout
 piece of silk is passed beside the finger in the subperitoneal
 space and then directed forward through the musculature and s
 skin of the abdominal wall. The other end of the same piece of
 silk is now passed by a needle in the same way but at the other
 side of the twisted sac, and brought out through the abdominal
 wall at the same level and close to the first end. The effect
 now, of drawing on these two ends, is that the loop pulls up the
 knuckle of the twisted sac in the subperitoneal tissue at the
 back of the strong muscular abdominal wall. It is now fixed by
 tying the two ends lightly over a lead plate. If the sac is of
 moderate size the fundus lies now in the inguinal canal and to:
 :gether with the spermatic cord is pressed firmly with the fin:
 :ger backwards towards the abdominal cavity, while deep sutures
 are passed taking good hold of the lateral structures of the
 canal and also picking up the twisted sac as it lies on the
 cord. The sac sutures are closed over lead plates and the skin
 wounds is closed by fine continuous sutures. The deep sutures
 are left in from nine to ten days. After their removal the pat:
 :ient is allowed up. No truss is worn.

Czerny.

Czerny's method after the preliminary incision and dissections
 have been carried out, is to dissect out the sac, ligate it, and
 cut away the distal portion. He simply closes the external

ring by sutures.

Macewen.

Sir William Macewen, Regius Professor of Surgery, University of Glasgow describes his operation thus:—"When a patient has been anaesthetised, the limb on the side of the hernia is flexed at the knee by a pillow, which is placed under the latter. An assistant, whose duty it is to retract the parts, stands at the opposite side of the surgeon. The needles found to be most useful are figured here—fig. 1.—one for passing the thread from right to left the other from left to right. Woods' needle might be employed for all suture, except the double one introduced into the Conjoined Tendon.

Having reduced the bowel, make an incision sufficient to expose the external abdominal ring. An exploration of the sac and its contents is then made, and the finger introduced through the canal

examines the abdominal aspects of the internal ring, and the relative position of the Epigastric artery. The operation may be divided into two parts, the one relating to the

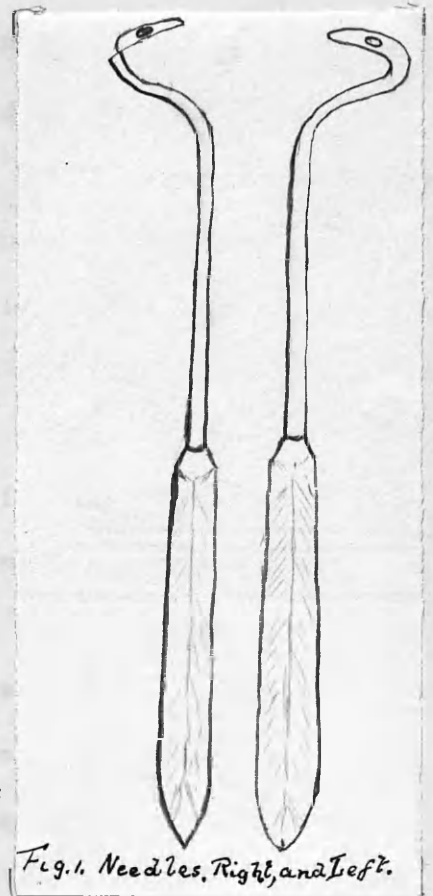


Fig. 1. Needles, Right, and Left.

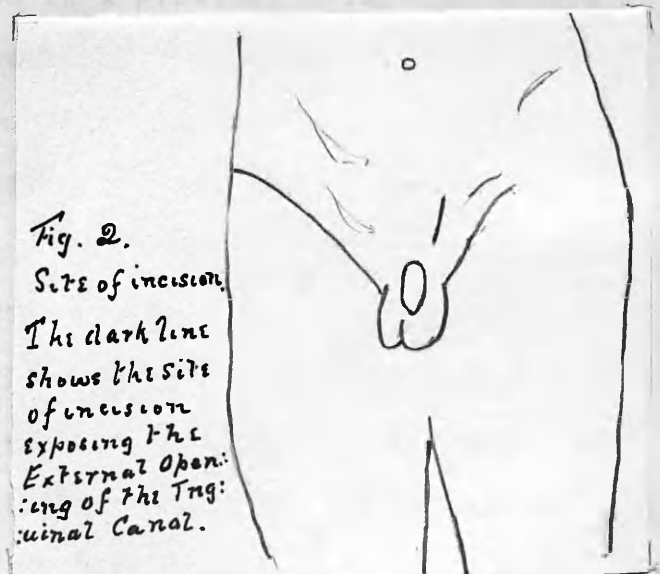


Fig. 2.
Site of incision.
The dark line shows the site of incision exposing the External Opening of the Inguinal Canal.

establishment of a pad on the abdominal aspects of the internal ring, the other to the closure of the inguinal canal.

The steps of the operation are as follows:-(A) The formation of a pad on the abdominal surface of the circumference of the internal ring-(1). Free and elevate the distal extremity of the sac, preserving along with it any adipose tissue that may be

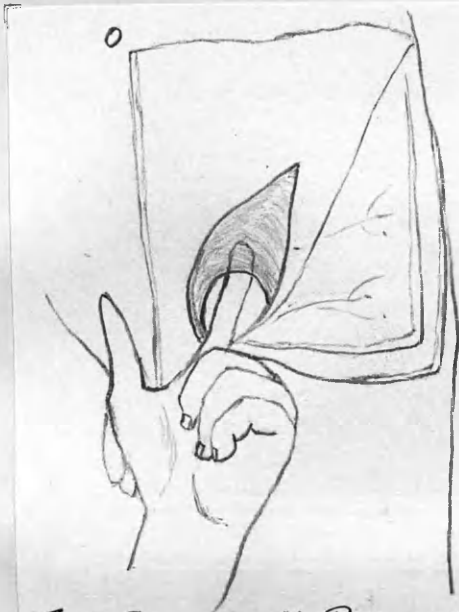


Fig.3. Separating the Peritoneum. Showing the finger inserted through the Inguinal Canal separating Peritoneum from abdominal aspect of the circumference of Internal Ring.

adherent to it. When this is done pull down the sac, and while maintaining tension upon it, introduce the index finger into the inguinal canal separating the sac from the cord and from the parieties of the canal.

(2) Insert the index finger outside the sac till it reaches the internal ring. Then separate with its tip the peritoneum for about half an inch round the whole abdominal aspects of the circumference of the ring-fig.3-

(3) A stitch is secured firmly to the distal extremity of the sac. The end of the thread is then passed in a proximal direction several times through the sac, so that when pulled upon the sac becomes folded upon itself like a curtain.-fig.4- The free end of the stitch threaded in a hernia needle is introduced through the canal to the abdominal aspect of the Fascia Transversalis, and there penetrates the anterior abdominal wall about an inch above the upper border of the internal ring. The wound in the



Fig.4. Folding the sac. The sac transfixed, and drawn into a series of folds.

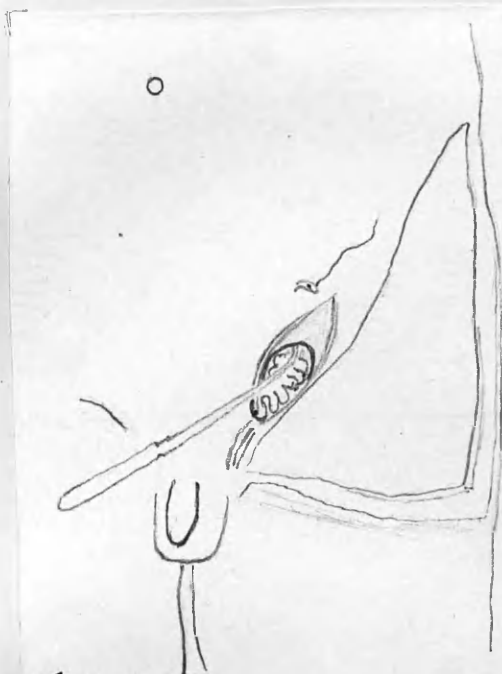


Fig. 5. Securing the folded sac above. The hernia needle, carrying the thread from the upper portion of the sac through the abdominal muscles, from behind forward, about one inch above Internal Ring.

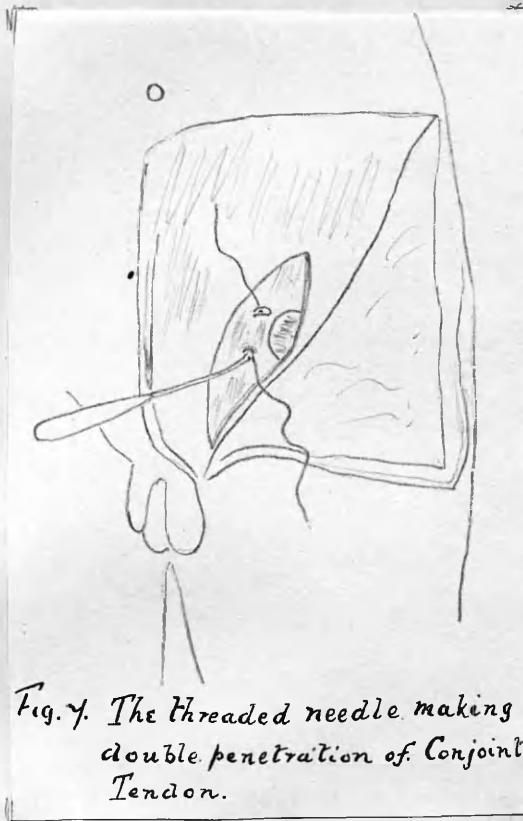
skin is pulled upwards, so as to allow the point of the needle to project through the abdominal muscles without penetrating the skin, fig. 5-. The thread is relieved from the extremity of the needle, and the latter is withdrawn. The thread is pulled through the abdominal wall, and when traction is made upon it, the sac, wrinkling upon itself, is thrown into a series of folds, its distal extremity being drawn further backwards and upwards. An assistant maintains traction upon the stitch until the introduction of the sutures into the inguinal canal, and when this is completed, the end of the stitch is secured by introducing its free extremity several times through the superficial layers of the External Oblique Muscle. A pad of peritoneum is thus placed upon the abdominal side of the internal opening where, owing to the abdominal aspect of the circumference of the internal ring having been refreshed, new adhesions may form, fig. 6.

