

cially upon the methods of radical cure. In the second month of fetal life a process, the *processus vaginalis peritonei*, is found evaginated from the peritoneum of the body cavity and accompanying the gubernaculum to

these structures. Its commencement, the internal abdominal ring, is an aperture in the transversalis fascia normally just large enough to permit the passage of the cord. Its termination, the external abdominal ring, is a

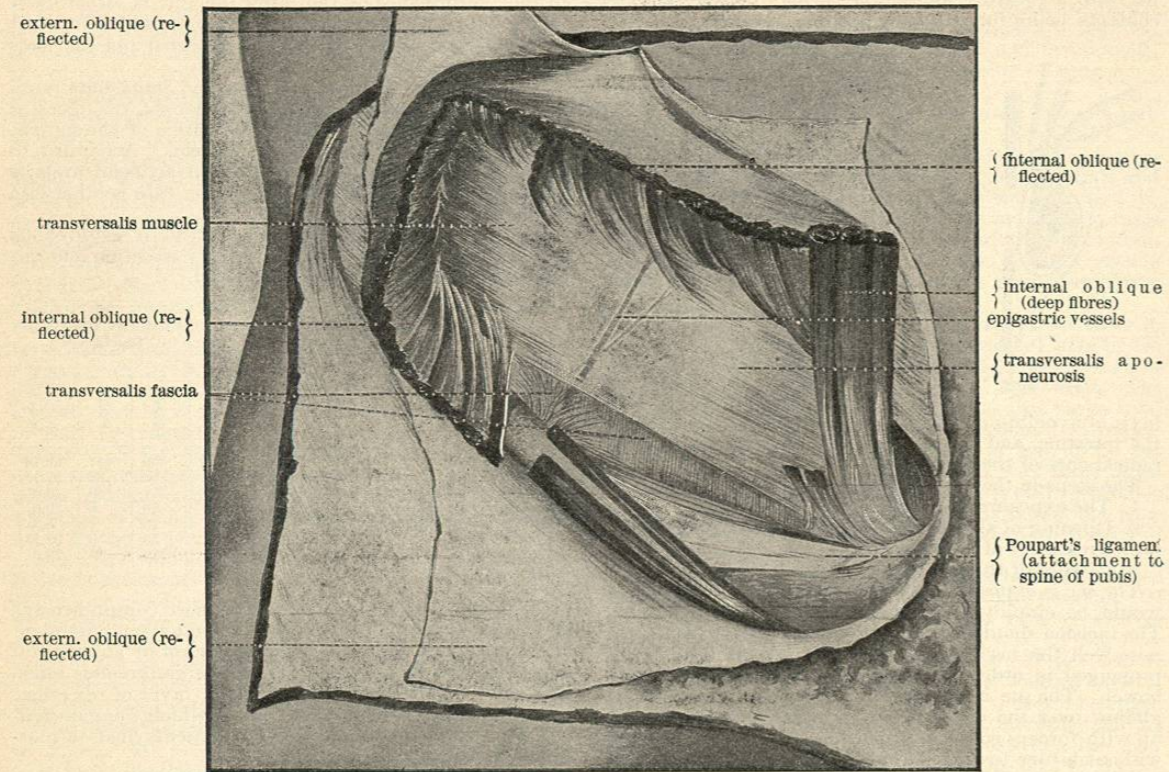


FIG. 2623.

that part of the skin of the inguinal region which becomes the scrotum in the male and the labium majus in the female.

Later the testicle descends alongside of this process to the scrotum, and the distal portion of the process forms the *tunica vaginalis testis*. The proximal portion ordinarily becomes obliterated, but if it remains open the tunica vaginalis continues in communication with the peritoneum, and a portion of the abdominal contents may descend through it. Such a protrusion is known as a congenital hernia, even if it does not descend until adult life. If the process remains open in the female it is known as the canal of Nuck.