Closure of the Inguinal Canal.

The sac having been returned into the abdomen and secured to the abdominal circumference of the ring, this aperture is closed in front of it in the following manner. The finger is introduced into the canal, and lies between the

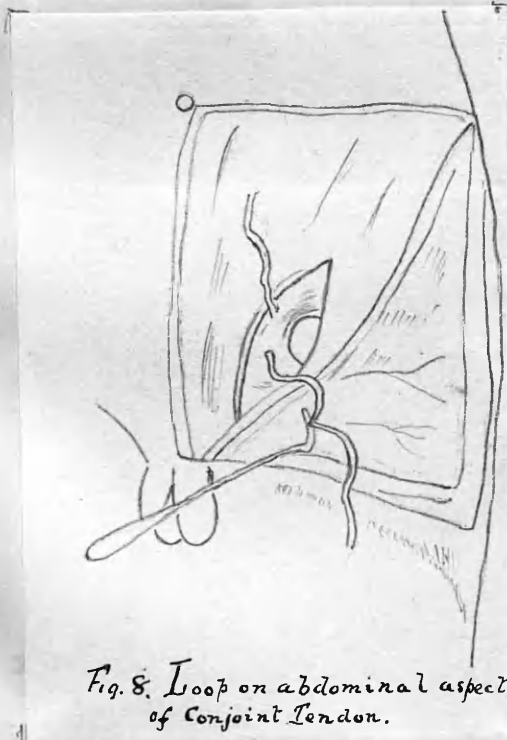


Fig. 6. Pad covering abdominal aspect of Internal Ring.



inner and lower borders of the internal ring, in front of and above the cord. It makes out the position of the Epigastric artery, so as to avoid it. The threaded hernia needle is then introduced and guided by the index finger, is made to penetrate the Conjoined Tendon in two places: first, from without inwards near the lower border of the Conjoined Tendon; secondly, from within outwards, as high up as possible on the inner aspect of the canal. This double penetration of the Conjoined Tendon is accomplished by a single screw like turn of the instrument-fig.7-

One single thread is then withdrawn from the point of the needle by the index finger, and when this is accomplished, the needle, along with the other extremity of the thread is removed. The Conjoined Tendon is therefore penetrated by this thread, and a loop left on its abdominal aspect-fig.8-



Secondly, the other hernia needle, threaded with that portion of the thick stitch which comes from the lower border of Conjoined Tendon, guided by the index finger in the inguinal canal, is introduced from within outwards, through Poupart's ligament which it penetrates at the point on a level with the lower stitch in the

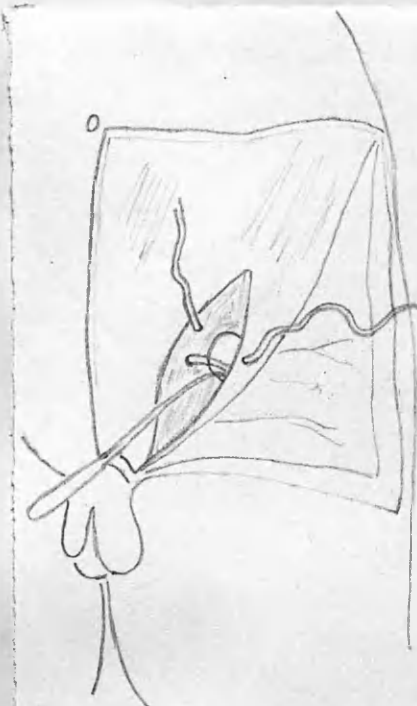


Fig. 9. Thread from lower border of Conjoint Tendon being carried through outer pillar of Internal Ring.

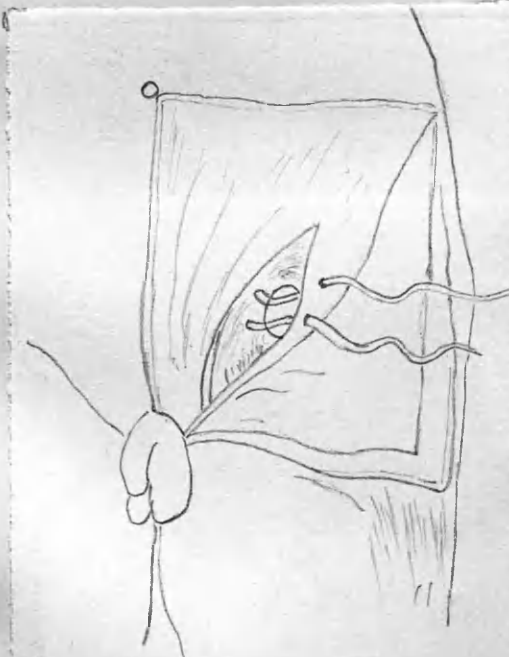


Fig. 10. Thread ready for tying.

Conjoined Tendon-fig.9-. The needle is then completely freed from the thread and withdrawn. Thirdly, the needle is now threaded with that portion of the catgut which protrudes from the upper border of the Conjoined Tendon and is introduced from within outwards through the Transversalis and Internal Oblique Muscles, and the aponeurosis of the External Oblique at a level corresponding with that of the upper stitch in the Conjoined Tendon. It is then quite freed from the thread and withdrawn-fig. 10-. There are now two ends of the suture on the outer surface of the External Oblique, and these are continuous with the loop on the abdominal aspect of the Conjoined Tendon. To complete the suture, the two free ends are drawn tightly together and tied in a reef knot. This unites firmly the internal ring. The same stitch may be repeated lower down the canal if thought desirable. In adults it may be well to do so when the gap in the abdominal parietes is wide. The pillars of the external ring may likewise be brought together. In order to avoid compression of the cord which might lead to serious embarrassment and sloughing or ultimate atrophy of the testicle, it ought to be examined before tightening each stitch. The

cord ought to be behind and below the sutures and be freely movable in the canal. It is advisable to introduce all the necessary sutures before tightening any of them. When this is done, they might be all experimentally drawn tight and maintained so while the operator's finger is introduced into the canal to ascertain the results. If satisfactory they are then tied beginning with the one at the internal ring, and taking up in order any others which may have been introduced. In the great majority of cases the stitch in the internal ring is all that is required. During the operation the skin is retracted from side to side, to bring the part into view and to enable the stitches to be fixed subcutaneously. When the retraction is relieved the skin falls into its normal position, the wound being opposite the external ring. The operation is therefore partly subcutaneous. When the canal has been brought together, a decalcified chicken bone drainage tube is placed with its one extremity next the External Ring, the other projecting just beyond the lower border of the external wound. A few chromic-gut sutures are then introduced along the line of skin incision.

Dressing of the wound:- Iodoform is dusted over the wound the interstices of the scrotum, and its junction with the thigh. A sublimated wood-wool pad is applied, held in position by an aseptic bandage. As a rule, a portion of elastic webbing is placed over the margins of the pad to secure it firmly. As the patient is laid in bed, a pillow is placed under the knees, while his shoulders are slightly raised, so as to relax the tissues about the canal.

After Treatment:- The rectal temperature is taken night and

morning and at the same times the dressings are inspected. The dressings are left undisturbed from fourteen to twentyone days, unless they are previously stained or the temperature is abnormally high. On their removal at the end of that period the wound is found healed. Fresh dressing is applied to maintain pressure. The patient is allowed in from four to six weeks. He is not permitted to work until the eighth week. He is advised not to lift heavy weights till the end of the third month at the very earliest. Adults engaged in laborious occupations are advised to wear a bandage and pad as a precaution, others are not unless of very lax habit.

In congenital hernia the sac is first isolated from the cord. As this structure is generally intimately*with the posterior surface of the sac, often by close organic adhesions, the sac should be divided longitudinally by two parallel incisions, one on each side of the cord, and the latter permitted to lie behind clear of the sac. The isolated sac should then be div-

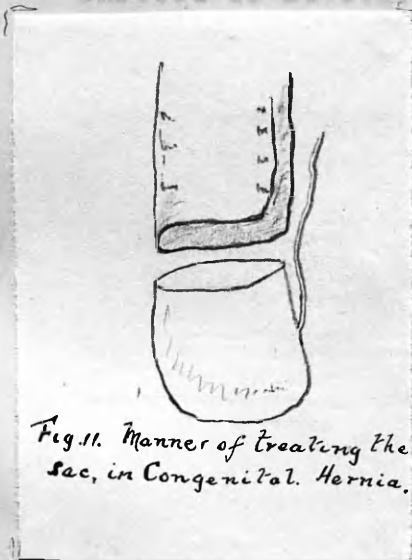


Fig. 11. Manner of treating the Sac, in Congenital Hernia.

ided transversely about an inch above the testicle. The lower part is formed into a Tunica Vaginalis. The upper is pulled down as far as possible, and dealt with quite as the sac of an acquired hernia, additional precautions being necessary to clear the cord at the internal abdominal ring-fig. 11-. On one occasion a separate tube was formed for the cord out of the sac but this has not been repeated. In congenital hernia it has been

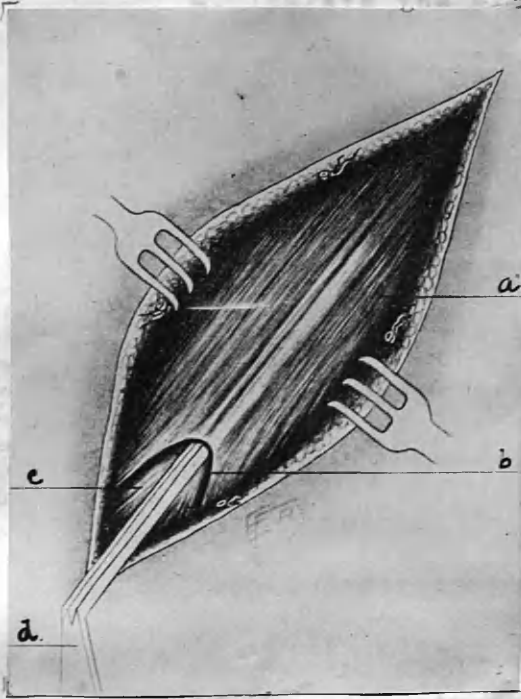
advised that the testicle ^{be} ablated. On two occasions this has been done, once when the testicle was injured by a blow received prior to admission, and ~~wh~~ once when that organ was affected by cystic degeneration. In both instances the absolute rigidity of the abdominal wall which resulted, taken along with the ease of the procedure, explains the desire for ablation of the testicle in congenital hernia evidenced by advocates of this method." The description of this operation is taken from the British Medical Journal, Dec., 1887-in which it forms ~~w~~part of the report of an Address read by Sir William Macewen, to the Section of Surgery at the annual meeting of the British Medical Association held in Dublin in August 1887. The description is also given in the Annals of Surgery, 1886. Sir William Macewen's method today is practically the same as that just described. In the treatment of the sac-after the ligature has been fixed at the distal end, it is carried through the sac, ^{at the neck} and brought out on the anterior ~~artery~~ ^{at the neck.} aspect. It thus traverses the sac twice instead of several times, as in the original description. The decalcified drainage tube is now dispensed with; the wound is completely closed. The dressing now employed is a narrow strip of iodoform gauze, covered by celloidin, a sterilized pad and bandage being applied over all.