Incomplete or partial obliteration of the process gives rise to cystic swellings, known as hydroceles of the cord or of the round ligaments, as may be.

The abdominal wall in this region, omitting the superficial structures, consists of the following muscular and aponeurotic layers from without in: the aponeurosis of the external oblique, the internal oblique and transversalis muscles, and the transversalis fascia. At the mesal part of this region the rectus abdominis is inserted into the pubis on a plane dorsal to the structures enumerated, with the exception of the transversalis fascia, which sends a prolongation over the dorsal surface of the muscle.

The general arrangement of these structures is shown in the accompanying figures (Figs. 2623 and 2624). The inguinal canal, which contains the gubernaculum and processus vaginalis peritonei in the fetus and the spermatic cord or round ligament in the adult, and through which the testicle passes in its descent, is found between

slit-like aperture in the aponeurosis of the external oblique muscle. The internal ring is situated about 4 cm. laterad to the spine of the pubis and about 1 to 1.5 cm. above Poupart's ligament, being suspended as it were in the transversalis fascia (Fig. 2624), which is developed in curving fibres on its mesal and lower aspect, forming the inguinal ligaments of Henle. It lies thus about half-way between the anterior superior spine of the ilium and the spine of the pubis, and a finger's breadth above Poupart's ligament. The deep epigastric artery passes upward at the mesal border of the ring between the transversalis fascia and the peritoneum. The external ring lies just above and laterad to the spine of the pubis.

The inguinal canal is about 3.5 cm. long and is slightly longer in the female than in the male. At its commencement its ventral wall is formed by the thick fleshy fibres of the internal oblique and the transversalis muscles, and its dorsal wall by the transversalis fascia. At about its middle its dorsal wall is still the transversalis fascia, but the internal oblique and transversalis muscles are above it and its ventral wall is formed by the aponeurosis of the external oblique. At its termination it escapes through the external oblique, and its dorsal wall is here formed by transversalis fascia, which for the last centimetre is strengthened by the conjoint tendon and the triangular ligament. In the final two-thirds of its course its floor is formed by the shelf of Poupart's as it broadens into Gimbernat's ligament. The greater part of the dorsal wall is thus seen to be formed by the transversalis fascia, and the importance of this as a safeguard cannot be overestimated. It is in fact a special development of the trans-

versalis fascia, and by some it has been described as a part of the conjoint tendon, although it is entirely distinct from this structure. Its mesal portion consists of strong vertical fibres, its lateral of the fibres before mentioned as curving about the internal ring. Between these stronger portions is a weaker one, lying as a rule on the mesal side of the deep epigastric artery, and at this part direct inguinal herniae occur (Fig. 2624). The transversalis muscle is very poorly developed in this region, and consists chiefly of an aponeurosis, the fibres of which pass horizontally across to their insertion in the ventral rectus sheath, and as a rule are wanting for some distance above Poupart's ligament (Fig. 2623). The internal oblique muscle, on the other hand, consists of a thick, fleshy mass of fibres which, unless displaced by a hernia or ill developed, completely protect the internal ring and pass to their insertion with a general direction parallel to Poupart's ligament, only rising sufficiently to allow the cord to pass below them. The conjoint tendon consists of a few fasciculi derived from the opposed surfaces of the internal oblique and transversalis muscles, and passes on the deep surface of the former muscle to be inserted by tendinous fibres to the crest and ilio-pectineal line. This structure is wholly concealed by the internal oblique, and its insertion seldom extends for more than a centimetre laterad to the spine of the pubis. Although given considerable prominence in most text-books, it is a negligible factor in procedures for the radical cure of hernia.

An oblique inguinal hernia is enclosed in the same layers of fascia as the spermatic cord. These layers from within out are: the infundibuliform fascia derived

same, with the exception that the transversalis fascia itself is substituted for its infundibuliform process.