Bassini.

The incision begins at a point to the inner side of the anterior superior Iliac spine and about half an inch above Poupart's ligament-passes obliquely downwards parallel with and about half an inch above Poupart's ligament-and ends over the middle of the External Abdominal Ring-being about three to three and

and a half inches long. Having divided the skin and superficial fascia clamp all bleeding vessels and retract the edges of the wound, exposing aponeurosis of External Oblique.

2. Demonstrate the External abdominal ring and pass a grooved



a. Aponeurosis of Ext. Oblique. b. Ext. Ring. c. Cord. d. grooved director.

director through its opening and carry it obliquely upwards in the line of the fibres of the external oblique aponeurosis and immediately beneath its surface, for a distance of about two and a half inches—the instru-

ment showing through its thin texture, fig. 1-

Slit up the fibres of the aponeurosis of the

External Oblique upon the grooved director

with a scalpel, travelling in the cleavage

line of the fibres. Dissect, by blunt separ-

ation, the upper edge of the cut aponeurosis

inward and upward nearly to the outer edge

of the Rectus sheath. Similarly dissect by

blunt separation, the lower edge of the cut aponeurosis of the

External Oblique downwards and outwards to the shelving portion

of Poupart's ligament. The Inguinal Canal, except that part

covered by the Internal Oblique, is thus exposed.

3. Grasp, with forceps, aided by the fingers, the mass of soft

tissues just within, or emerging from the external abdominal

ring, composed of cord and hernial sac—and, pushing aside the

muscle fibres with a blunt dissector, or closed ends of blunt

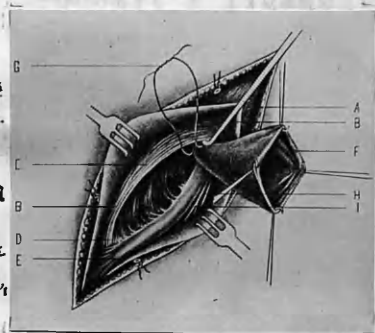
curved scissors, lift upwards and outwards the hernial sac and

cord—drawing them partly from the direction of the inguinal

canal, and partly from the direction of the scrotum-the hernia lying anteriorly, surrounded by the infundibuliform fascia, and the cord posteriorly-the sac and cord being more or less intimately adherent.

4. Isolate the sac from the cord by blunt dissection and carry on the freeing of the sac upward, retracting the Internal Oblique muscle outward to expose the outward aspect of the inguinal canal until the sac begins to open out into the general periton:

- A. Ext. Oblique.
- B. Aponeurosis of Ext. Oblique.
- C. Internal Oblique.
- D. Conjoint tendon.
- E. Cord.
- F. Sac.
- G. Neck of sac surrounded by ligature.
- H. Ilio inguinal nerve.
- I. Semio Crural artery.

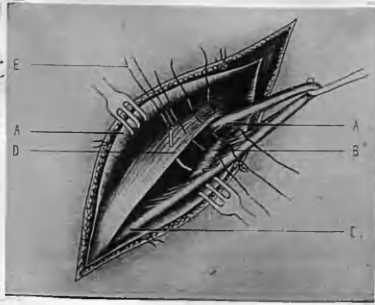


aeum. If it be certain that the sac contains no adherent intestine or omentum, it need not be opened. If there be any question-and it is probably better to do so in all cases, whether question or not-the sac should be opened at some distance below the point of

intended closure and examined; fig. 2.- The contents of the sac if any, are returned to the abdominal cavity. The sac is then to be treated in one of two ways:-If it be small a double chromic gut ligature is carried through the centre of that portion which is to form the line of occlusion-these two ligatures are crossed and are firmly tied on each side-and the sac cut off a safe distance from the ligatures. If the sac be large (so that ligaturing it would cause too much puckering and probably slip off) its surfaces are to be sutured with chromic gut on a level with the site of division-and then cut off with scissors at a safe distance distal to the suture line. The sac is thus disposed of and returned to the abdominal cavity.

5. The cord is now taken up in the left thumb and index finger

- A. Aponeurosis of
Ext. Obliquus,
B. Poupart's ligament
C. Cord.
D. Internal Obliquus
& Transversalis.
E. Sutures.



and isolated from external to internal ring, en masse, without disturbing its component structures, and a strip of gauze is passed beneath it—whereby it is held up by an assistant well out of the way until its new bed is made for it, fig. 3.—

6. The lower border of the Internal Oblique and Transversalis muscles are now sutured to the shelving portion, or border of Poupart's ligament, with interrupted sutures of kangaroo tendon

or chromic gut, taking a good hold of both structures, using a curved needle, preferably

of the Hagedorn type. Fig. 4. Prior to the

insertion of the sutures uniting Internal Ob:

liquus and Transversalis above, to Poupart's

ligament below, the lower borders of the In:

ternal Oblique and Transversalis should be

isolated by the surgeon's fingers from the

Transversalis fascia, beginning at the Conjoined Tendon and ex:

tending outwards to the Internal Abdominal Ring. While passing

the sutures, the surgeon's left index finger should be carried

behind the Conjoined Tendon and also behind the lower borders

of the Internal Oblique and Transversalis muscles, so as to

guide the needle point. The first suture near the upper end of

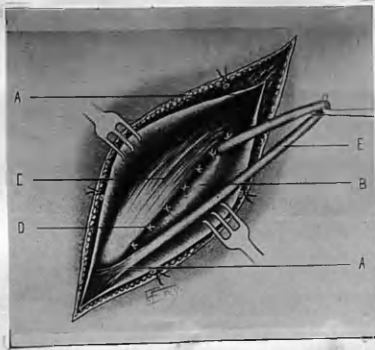
the wound, pierces the Internal Oblique almost as far outwards

as the external border of the Rectus muscle. It should just com

in contact with the inner aspect of the cord when the latter is

held at a right angle to the plane of the Internal Oblique

- A. Aponeurosis
of Ext. Obliquus.
B. Poupart's lig.
C. Int. Obliquus &
Transversalis.
D. Sutures forming
new bed for Cord.
E. Cord.



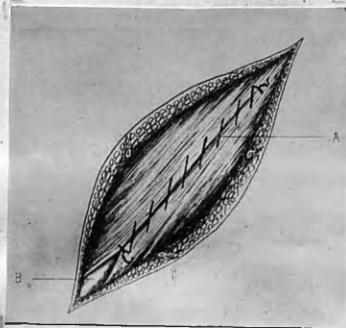
- muscle as it emerges from opposite the internal ring. A second suture is placed just above the cord, to strengthen the internal ring, the cord thus emerging between two sutures. As many similar sutures as are indicated (generally six or seven altogether) are thus placed. The last, lowest, suture passes through the Conjoined ^{Tendon} of the Internal Oblique and Transversalis above, and the shelving portion of Poupart's ligament below.

7. The cord is now dropped down upon its new bed made by suturing the Conjoined Tendon and the Internal Oblique and Transversalis muscles to the shelving border of Poupart's ligament.

8. The separated edges of the aponeurosis of the External Oblique

A. Split fibres of aponeurosis of External Oblique united to form roof of canal.

B. Cord emerging from new External Ring.



lique are now sutured directly over the cord with continuous kangaroo or chromic gut sutures, fig. 5- carefully avoiding too tightly suturing the edges over the cord at the lower end, the new external ring, where the cord escapes into the scrotum.

9. The skin is closed throughout with interrupted sutures of fine catgut. No drainage is used. The first dressing usually comes off at the end of a week. Comment. No muscular tissue, except aponeurosis of External Oblique is cut.

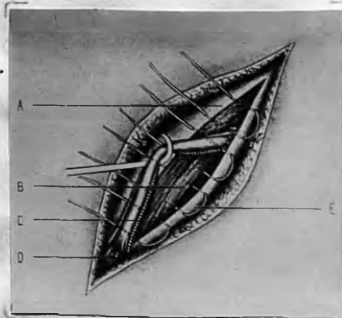
Halsted.

1. Incise skin and fascia-control hæmorrhage-retract edges of wound-and expose external oblique aponeurosis, and external abdominal ring.

2. Divide, in order, upon grooved director, in line of original incision, the external oblique aponeurosis, internal oblique

- muscle, transversalis muscle, and fascia—all upward and outward to a point one inch above the internal abdominal ring.
3. Expose and draw outwards the hernial sac and cord—and separate the cord, en masse, from the sac.
 4. Isolate the structures of the cord recognising Vas, arteries, and veins. Excise all the veins except one or two, between gut ligatures placed beyond the upper and lower lines of excision.
 5. Separate the sac from all structures and from the margins of the internal ring. Return its contents to the abdominal cavity—first opening it, if necessary, or in doubt. Excise the sac beyond its neck, and shut off the peritoneal cavity by suturing the edges of its mouth with silk sutures (continuous or mattress sutures).
 6. Lift the cord out of the wound upon a blunt hook, and place about six or eight deep silver wire mattress sutures beneath it

- A. Aponeurosis.
- B. In Oblique & Transv^{ls}.
- C. Cord.
- D. Free end of veins excised.
- E. Wire mattress sutures.

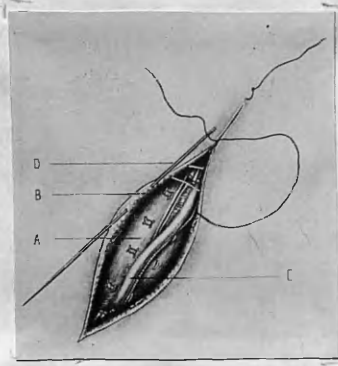


passing through external oblique aponeurosis, internal oblique muscle, transversalis muscle, and transversalis fascia, on the upper side—and going through the transversalis fascia, Poupart's ligament, and fibres of aponeurosis of external oblique, on the lower side, fig. 1.

The two sutures placed most external will pierce muscle tissue upon both upper and lower sides of the wound/the cord escaping between them. Tighten all sutures so as to approximate the occluded parts snugly—twisting the wires, cutting them moderately short, and burying them. The cord is then allowed to fall upon its new bed.

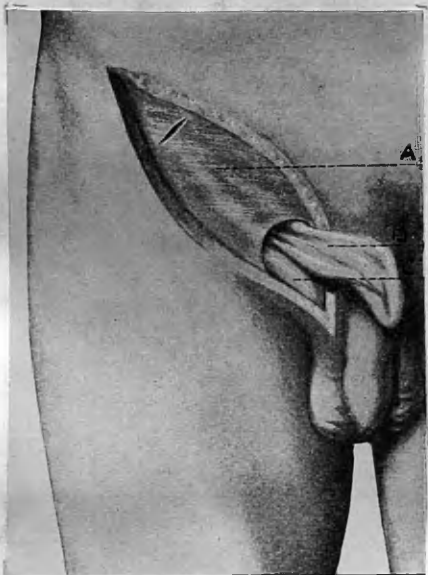
7. The skin and fascia are closed directly over the cord, by a

- A. Aponeurosis.
 B. Wire sutures,
 C. Cord.
 D. Subcuticular
 Suture.



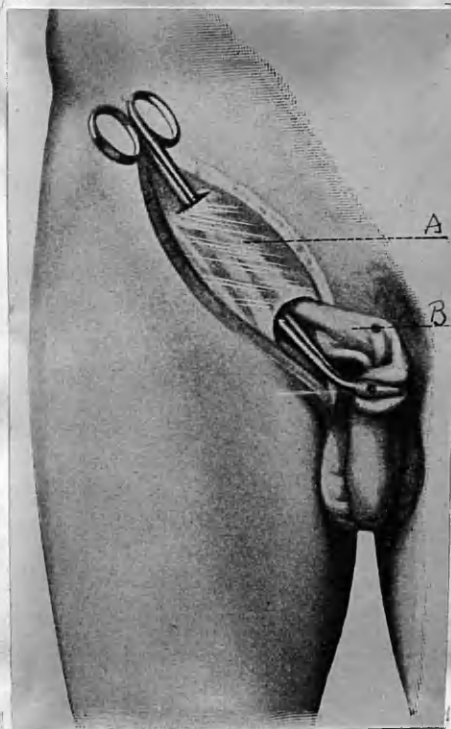
subcuticular silver wire suture, fig. 2- which is withdrawn after healing. No drainage is used. Comment. Avoid endangering the cord by the removal of too many vessels. (2) Avoid too tightly compressing the cord between the two outer sutures. (3) When the abdominal muscles and transversalis fascia are divided, the internal abdominal ring disappears, and the neck of the sac, its apparently constricted part, also disappears. (4) When the sac is isolated and opened a gauze pad upon a string may be put into the abdominal cavity to hold the intestines out of the way. The sutures are then placed in the mouth of the sac to bring its edges together-are temporarily separated to withdraw the gauze pad and are then tightened-the sac being cut away safely above the suture line. (5) If the muscles at the point at which the cord is brought out are thin, then the cord is transplanted outwards.

Kocher.



A. Aponeurosis of Ext. Oblique. B. Sac. C. Cord.

Kocher wishes to avoid the splitting up of the Inguinal Canal, which must be made in Bassini's operation, and performs an operation which he designates as the lateral displacement method, and which may be divided into four steps. First step-fig. 1. The skin is incised in the direction of the inguinal canal, the length of the incision being somewhat greater than that of the canal. The incision is not to be carried down any further than is necessary for

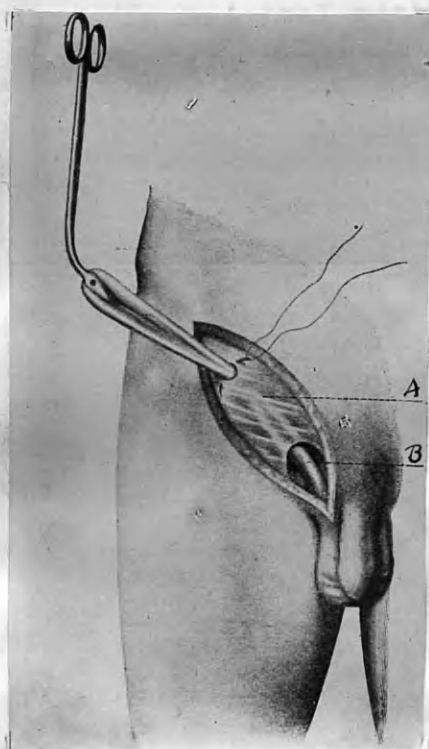


A. Aponeurosis.

B. Sac.

the isolation of the hernial sac from the spermatic cord, and the separation of the sac from the surrounding tissues. An incision at right angles to the course of the inguinal canal is now made somewhat to the outer side of the region of the internal abdominal ring. The hernial sac is isolated and its contents reduced.

Second Step, fig. 2. A curved dressing forceps is now introduced into this lateral opening, carried through the inguinal canal, brought out at the external abdominal ring in front of the spermatic cord, and made to grasp the tip of the isolated hernial sac.

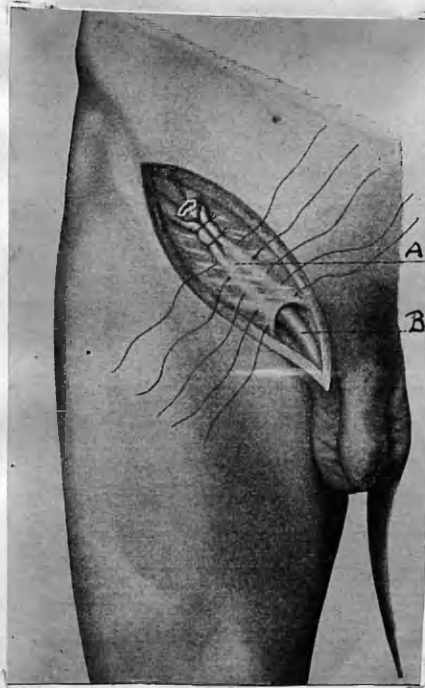


A. Aponeurosis.

B. Cord.

Third step, fig. 3. The entire hernial sac is drawn back through the inguinal canal and out through the small lateral opening. The sac, instead of passing inward and downward, now runs in the opposite direction, and the funnel like neck of the sac is forcibly drawn into the small opening in the External Oblique muscle. A suture is now passed around the portion of the sac situated within the abdominal wall and firmly tied.

Fourth step, fig. 4. The neck of the sac is still more securely fixed by a second, and sometimes a third, suture which passes more



A. Aponeurosis. B. Crura.

superficially through the approximated fibres of the aponeurosis of the external oblique and through a portion of the neck of the sac. The sac is then cut off beyond these sutures and a row of deep sutures is passed through the aponeurosis of the external oblique muscle and the underlying muscular tissue in order to narrow the inguinal canal throughout its entire extent. The operation is completed by the suture of the cutaneous incision.

Kocher has obtained still better results by

a modification of this operation which he has recently published, and which he designates as the Invagination Displacement Method. The first step of the operation is carried out as in the original method. In the second step, however, not only the aponeurosis of the external oblique muscle is incised, but the fibres of the internal oblique and transversalis muscles are also divided upon a grooved director, and the peritoneal cavity is opened in the depth of the wound. The dressing forceps is introduced into the peritoneal cavity through the opening, carried into the interior of the hernial sac, the apex of which is seized, and the sac, instead of being drawn back through the inguinal canal, is invaginated throughout its entire length and pulled out through the small lateral wound. The parietal peritoneum is also drawn out of the wound by means of two to four haemostats, and the sac is tied off as high up as possible by the method of double ligation previously described. The operation is completed as in the lateral displacement method.

Dr. Robt. Kennedy, Glasgow, describes his operation as follows:-

1. Incision over the Inguinal Canal in the usual way until the tendons of the External Oblique and External Ring are exposed.
2. The contents of the scrotum are withdrawn and the sac isolated and the testicle and cord returned to the scrotum. The sac is isolated from its surroundings up to the Internal Ring by means of the finger inserted into the canal.
3. The lowest point of the sac is then grasped by a Kocher's or other suitable forceps, and the sac invaginated until its lowest point is carried up to a point about three quarters of an inch above and to the outside of the Internal Ring. The point of the forceps is then made to press outwards at this point, and bulge the abdominal wall outwards. A very small puncture is then made on the point of the forceps with a knife, and the forceps passed through and the invaginated sac seized. The forceps are then removed, and the invaginated sac pulled out through the small opening in the abdominal wall, and, of course, the peritoneal lining is now outermost. The sac is then transfixed at its base by a curved needle threaded with catgut, and ligatured, and fixed with the ends of the same ligature to the abdominal wall. The sac is then cut off close to the ligature. This completes the first part of the operation, namely the treatment of the sac, and it is seen that this is treated exactly as Kocher does in his more recent method. The second part of the operation consists in uniting the Internal Oblique and Transversalis muscular fibres to the deep aspect of Poupart's ligament