The relations of the spermatic cord to the sac are important. The structures of the cord are usually somewhat spread out on the surface of the hernia unless the latter is small or a direct one. The vessels lie on the lateral and the vas deferens on the latero-dorsal aspect of the sac. In a direct hernia the entire cord is on the lateral aspect of the sac. In congenital hernia the cord is more closely adherent to the sac than in acquired hernia. The importance of the peritoneal fosse on the internal abdominal wall as etiological factors in the production of hernia seems to the writer to be exaggerated. The presence of muscular or fascial weaknesses or dimples is of far greater importance, inasmuch as the peritoneum is a highly elastic and distensible membrane, and when unsupported by other structures offers little resistance to pressure from within. For the same reason the treatment of the neck of the sac is of minor importance in the operation for radical cure.

*Varieties of Inguinal Hernia.*—Inguinal herniae are divided into *direct*, which is always acquired, and *indirect* or *oblique*, which may be congenital or acquired (see Anatomy). In a direct hernia the protrusion is mesal, while in an indirect hernia it is lateral to the deep epigastric vessels. If the protrusion passes through the external abdominal ring into the scrotum or labium majus it is termed a complete or scrotal hernia; if not, an incomplete hernia or bubonocoele.

*Direct Inguinal Hernia.*—Direct inguinal herniae constitute seven per cent. of all inguinal herniae. They are more common in men than in women and are seldom

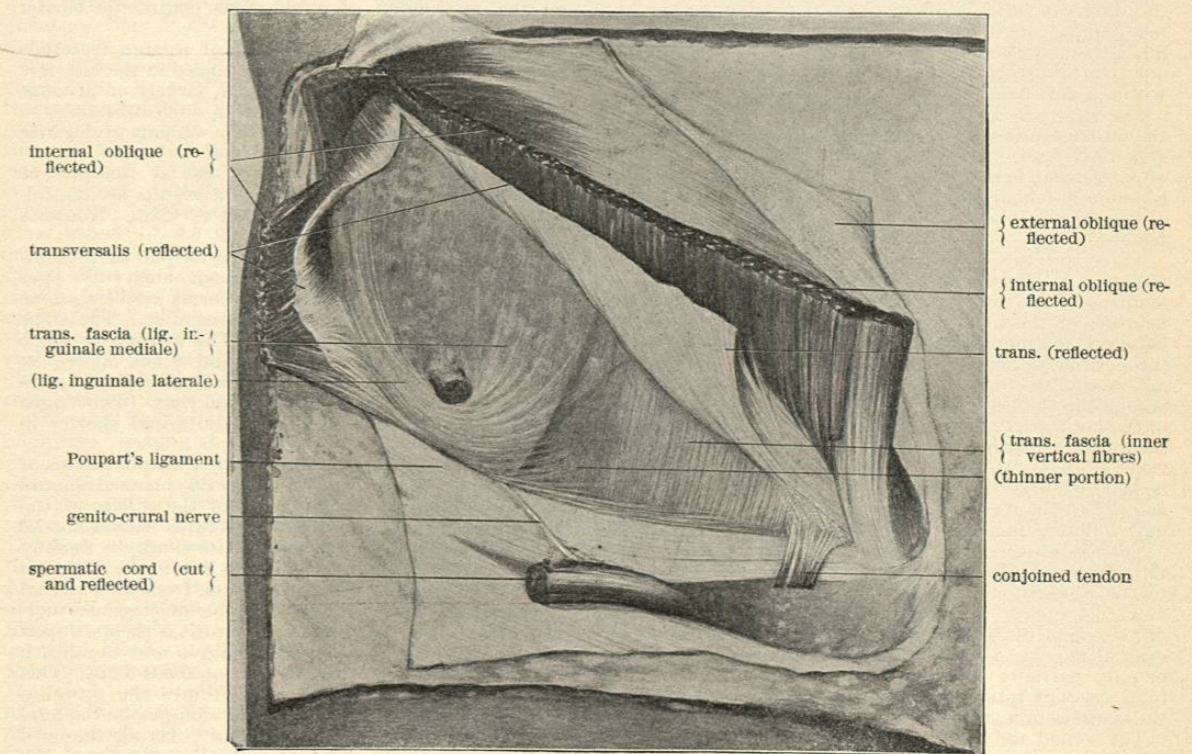


FIG. 2624.