and this is done as follows:-

1. The cord is kept to the inner aspect of the external ring out of the way by making traction on the testicle, or on the cord itself. The forefinger of the left hand is then introduced into the inguinal canal and feels the border of the muscle (Internal Oblique and Transversalis), which has to be drawn down to Poupart's ligament. The finger takes up its position on the deep aspect of the transversalis edge, with the palmar surface directed forward. A special needle threaded with strong catgut, is then passed through Poupart's ligament at a point opposite to the outer end of the inguinal canal. The point of the needle within the inguinal canal is carried upwards and the point made to transfix the lower edge of the combined Internal Oblique and Transversalis, the point being received on the forefinger which supports the muscles while they are being transfixed. ^{Pressing} Passing the point of the needle against the forefinger the transfixed muscles are now pulled down until in contact with Poupart's ligament. When this is done it will be found that only the curved portion of the needle remains in the tissues. The handle of the needle is then carried upwards, describing a semi circle, until it is in contact with the anterior abdominal wall. By this movement the point of the needle will now have emerged through Poupart's ligament at a point a little below the point of entrance. The suture is now removed from the eye of the needle by means of a blunt hook, and the needle withdrawn, leaving the suture in place. The first suture is now in place, and it thus passes through the border of the Internal Oblique and Transvers

alis, with its two ends passing through Poupart's ligament. A second suture of the same kind is placed about half an inch nearer the middle line, and succeeding stitches, separated by similar intervals are placed until the External Ring is reached. The stitches are then tied, thus bringing the ~~Intern~~ combined Internal Oblique and Transversalis into close contact with Poupart's ligament, and completely obliterating the inguinal canal. The opening remaining between the Internal Oblique and outer pillar is then reduced by similar stitches until the gap in the abdominal wall is as small as compatible with safety to the structures of the cord. The number of stitches required to effect a satisfactory closure is, in an adult, about five and, in a child, two or three. The wound is then completely closed by a continuous suture.

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IN the preceding pages there have been traced some of the many methods, ancient and modern by which "cure" was or is brought about. One has now to consider two questions:—(1) What is the operation best suited for the general practitioner to perform; and (2) What is the operation best suited for the variety of Hernia under consideration. Now the answer to the first question is—The simplest and easiest we can find; and, perhaps, the simplest operation of those described is the one of Incision, and the subsequent healing of the wound by granulation. On the other hand, however, such a procedure is not suited to answer question two, inasmuch as the results from such operation are extremely bad. One must therefore decide on an operation

in which is combined simplicity and satisfactory results. This simplicity of operative interference weighs more with the practitioner in a country district than with the surgeon in hospital. In our modern hospitals, from an aseptic theatre downwards, everything promises a satisfactory result. The operator is experienced; the nursing excellent. In the country district one has to contend with many disadvantages as to operating rooms, nursing &c., and in the nature of things the practitioner has not the experience of the hospital surgeon. The question naturally rises here-If that be so, why not send the patient to hospital? The answer to that question is, that there are certain patients who will not enter an hospital door. To quote the answer I had from one patient-"If you cant do the thing yourself at home, I'll bide as I am." One is therefore brought face to face with the question: What operation shall I perform? In the selection of one's operation there are several points which ought to receive careful consideration. Having weighed these points well, select the operation which meets all their requirements. Once a selection is made, stick to your operation until you see good and sufficient reason to change. It seems to me a mistake for a practitioner to experiment with various methods. The old saying "let the other fellow pay for the experience" can be aptly applied here. Let the hospital surgeon pay for the experience, but let the practitioner take, free gratis and for nothing, the fruits of such experience. The points above referred to are:-

1. The operation must give us a permanent satisfactory result.

If returns are frequent, the operation had better be left undone both for the sake of the patient and for the sake of the operator.

2. The operation ought to be easily and quickly performed. The easier and simpler the operation so much the more satisfaction to the operator; and, I would add, so much the better for the patient. Professor Annandale, in his address on Surgery to the British Medical Association, Edinburgh meeting, said:—"If I were asked to define any special characteristic which would apply to the practice of Surgery at the present day, I would be inclined to say, simplicity, antisepticity being granted—a simplicity in which was included operative procedure, instrumental assistance, and after treatment." As regards speed, it is said by many, that nowadays with chloroform there is no need for hurry. The patient feels no pain therefore, why be in haste? It is, however, my firm conviction, that there is need for speed with chloroform, for, of all the dangers of an operation, those from the anaesthetic are the greatest. One never can foretell how a patient will behave under an anaesthetic. He may be all right the one minute and the next in a critical state. Again, chloroform is a poison and a prolonged exhibition of the drug is in itself dangerous. It is my experience (and this experience is the result of from 1000 to 1200 administrations) that after prolonged and deep anaesthesia, severe vomiting and retching were almost sure to follow. Surely in an operation which has as its aim the retention of bowel within the abdominal cavity, the sequelae are to be guarded against. Lastly, Bull and Coley, in a paper dealing

with several points of interest, conclude by agreeing with Mikulicz, "that the danger of infecting the wound increases with the length of time occupied by the operation. "

3. The operation should interfere as little as possible with the tissues. The aim should be, to assist nature, not to teach her as some would seem to advise.

4. The operation chosen should be free from untoward sequelae e.g. orchitis. This end will be best achieved by observing the recommendation under point 3.

Let us now consider the more modern operations in the light of these four essentials with the view of selecting one suitable to our purpose.

1. Mitchell Banks* Operation. This operation fulfils all the conditions except the first. Returns are frequent. On examining into the cause of these returns one is forced to the conclusion that the fault lies principally in the method of dealing with the Inguinal Canal. The closure of the External Ring by sutures is not sufficient. It is in this that the weakness of the operation lies. Statistics of a hundred cases are given by Mitchell Banks in the British Medical Journal, Dec., 1, 1888. He divides the results into three classes, - (1) Sound. Where there was no return. (2) Partial success. Where there was a recurrence; but to a less extent than before operation. (3) Complete failures. Where the state of matters was as bad as before operation. Of the hundred cases of moderate size, non-strangulated and strangulated Hernia combined - 77 were traced for a considerable period, when there were found 48 sound; 17 partial successes and

12 complete failures.

2. Ball's Operation. In this operation the method of dealing with the sac is objectionable. The preliminary ⁱtwisting of the sac is a most delicate operation, and I think the fear of rupturing it would prevent me from ever attempting this method. Further, by the twisting of the sac a most beautiful pouch of peritoneum is created proximal to the ligature. Then again the pouch must be anchored, though he anchors it where the abdominal wall is strong. Lastly, he has a whole conglomeration of tissues fixed in the inguinal canal, and he allows the patients up in ten days. On the whole therefore this operation had better be left in Dublin.

3. Czerny's Operation. All that need be said of this operation in passing is, that the closure of the External Ring by sutures is not sufficient to fulfil condition 1.

4. Professor George Buchanan's operation. This operation now is only of interest historically, for, the plugging of the Internal Ring, in light of modern knowledge, is ^{ke}lightly to do more harm than good.

5. Sir William Macewen's operation. The full discussion of this operation will be found at pages. 87, 88, 94, 95, 96 *et seq.*

6. Bassini's and Halsted's Operations. These two operations, somewhat similar may for the present purpose be classed together. Both interfere far too much with the natural tissues, an interference which I hope to prove is quite unnecessary. In both the cord is placed in a new situation-in Bassini's between the Conjoined Tendon and Poupert's ligament on the one hand, and the sutured External Oblique on

the other. In Halsted's, the cord lies on the surface of the External Oblique, its only coverings being fascia and skin. In both, the cord appears to me to be in an "ill situation"-liable in the first instance to damage from sutures or from cicatricial tissue, in the second from violence from without. As I have already pointed out the state of the canal is not the cause of the hernia. It has nothing more to do with the hernia than to give it lodging, just as the scrotum does. Why then do these men, in the process of their obliterating work, not include the scrotum also? It is not surprising that untoward sequelae, such as orchitis or atrophy of the testicle, are frequent from these operations. Dr. O'Connor says that, in 80% of his cases by Halsted's method, orchitis supervened; and, in 20 cases out of 129, atrophy of the testicle followed. (Lancet-Aug., '99) Further ventral hernia is not uncommon at the site of former operations by these methods. Truly it can be said of such a patient, as pointed out by Kennedy, that the last state of this man is worse than the first.

7. Kocher's Operation. This method is not difficult to understand and is apparently easy in execution. It fails, however, in regard to the ^{third} ~~first~~ consideration. By his incision no matter how small, in the muscular wall, he weakens that wall. He further anchors the pouch of peritoneum at this very spot. Thus, increased intra abdominal pressure, as caused by lifting a heavy weight, is brought to bear on the weakened part, or, exactly where it is not wanted. His method also of dealing with the Inguinal Canal is a totally insufficient one.

Kennedy's operation. This is a decided improvement on Kocher's inasmuch his method of dealing with the Canal is the better of the two. Still, Kennedy's method is not nearly so good as Macewen's; and his way of dealing with the sac, practically the same as Kocher's is open to the objection stated above (see above, no. 7).

The following statistics assist in showing the respective merits of the foregoing methods.

TABLE II.

Showing the number of recurrences after the operation for the Radical Cure of Oblique Inguinal Hernia by different methods. Kennedy.

Number of years which have elapsed since operation was performed	Kennedy			Bassini			Kocher			Macewen			Total number of cases.
	Total Number.	Number traced.	Recurrence.	Total Number.	Number traced.	Recurrence.	Total Number.	Number traced.	Recurrence.	Total Number.	Number traced.	Recurrence.	
1 to 2	10	10	0	-	-	-	-	-	-	-	-	-	10
2 to 3	24	29	1	2	2	2	-	-	-	-	-	-	26
3 to 4	20	15	0	1	1	0	-	-	-	1	1	0	22
4 to 5	14	8	0	7	5	1	-	-	-	-	-	-	21
5 to 6	2	2	0	-	-	-	3	3	0	4	3	0	9
6 to 7	-	-	-	-	-	-	-	-	-	11	5	1	21
over 7	-	-	-	-	-	-	-	-	-	4	2	1	4
Totals	70	54	1	10	8	2	3	3	0	20	11	2	103

TABLE iii.

Showing the mortality after operation for Non-Strangulated Abdominal Hernia.

Saunders' Atlas.

Year	Author	Operations	Deaths	Cause of Death
1895	Nordische Sammel- forschung (Bassini)	748	10	Two haemorrhages, 1 haemorrhage & sepsis, 1 bichloride poisoning, 1 chloroform poisoning, 3 degener- :ation of heart, 1 emphysema & bronchitis, 1 pneumonia.
1895	Beresowski (Kocher)	220	0	
1896	af Schultén (Bassini)	235	2	One phlegmon, 1 collapse, peri: :cardial adhesions.
1896	Simon (mostly Czer: :ny)	105	2	One aspiration pneumonia, 1 gang: :rene of the lung.
1897	Ludwig (Bassini)	143	1	Pyæmia.
1898	Slajmer (Wolfler)	250	0	
1898	Lebensohn (Kocher)	126	0	
1898	Borelius (Bassini)	147	1	Cardiac paralysis 8 days after the operation.
1898	Iwensen	102	0	
1898	Maydl	190	2	One phthisis, 1 broncho-pneumonia
1899	Rotter (Bassini)	250	1	Erysipelas.
1899	Franz (Bassini)	100	0	
1899	Bull and Coley (Bassini)	917	5	One double pneumonia, 1 periton: :itis, 1 pericarditis & pneumonia 1 omental haemorrhage, 1 shock.

Year	Author	Operatns	Deaths	Cause of Death
1899	Bloodgood (Halsted)	395	2	One diphtheritic colitis, 1 pulmonary embolism.
1899	Galeazzi (Bassini Kocher)	1400	2	Accidental diseases having no connection with the operation.
1900	Kirschkopf (Kocher)	191	0	
1887	Macewen 1.	65	0	
	Total	5484	28	

TABLE IV.

Tabulated Review of the number of recurrences after Radical Operations.

Year	Author	Cases Traced*	Percentage of Returns	Variety of Hernia
1887	Macewen 1.	65	0	Strangld. & non strgld. Inguinal
1895	Beresowski (Kocher)	152	10.8 %	All varieties together.
1895	Nicoladoni (Bassini)	49	6.1 %	Not stated.
1896	af Schulten	112	1.5 %	All varieties together.
1896	Simon (Czerny)	109	11.9 %	Inguinal & Femoral Hernia.
1898	Slajmer (Wolfler)	76	9.2 %	Inguinal Hernia.
1898	Lebensohn (Kocher)	83	4.8 %	Inguinal Hernia.
1898	Brenner	169	5.9 %	Inguinal Hernia.
1898	Bull and Coley	618	1.9 %	Not stated.
1899	Franz (Bassini)	31	6.4 %	Inguinal Hernia.
1899	Galeazzi	840	5.71 %	Inguinal Hernia.
1900	Hirschkopf	83	1.2 %	Inguinal & Femoral Hernia.
1901	Coley (Bassini)	531	1.3 %	Inguinal (500); Femoral (31).

* These figures represent the number of cases subsequently observed in which at least one year had passed since the operation.

1. I have included in the table the results of this author, to give it completeness.

From the foregoing tables it is seen at a glance that the mortality rate is very low, ranging from 0%, Macewen's and Kocher's, to 1.34 %, Bassini. Regarding returns, in table ii, they are at the rate of:- 1 in 70 (Kennedy); 2 in 10 (Bassini); 0 (Kocher); 2 in 20 (Macewen). In his own cases Sir William Macewen has had no returns. With a recurrence therefore of 10% as in the table above, it leads one to ask the question, was the operation correctly performed? In the ~~table~~ table the recurrences are at the rate of 1.3 % to 6.1 % (Bassini); 1.2 % to 10.8 % (Kocher); 11.9 % (Czerny); 9.2 % (Wolfler); 0 % (Macewen). Here again it is seen that the results vary according to the operator. In the Rev. Med. de la Suisse Romande, Jul., 97, Roux Clinique-it is stated that the results of 324 operations give a percentage of relapses after Bassini's operation, three times as great as that following the use of Ferrari's method-apparently similar to that which we know as Mitchell Banks' operation.

Thus all the operations described, save one, are defective inasmuch as they fail as regards:-

1. The treatment of the sac. Czerny and Mitchell Banks by simply amputating the sac leave a pouch of peritoneum which invites to a recurrence. In the operations of Ball and Buchanan the sac, left in the canal, forms a wedge and therefore a dilator.
2. The closure of the canal. Mitchell Banks, Czerny, Ball, are all defective in this respect, and in Kocher's operation the suturing is quite insufficient.
3. Complications. In Bassini's and Halsted's operations the cord is liable to injury. That this occurs, is proved by the experien

ence of several surgeons already mentioned. Further, in Bassini's operation the abdominal wall is weakened and ventral hernia may occur.

The ideal operation must provide under:-

1. The treatment of the sac-a peritoneal surface which offers no inducement to a hernial protrusion.
 2. Closure of the canal. Permanency in the complete closure of the Internal Abdominal Ring, and in the accurate approximation of the parietes of the Inguinal Canal.
 3. Complications. That the foregoing be effected ~~etc~~ without detriment to the vitality of the spermatic cord and testicle, and without impairment of the tissues comprising the abdominal wall.
- The operation I have practised and which will shortly be described, seemed to me to fulfil the requirements previously mentioned, inasmuch as it did not interfere with the spermatic cord. The abdominal wall was not weakened in any part, the sides of the canal were brought into close apposition. The treatment of the sac, however, left something to be desired for although the procedure was simple and in its result as satisfactory as any described in the foregoing operations, yet it failed to fulfil the first requirement-that is to say, the sac so treated presented a concavity on its abdominal aspect, and as adhesions formed between the surrounding tissues and the stump the latter became anchored at the side of the Internal Abdominal Ring. Thus at the very point where the bowel had made its escape, there remained a pouch inviting to a return of the hernia. A careful study of the subject convinced me that the only oper:

tion which fulfils all the requirements is that devised by Sir William Macewen. The accounts of this operation vary so widely in different text books, that one easily fails to appreciate Macewen's method of treating the sac. The text books at my disposal differ in their accounts of (a) the folding of the sac, (b) the position assumed by the sac when folded, and (c) the method of fixing the sac in its new position. It is only recently after studying Sir William Macewen's description of his operation, in the British Medical Journal, that I clearly understand and appreciate his method, and though all along I have adopted his treatment of the canal it is only recently I have adopted his operation in its entirety. I will therefore now detail the operation I have performed and compare it with that devised by Sir William Macewen, indicating the advantages of Macewen's method over the former and ^{thereby} justify my preference for the latter.

The success of this, as of any operation, depends a good deal on the attention paid to every detail from the very commencement of the operation till convalescence is well established. We will therefore consider:-

Preparation of the Patient. This part is of very great importance alike as regards the successful result of the operation, and the successful administration of the anaesthetic.

(a) Preparation for operation. In the morning preceding the day of operation the patient should have a hot bath and be well scrubbed with soap and water. This ensures a clean skin and a healthy action of the same. Following upon the bath, the parts for some distance around the Inguinal Canal are shaved, then

well washed with soap and water, and thoroughly scrubbed with turpentine then methylated spirits then ether. A moist carbolic dressing 1-40 is now applied. In the evening this is removed and the parts again cleansed by soap and water, turpentine, spirits, ether, and the 1-40 carbolic dressing reapplied. On the morning of the operation this process is again gone through but applying this time a carbolic dressing, strength 1-20. This routine is gone through in all cases except in children. In their case a moist boracic dressing takes the place of the carbolic one until half an hour before the operation when a 1-40 carbolic dressing is applied. This change in the routine is made necessary by the fact that children are very susceptible to the poisonous effects of carbolic acid.

(b) Preparation for the anaesthetic. A general careful examination of the various organs of the body is made and noted. The urine is analysed and the analysis noted. On the day before the operation the patient has a light dinner. In the afternoon from half an ounce to an ounce and a half of castor oil is administered. Any food given after the administration of the oil should consist of a cup of tea, or bovril or thin soup. Early in the morning of the day of operation an enema should be given to ensure a thorough clearing out of the lower bowel. No food is allowed on the morning of the operation. Professor George Buchanan was accustomed to give one quarter of a grain of morphia before the operation in order to lessen or avoid sickness. I cannot say that this is good practice. These details should be seen to by the practitioner himself if at all possible, and,

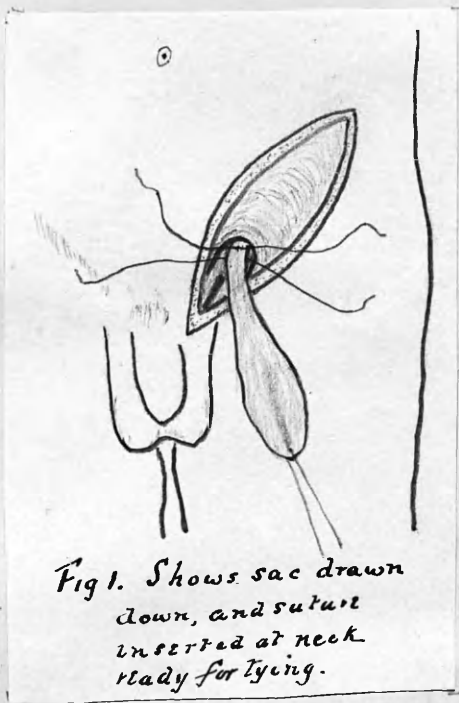
most certainly he should personally attend to the sterilisation of all instruments, sutures, ligatures, dressings &c required. The practitioner about to perform this operation requires assistance and the question often is, not how many assistants does he need, but how many can he get. In my practice I find two assistants sufficient. My partner administers the anaesthetic and the chemist gives what other assistance is necessary. One or two trained nurses are of very great help, but when for financial reasons this is out of the question a handy woman often does very well. The room-for the time being the theatre-should be thoroughly clean, well warmed and lighted. Every thing necessary for the operation should be at hand, and all care taken to render the hands and arms of the operator and his assistants as aseptic as possible.

2.Operation. The patient being thoroughly anaesthetised the operator takes his stand on the hernial side of the patient. The dressings are removed and towels rung out of 1-40 carbolic solution are placed above and below the site of incision.