from the transversalis fascia; the cremasteric fascia and muscle derived from the internal oblique; and the inter-columnar fascia derived from the external oblique. These layers must be divided in separating the sac from the cord. The fascial coverings of a direct hernia are the

seen in children. They are always acquired. They are seldom complete and may usually be recognized by their globular shape and by the fact that they appear to bulge directly through the abdominal wall.

*Indirect Inguinal Hernia* constitutes the greater part

(ninety-three per cent.) of inguinal herniæ. The hernia may descend into the unobliterated processus vaginalis either in the male or in the female, being then called congenital hernia (Fig. 2625, A); or its sac may be formed

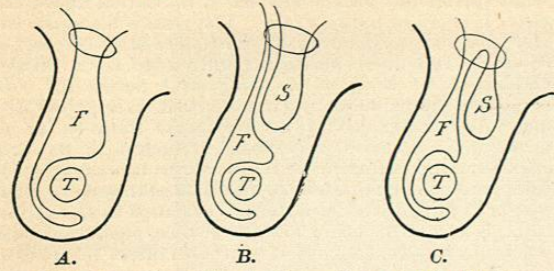


FIG. 2625.—Formation of Sac in Congenital and Infantile Hernia. A, Congenital hernia; B and C, infantile hernia; F, funicular process; S, sac; T, testicle.

by the protruded peritoneum of the abdomen—acquired hernia. The proportion of congenital to acquired hernia is difficult to state, as the diagnosis is made only by operation. A study by Bull and Coley<sup>10</sup> of five hundred cases of inguinal hernia operated upon in children under fourteen years of age showed that less than fifty per cent. were congenital.

A form of hernia known as *infantile hernia*, although always acquired, is sometimes confounded with congenital hernia. The hernial sac in these cases is formed from the parietal peritoneum and is pushed down alongside of an open or partially obliterated funicular process; the different varieties of this form depend upon the extent and the site of the obliteration (Fig. 2625, B and C). Since the unobliterated funicular process is often spread out over the hernial sac, the latter appears as a sac within a sac; hence the term *encysted hernia*.

*Interstitial Hernia* is a form of inguinal hernia in which the protrusion insinuates itself between the layers of the abdominal wall. According to Langdon,<sup>11</sup> the frequency of interstitial hernia is 1 in 1,100. It is relatively more common in females than in males, forming 0.13 per cent. of all inguinal herniæ in males and 0.61 per cent. in females.

Three varieties are recognized. In order of frequency they are: (1) Between the internal oblique and the aponeurosis of the external oblique; (2) between the aponeurosis of the external oblique and the skin; and (3) between the peritoneum and the transversalis fascia (properitoneal hernia). The first two varieties present an external swelling, while no visible or palpable tumor is found in the last variety. In the majority of the cases of the last variety there is also a scrotal or labial hernia. Such an accompaniment is seldom observed in the first two varieties. In fact the sac of a properitoneal hernia is usually a diverticulum of the sac of a complete hernia; and herein lies its danger, since a false idea of security may follow reduction of the complete portion.

The causes contributing to the production of interstitial hernia are efforts at reduction, giving rise generally to the properitoneal form; and errors in development, namely, non-descent of the testicle or incomplete closure of the canal of Nuck. Macready states that in 67 per cent. of the cases in males the testicle was wholly retained or only partially descended. According to Langdon,<sup>11</sup> in 42 cases of interstitial herniæ in males in only 2 were the testicles in normal position in the scrotum.

The second and third varieties may acquire very large dimensions. Inasmuch as it is difficult to prevent the return of an interstitial hernia by a truss, operation is as a rule indicated.