An incision is made about three inches in length over the tumour, or, if the hernia be reduced, over the Inguinal Canal so that the centre of the incision corresponds to the centre of the External Abdominal Ring. A three inch incision is generally sufficient, but if necessary it can be increased at either end. Any bleeding points being secured and the wound mopped dry with sterilised gauze pads, the tissues are carefully dissected till the sac and external ring are well exposed. It is important to at once secure any bleeding point and to keep the wound dry. Should the sac contain bowel this is reduced and the sac opened

The opening of the sac must be done in every case to ensure that it is really empty. Should omentum be present to any extent it is well to ligature it high up, cut away the distal portion, and return the stump to the abdominal cavity. It is however rare to find much omentum in operable reducible herniae.

The sac, if free from adhesions, is now lifted and drawn well out

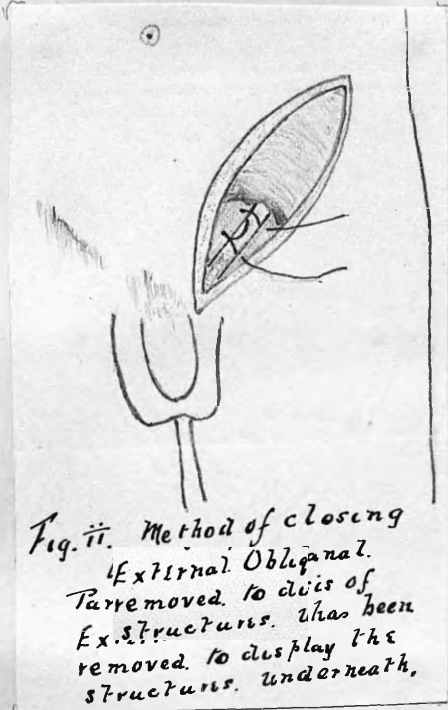


of the wound. A needle, threaded with a double cat gut ligature, is passed through the neck of the sac as high up as possible, and tied on both sides. Where the neck of the sac is thickened or redundant, it may be necessary to pass several sutures through it, for, by so doing, one lessens the amount of puckering or folding. The sac is now cut through about half an inch distal to the ligature. The stump is examined and if found correct is returned to the abdominal cavity.

In certain cases the sac will be found adherent to the surrounding tissues, either by (a) recent soft adhesions, or by (b) old standing firm adhesions. (a) In these cases the adhesions are easily separated and broken down, and, having so separated the sac, proceed as above indicated. (b) Here we have firm dense adhesions to deal with, and the dissecting out of the sac is a matter of great difficulty or altogether impossible. In such cases it is well to free the neck of the sac, ligature as high up as possible, and remove with scissors as much of the fundus of the sac as is not bound down by firm adhesions, carefully

securing any bleeding points. By so doing one interferes but little with the adjacent tissues. There is little or no risk of damaging the spermatic cord. There is no risk of orchitis or atrophy of the testicle being the outcome of the operation. If the veins around the spermatic cord are varicose, and form a considerable swelling, it is well to remove some of them between ligatures. Care however must be taken to in no way injure the spermatic cord or interfere with its vitality.

The next step in the operation is the closure, or rather, lessening the calibre of the inguinal canal. As already stated Mac-



cewen's method is by far the best, and it is this which I always employ. A Macewen's needle is threaded with a strong catgut or silk, - I prefer catgut - and a forefinger being introduced into the inguinal canal, the Conjoined Tendon is made out. The needle carrying the catgut is passed through the tendon as high up as possible from within outwards. One end of the suture is caught and the needle withdrawn. The point of the needle is now made to pass through the same structure close to the in-

ternal pillar of the ring. The free end is again caught and the needle withdrawn. Thus on the inner side there are two free ends and a loop, the loop being under the Conjoined Tendon. The two free ends are now passed through Poupart's ligament from within outwards, each fairly opposite its fellow on the inner side. Care must be exercised not to damage the spermatic cord or vessels. The two free ends are now drawn tight and tied in

a reef knot. The calibre of the canal is thus lessened, and its oblique direction maintained, or, if already lost, restored. In the congenital variety, the technique is the same as just described except that, after the stump is returned to the abdominal cavity, a portion of the process of peritoneum is retained to form a Tunica Vaginalis Testis. The excess of peritoneal process is cut away and the mouth of the tunica vaginalis closed by catgut sutures. The external wound is now closed by interrupted catgut sutures. No drainage is required. The dressing I employ is, two or three layers of cyanide gauze, gamgee tissue and a bandage. In young children the same dressing is used, means however being taken to ensure that the dressings are not contaminated by urine. The operation over, the patient is placed in bed where he is kept for six weeks. The dressings are removed in from twelve to fourteen days, when any superficial stitches not absorbed are removed. A fresh dressing is applied which may be dispensed in another ten days or so. A truss is not necessary unless the patient has to return to arduous labour where straining is the order of the day. In such cases I advise the wearing of a truss for two or three months. The material used to draw the sides of the canal together was, in the earlier cases, silk. Latterly, however, I have used chromic catgut. This catgut I obtain from Messers Allen & Hanbury, London. It is prepared according to the formula given by Sir William Macewen at the meeting of the British Medical Association at Oxford, 1904.

There is an American objection to Macewen's method of dealing with the canal and it is "that a fresh protrusion eas:

ily descends along the cord as it passes through the abdominal wall directly instead of obliquely." Wharton and Curtis. If this part of the operation be carefully performed and the Conjoined Tendon approximated to Poupart's ligament, the direction of the canal cannot be otherwise than oblique, unless Poupart's ligament in America is a very different structure to Poupart's ligament on this side of the water. Some operators, mostly American, object to the six weeks confinement to bed as being too long, putting forward in support of their objections, a lot of sentimental nonsense, such as-it keeps the breadwinner too long away from his family. They allow their patients up in two or three weeks. Such practice seems to me to be seriously in error. It is well known, physiologically and pathologically, that cicatricial tissue is only firm at the end of six weeks. At least in adult life this is so. Therefore to allow a patient, the subject of this operation, to be out of bed at an earlier date, seems to me to court disaster. In the series of cases which follows, the method of treatment I have described was carried out in its entirety. All the herniae were reducible, and of the complete oblique inguinal variety.

TABLE v.

No.	Initials	Age	Sex	Occupation	Form	Side	Duration	Remarks
1	D.F.	44	M	Labourer	Acquired.	L	18 years	Fatty tumour in Inguinal canal, in addition.
2	J.M.	45	M	nil	"	L	2 months	
3	F.M'R.	32	M	"	"	R	2 years	
4	J.C.	6	M	Scholar	"	R	4 years	Hernia large.

No.	Initials	Age	Sex	Occupation	Form	Side	Duration	Remarks
5	F.M*I.	35	M	Miner	Acquired	R	8 months	
6	J.P.	33	M	Storeman	Cong.	L	2 years	
7	E.R.	12	M	Scholar	Acquired	R	Lifelong	
8	W.D.	25	M	Smith	"	L	2 years	
9	G.L.	49	M	Gasfitter	"	R	6 months	
10	J.T.	60	M	Sailor	"	R	3 "	
11	C.L.	18	M	Turner	"	R	1½ years	
12	P.o'H.	21	M	Labourer	"	R	4 years	
13	J.M.	25	M	"	"	R	9 months	
14	G.M'C.	8		Scholar	Cong.	L	Lifelong	
15	J.K.	39	M	Carter	Acquired	R	10 years	Adhesions firm.
16	D.M'G.	20	M	Labourer	"	R	1 year	
17	J.M'N.	4	M	nil	Cong.	L	Lifelong	Large hernia.
18	J.K.	20	M	Carter	"	R	4 years	
19	R.H.	48	M	Beadle	Acquired	R	1 year	
20	W.A.	17	M	'Prentice	"	R	9 months	
21	D.D.	54	M	Bl'r-M'kr.	"	R	5 months	
22	S.W.	43	M	Steel Wrkr.	"	R	7 years	
23	W.M.	25	M	Furnaceman	"	R	1½ years	
24	J.M.	32	M	Labourer	"	R	12 years	
25	P.H.	19	M	Vanman	"	R	2 weeks	
26	J.L.	26	M	Engineer	"	R	3 months	Hydrocele in addition
27	W.G.	27	M	Tanner	"	R	3 years	
28	W.M'D.	46	M	Waiter	"	R	3 weeks	
29	J.B.	38	M	Miner	"	L	2½ years	
30	P.G.	40	M	Labourer	"	R	9 months	

No.	Initials	Age	Sex	Occupatn.	Form	Side	Duration	Remarks
31	J.C.	34	M	Carter	Acqd.	L	12 years	Recurrence 16 months after op. as Buboncl
32	J.G.	49	M	Blr Maker	"	R.	4 months	
33	J.M.	21	M	Machinst.	"	R	13 months	
34	J.C.	36	M	Labourer	"	R	19 months	
35	C.C.	2	M	Nil	"	D	6 months	Both sides operated on
36	J.M.	19	M	'Prentice	"	R	5 months	
37	S.F.	17	M	Grocer	"	R	18 months	
38	G.T.	34	M	Holder on	"	L	3 years	
39	M.W.	20	M	Labourer	"	R	4 "	
40	J.C.	32	M	"	"	R	10 mnths.	
41	J.G.	40	M	"	"	R	1 year	
42	J.C.	60	M	Nil	"	R	7 years	Varicocele in additn.
43	W.P.	38	Turner M	"	"	R	10 mnths.	
44	Mrs. S.	50	F	Housewife	"	R	4 years	
45	J.C.	5½	M	Nil	Cong.	L	5 years	Omentum present
46	J.M'D.	23	M	Labourer	Acqd.	R	1 year	Phimosis & circumcism.
47	J.Q.	20	M	Fndry man	"	L	8 mnths.	Hydrocele also
48	H.A.	19	M	Draughtsmn	"	D	9 mnths.	R op.on; L, 6 m.later
49	D.H.	49	M	Engineer	"	R	18 mnths	
50	H.P.	28	Draughtsman	"	"	R	6 months	
51	J.G.	2	M	Nil	Cong.	R	16 mnths	Phimosis & circmcsm.
52	W.M.	28	M	Miner	Acqd.	R	10 mnth.	Recurred in 8 months. No ret.for 3 yrs after second operation
53	J.G.	19	F	Domestic	"	L	2 years	