*Diagnosis of Inguinal Hernia.*—The subjective symptoms are pain, which is present in ninety-six per cent. of all cases in the early stages, and later a sense of fullness and discomfort. The chief objective sign is a tumor, which as a rule disappears when the patient lies down but returns upon his standing, coughing, or crying. Im-

pulse is present in reducible forms, and in complete hernia the contents may be felt to descend by the finger introduced into the canal.

*Incomplete hernia or bubonocoele* must be differentiated from femoral hernia, hydrocele of the cord or canal of Nuck, inflammatory conditions and new growths of the inguinal glands and cord, psoas abscess, and undescended testicle. It is distinguished from femoral hernia by its relation to Poupart's ligament and the spine of the pubis; from hydrocele by the irreducibility, circumscription, and fluctuation of the latter; and from psoas abscess by the presence in the latter condition of a deep-seated swelling above Poupart's ligament, between which and the visible protrusion fluctuation can be obtained.

The conditions most commonly confounded with complete inguinal hernia are hydrocele, hematocele, varicocele, and tumors or inflammatory conditions of the testicle or epididymis. The statements of the patient as to the position and growth of the swelling at its incidence, taken with the characteristic signs of the several conditions, will serve, as a rule, to make the diagnosis evident.

*Treatment of Inguinal Hernia.* (For treatment by truss see "Mechanical Treatment of Hernia.")

*Radical Cure of Inguinal Hernia.*—The operative methods devised for the cure of inguinal hernia are so numerous, and so many have become obsolete, that the reader must be referred to special treatises for the details of those operations which have a historical interest only.

The success with which radical cure is performed at the present time is due primarily to the almost uniform aseptic healing obtained, and, secondly, to the improvements in technique and method. The aim of present methods is to secure the least possible scar formation, and the production of a muscular contractile barrier against future relapse.

Methods depending upon the use of foreign materials to form an obturator have been advanced in the last few years but have not become popular, largely on account of the inherent difficulties in getting such substances to remain within the tissues of the body without giving rise to trouble.

The methods most commonly in use at the present time and which have given the best results are the following: Bassini's (1888), Halsted's (1890), Kocher's (1892), and Macewen's (1886).

The Bassini operation is the favorite one at present. According to a recent writer,<sup>12</sup> about ninety-five per cent. of all operations for inguinal hernia are being done by this method or slight modifications of it. The steps of the operation are as follows: The incision is made parallel with Poupart's ligament and 2 cm. above it, from a point laterad to the internal ring to a point corresponding to the centre of the external ring. The length of the incision is 7 to 9 cm. in adults and shorter in children.

The incision is carried directly to the aponeurosis of the external oblique, and if properly planned should strike it in the line of divergence of the pillars of the external ring. The superficial structures should not be stripped from the aponeurosis since its vitality is thereby impaired. The aponeurosis is then slit in the direction of its fibres for a distance of 5 or 6 cm. from the external ring, care being taken not to wound the underlying structures. The upper lip of the aponeurosis is then stripped from the surface of the internal oblique and the sheath of the rectus for a distance upward of about 3 cm. This separation is important, as it facilitates the bringing down of the fibres of the internal oblique in the final steps of the operation. The tissues covering the cord and sac are similarly stripped from the lower lip of the aponeurosis until the deep surface of Poupart's ligament is well exposed as far as its insertion to the pubic spine. This clearing of the deep surface of the external oblique is best done by blunt dissection, the instrument being swept toward the middle line in the direction of the aponeurotic fibres.

The sac and cord enclosed in their coverings now lie freely exposed, and the second step of the operation, the

isolation of the sac, is commenced. A longitudinal incision is made through the cremasteric and transversalis fascia, exposing the sac at its uppermost part (Fig. 2626). The assistant now catches the sac with two toothed forceps, one at each extremity of the incision, and lifts it upward, while the operator seizing the margin of the fascia nearest to him, *i.e.*, on the outer aspect of the sac, draws it away from the sac. The vessels of the cord now appear and must be freed from the sac by a few light touches of the knife. Just beneath the vessels on the outer side of the sac the vas deferens is recognized and is to be freed in a similar manner. The operator in grasping these structures should use smooth forceps and make very light pressure. As the dissection is carried around the sac the assistant shifts his hold, so that at all times the sac is kept tense. If any vessel is divided in this dissection it should be immediately caught and tied so that the field may not be obscured.

The cord now being isolated from the neck of the sac, the finger is inserted between it and the sac from without inward, and curved about the latter; in this way the remaining attachments of the fascia on the inner aspect of the sac are easily stripped off over the point of the finger and the neck is completely circumscribed. The direction of the encircling finger may now be reversed, and the stripping of the sac can be readily accomplished by pushing the cord away from it with gauze, this being aided by a few touches of the knife.

If this procedure is carried out with extreme gentleness subsequent swelling of the cord rarely ensues.

The fundus of the sac having been freed, it is lifted up, and the internal oblique having been retracted to expose the internal ring, the freeing of the sac is carried upward beyond its neck to the point where it flares out into the parietal peritoneum. On the inner aspect of the neck considerable subperitoneal fat will be found, and in large indirect as well as in direct herniæ this may contain the bladder. In congenital hernia the sac is cut in two, the lower portion being of sufficient size to cover the testicle, over which it is sutured.

The third step of the operation comprises opening of the sac, reduction of its contents, and ligation of the neck. Adherent masses of omentum are treated in the usual manner by chain ligation. Ligation of the sac is done by drawing it down as far as possible, its mouth being kept open, and then transfixing its neck as high as possible with a needle carrying heavy catgut. The ligature is tied around each half of the neck separately and then around the entire neck, and the sac is cut off. If the neck is too large for ligation it must be sutured (Fig. 2627).

The fourth step is the most important, and herein lies the peculiarity of the Bassini operation, namely, the transplantation of the cord and the suture of the internal oblique\* to Poupart's ligament. The cord is first freed

\*The internal oblique muscle is alone mentioned, since it is practically the only structure sutured to the ligament. See the section on Anatomy.

from its bed and retracted to the outer part of the incision against the point of origin of the internal oblique from Poupart's ligament.

The first stitch is taken on the inner side of the cord, the needle passing through the whole thickness of the internal oblique 1.5 to 2 cm. from its margin, and then picking up the deep shelving portion of Poupart's ligament. This suture should just touch the cord when it is held at right angles to the wound. Three or four similar sutures are then taken until the spine of the pubis is reached. The last suture takes in the conjoint tendon, and it is often better to include also in it the margin of the rectus, especially when the insertion of the internal oblique does not extend down to the pubic spine (Figs. 2628 and 2629).

The writer, following the example of W. B. Coley, always puts a suture on the outer side of the cord, but he differs from Coley in that he inserts and ties it before the other sutures are introduced, while Coley puts it in last. This suture subserves two purposes: it gives the muscular fibres a lower plane at their origin and it places the point of emergence of the cord at a greater distance from the internal abdominal ring, thus giving the latter