No.	Initials	Age	Sex	Occupation	Form	Side	Duration	Remarks
54	J.C.	39	M	Ironworker	Acqd.	L	2 years	
55	J.H.	49	M	Fitter	"	R	3½ years	
56	R.S.	20	M	Engineer	"	R	1 year	
57	J.C.	32	M	Miner	"	R	4 years	
58	M.C.	26	F	Housewife	"	R	6 months	
59	W.P.	36	M	Gardener	Cong.	L	8 weeks	
60	H.M'A.	38	M	Draughtsmn	Acqd.	D	1 year	L.op.on; R.6 mths.latr
61	J.F.	32	M	Watchman	"	R	2 years	
62	A.M.	49	M	Carter	"	R	2 years	
63	M.E.	41	F	Weaver	"	D	2 "	
64	J.J	14	M	Scholar	Cong.	D	4 "	Phimosis & circmsn.
65	H.M'L.	36	M	BrassFinisher	Acqd	R	3 "	
66	J.H.	9	M	Scholar	Cong.	R	6 "	
67	A.O.	18	M	Labourer	Acqd.	D	2 "	
68	T.Y.	28	M	Physician	"	L	Years	Also varicocele
69	A.K.	19	F	Shopgirl	"	L	2 years	
70	R.M'C.	19	M	Patternmkr	"	R	4 years	
71	R.M'K.	21	M	Shipscook	"	L	2 mnths	
72	C.C.	35	M	Labourer	"	R	5 years	
73	J.S.	31	M	Bookfinishr	"	L	5 mnths	
74	J.M'K.	24	M	Labourer	Cong.	R	6 weeks	
75	M.R.	42	F	Housewife	Acqd.	L	1½ years	
76	E.C.B.	5	M	Nil	Cong.	R	1 year	
77	R.C.	5	M	"	"	R	5 mnths	Death from Pneumonia 3 wks after operation

No.	Initials	Age	Sex	Occupation	Form	Side	Duration	Remarks
78	B.B.	17	M	Ironworker	Cong.	R	10 mnth	
79	W.M'K.	39	M	Fireman	Acqd.	L	9 weeks	
80	W.D.	7	M	Scholar	Infantile	L	5½ years	
81	J.W.	35	M	Labourer	Cong.	R	2 years	
82	J.S.	8	M	Scholar	"	R	3 weeks	
83	P.M'A.	50	M	Engineer	Acqd.	R	1½ years	
84	J.S.	30	M	Labourer	"	R	1 year	
85	T.H.	38	M	"	"	L	4 years	
86	O.C.	40	M	Carter	"	D	3 years	Admitted for R.Strngd hernia;L.reducible op. on 1 month later
87	T.A.	18	M	*Prentice	"	L	6 months	
88	J.H.	32	M	Railwayman	Cong.	D	6 months	
89	H.M.	56	M	Labourer	Acqd.	R	2 months	
90	J.H.	4	M	Nil	Cong.	R	4 years	
91	W.F.	40	M	Turner	Acqd.	R	1¼ years	
92	A.D.	2½	M	Nil	Cong.	R	4 months	Phimosis & circmsn.
93	M.M.	1	M	"	"	R	8 months	"
94	J.E.	6	M	"	"	L	2 months	"
95	J.M.	28	M	Furnaceman	Acqd.	R	1 year	
96	P.H.	24	M	Labourer	"	R	9 months	
97	J.W.	14	M	Scholar	"	R	1 year	
=====								
98	M.M'N.	50	F	Housewife	Acqd.	L	Strangulated. Hernia of Verm :form Appendix. (see page 8)	

In all the foregoing cases I was interested as medical attendant, operator, or assistant at the operation. The majority of the operations were performed in the Glasgow Royal Infirmary. My sincere thanks are due to "my old Chief", Dr. D.N. Knox, Professor of Clinical Surgery, Saint Mungo's College for giving me the opportunity of practising this method while I was Resident Surgeon in his wards. I am still further indebted to him for permission to make use of his record of 200 cases.

Most of the figures relating to my series of cases have already been given. Suffice it to say here that the mortality was 1 %, the cause of death in the single case being acute pneumonia-and that the returns, so far as could be ascertained, were 2%. Regarding returns, it is a difficult matter to give full details because in hospital practice one readily loses sight of one's patients. The system which obtains at the Royal Infirmary in Glasgow is, however, of great assistance in this respect. It is that, should a patient return to the Institution with hernia or other surgical ailment, he is placed in the wards in which he was formerly treated. This system therefore enables one to secure any cases of "return" which may seek readmission. Further, most of the patients were kept attending at intervals and did attend the hospital for a year. A year's time is, by general consensus of opinion, a fair test of the genuineness of the cure. I have however included in my "return" cases one which occurred 16 months after operation. I have had the last 27 cases under observation for a period of several years. In none has there been any symptom of recurrence. In the 100 cases 14 were found to be congenital hernia, the others acquired. It is further

worthy of note that sepsis was marked by its absence, and I am convinced that such absence enhances the value of the operation. Of untoward sequelae there were none.

TABLE vi--DR. KNOX' CASES.

No. of Cases	Sex	Side	Deaths	Recurrences
200	M. 162	R. 159	2	5
	F. 38	L. 33		
		D. 8		

The above were all Oblique Reducible Inguinal Hernia.

* TABLE vii--DR. STILES' CASES (In Children).

No. of Cases	Sex	Side	Deaths	Recurrences
360	M. 90%	R. in Boys 3	5	4
	F. 10%	out of 4. In Girls 2 out of 3		

Of these cases 4.2% were strangulated; and 2 of the recurrences, both since cured by a second operation, occurred in the strangulated cases. The others were reducible, so that Dr. Stiles percentage of returns in the reducible varieties is rather under 2.

TABLE viii--Summarising TABLES v, vi, and vii.

Total No. of Cases	Total Deaths	Total Recurrences
660	8; or 1.2%	11; or 1.6%

I regret exceedingly that I am unable to furnish results of Macewen's operation of a later date than those published in the Journal already referred to. And yet because that distinguished surgeon has seen no reason to change his method, except in minor details, one is confident that the results continue to

be as satisfactory as before. In his paper, Sir William Macewen gives the results in 49 cases of the radical cure for Inguinal Hernia, and in 16 subsequent to the relief of strangulation-in all 65 cases. There were no deaths and the operation was successful in all except one patient who developed an acute attack of Hydrocephalus which lasted some weeks. As a consequence his general vitality was reduced and the healing process in abeyance.

TABLE ix--Sir William Macewen's Cases

Time elapsed since Operation	Cases traced
Under 6 months	7
From 6 to 10 months	9
1 year	6
18 months	3
2 years	6
3 years	5
4 years	1
5 years	1
	38

All these patients when last examined were found to have their rings firm. There was no impulse on coughing. Out of the 48 cases in which the operation had been performed, only one was found afterwards to wear an external pad. The parts however were firm. The operation therefore devised by Macewen yields results which are far above those from any other operation, results in fact on which it is impossible to improve.

The success attendant upon the operation I have performed is good, viz., a mortality of one per cent and a traceable return of two per cent; but, a mortality of no per cent, and a return of no per cent is so much better that, after a careful study of Sir William Macewen's method, and benefiting by his experience, I had no hesitation in laying aside my former method of treating the sac and adopting his method altogether.

Now why is it that Macewen's operation gives better result than any other? There are several reasons.

1. By his treatment of the sac we have (a) a refreshed surface on which the pad lies; (b) this refreshed surface surrounds the internal abdominal ring; (c) the folded up sac being placed on, and fixed to this refreshed surface, quickly unites with the surrounding tissues, for peritoneum, as is well known physiologically, heals very rapidly if the surfaces are fresh; (d) there is therefore a firm mass of tissue at this side forming a boss or bulwark. "This bulwark has its convexity presenting backwards towards the abdomen while the base rests on the abdominal walls surrounding the circumference of the internal abdominal ring. This not only protects the ring but sheds the intestinal wave backwards away from the ring." In the operation which I have practised and in others where the treatment of the sac was similar there remains a funnel shaped puckering of peritoneum, the apex of which presents in or at the internal abdominal ring. As Macewen puts it "when the liquid movement of the intestine as it glides over the peritoneum, is thrown into the form of a wave by the sudden impulse of coughing or straining, it is carried into the pouch which guides it into the canal, where it

expends its force. It thus acts as a wedge widening and tending to open up the canal.

2. By Macewen's treatment of the canal we have the valve like condition restored and the oblique direction maintained. In short, there is a return to the normal anatomical and physiological condition.

3. By the after treatment adopted the healing process is allowed to be complete ere strain is thrown on the cicatrix.

Thus when increased abdominal pressure is brought to bear on the internal inguinal ring it is met by and defied by a natural valve like canal supported by a firm unyielding buttress.

Objections have been raised to this operation but they can readily be answered and that in few words. First. As regards the treatment of the sac, some authors deny that the sac remains as a buttress for any length of time, and by being fixed at the internal ring, they believe it thereby induces to recurrence. All that need be said, in reply to this objection, is that Sir William Macewen is in possession of a specimen of the inguinal canal and adjacent peritoneum removed from a patient who died some years after being operated on by this method.

In this specimen the buttress still remains as a small knob or button whose convexity projects backwards, thus.

The canal also is normal in size, and the walls are firm.

Second. As regards the treatment of the canal. The only objection raised against Sir William's method has already been dealt with. Third. The objection to the method of after treatment has also been discussed.

In the preceding pages there have been

mentioned and discussed some of the many methods of Radical Cure. Two operations stand out preeminently in the history of this cure- Wood's and Macewen's. To Wood we are indebted for first placing the operation on a sound anatomical basis. To Sir William Macewen, on the other hand, belongs the honour of devising and performing an operation which is sound in theory and practice, and which fulfils all the conditions I have enumerated, viz.,

1. It yields permanent satisfactory results.
2. It may be easily and quickly performed.
3. It interferes but little with the tissues, detracting nothing from their natural strength but rather increases it.
4. It is free from untoward sequelae.

My experience, therefore, is that this operation is the one best suited to the requirements of the general practitioner and to the interests of his patients.

(For Authorities consulted in the preparation of the foregoing Thesis--see below).

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