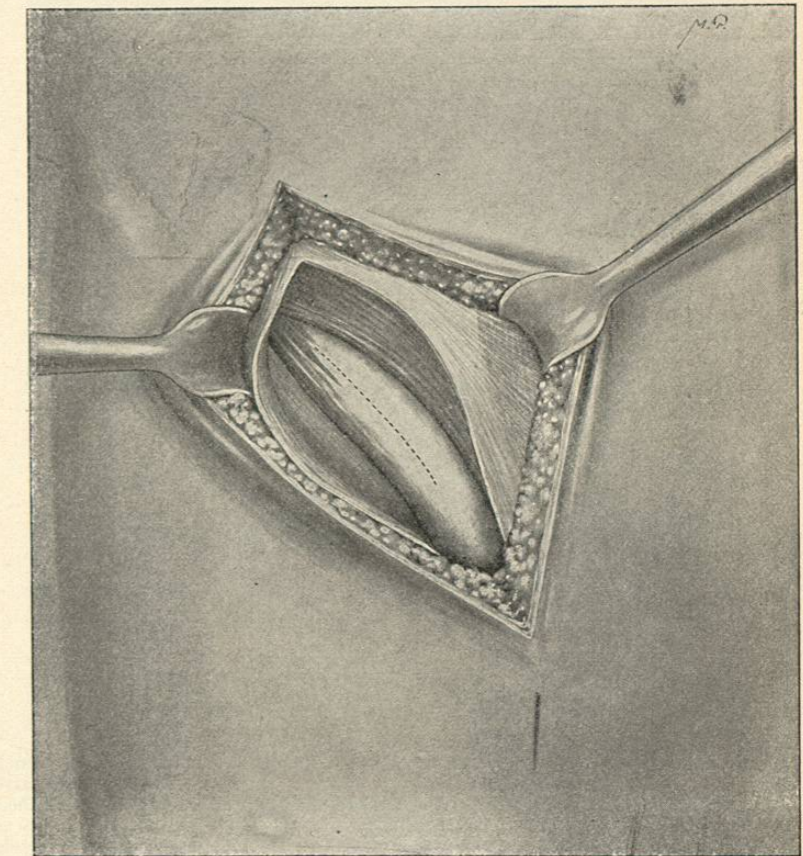


FIG. 2626.—Operation for the Radical Cure of Inguinal Hernia, Bassini's Method. External oblique divided and retracted. Sac in place. Line indicates incision preliminary to separation of cord from sac.

additional protection. The sutures should be tied without tension to avoid strangulation of the muscle fibres.

The best suture material is one that will be absorbed in about thirty days. Kangaroo tendon fulfils this condition best, then chromicized catgut. Non-absorbable suture material should not be used, for the tissues sometimes resent its presence and extrude it.

The next step is the suturing of the external oblique, which is done so as to include the cord between it and the internal oblique. A continuous suture is sufficient (Fig. 2630).

The cutaneous incision is then closed with or without drainage, according to the operator's technique.

In the female the steps of the Bassini operation are carried out as in the male, with the exception that in the

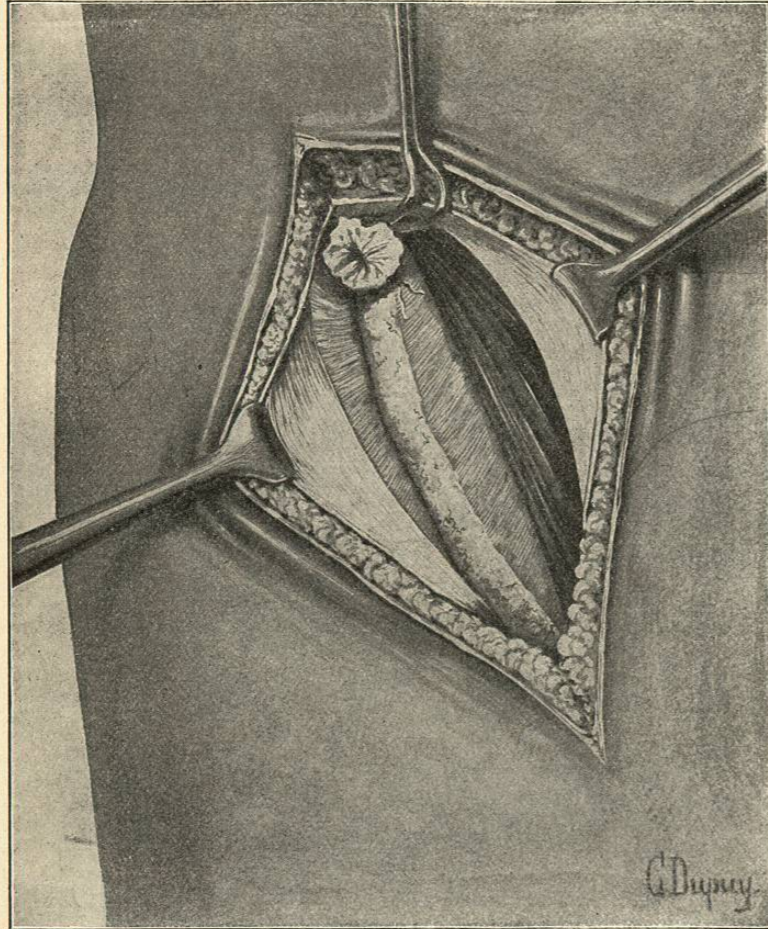


FIG. 2627.—Operation for the Radical Cure of Inguinal Hernia. Bassini's method. The margins of the aponeurosis of the external oblique muscle are retracted horizontally, the internal oblique upward, exposing the site of ligature of sac at the internal ring. The cord lies on the transversalis fascia.

description of the procedures the round ligament is to be understood whenever the cord is mentioned.

The writer, however, believes it to be a mistake to transplant the round ligament—*vide infra*.

**Suture of the muscles without transplantation of the cord** has been practised with success by Bull and Coley.<sup>13</sup> The writer has also employed this modification in cases in which the transversalis fascia forming the dorsal wall of the canal was well developed.

**Transplantation of the Rectus Muscle.**—To meet the condition in which the transversalis fascia forming the dorsal wall of the canal is deficient and the neck of the hernia is very large, Bloodgood<sup>14</sup> devised a most excellent method of transplanting the rectus muscle by slitting its deep or dorsal sheath and drawing it down with the internal oblique to Poupart's ligament. This method is superior to Wölfler's<sup>15</sup> in that the latter operator slits the ventral sheath, thus destroying the insertion of the in-

ternal oblique and transversalis at that point. Bloodgood's operation is done in conjunction with the Halsted operation (Fig. 2633). The writer has used his method of opening the sheath, but has stitched the rectus to Poupart's ligament first and brought the internal oblique down in front of it as in the Bassini operation. This procedure is also of value in direct herniæ and when the internal oblique is deficient.

**Halsted's Method.**<sup>16</sup>—The cutaneous incision, slightly more vertical than the Bassini, having been made, the knife is carried down from the outermost part of the external ring through the aponeurosis of the external oblique, the internal oblique and transversalis muscles, and the transversalis fascia to a point 2 cm. above and slightly lateral to the internal ring. The sac is isolated as high as possible and resected, and the peritoneum is sutured.

The veins of the cord are excised with the exception of one or two. Mattress sutures are then introduced through the entire thickness of the abdominal wall above, with the exception of the skin and peritoneum, and through the transversalis fascia, Poupart's ligament, and the aponeurosis of the external oblique below, the sutures passing beneath the cord, so that when they are tightened the cord lies directly beneath the skin. The sutures are passed so that the distal cut ends of the internal oblique are sutured to Poupart's ligament; thus, as it were, rotating the muscle. Halsted usually employs silver wire (Figs. 2631 and 2632). It is at once seen that there are marked differences between this method and Bassini's. These are: 1. The division of the internal oblique muscle. 2. The transplantation of the cord to a position between cut ends of muscle fibres. 3. The bringing of the cord in a direct line through the entire muscular wall. 4. The excision of the veins. 5. The suture *en masse* of the muscle. These differences are considered by some to be objections.

In fact, in the relapses after Halsted's operation the descent usually occurs along the cord, and in order to obviate this he has lately transplanted the vas deferens alone. The failures of the operation may be attributable to the first three of the points above enumerated. The excision of the veins has, moreover, led to atrophy of the testicle in some cases.

**Bloodgood's Method**<sup>15</sup> is the same as Halsted's, with the addition, already mentioned, of including the rectus drawn out of its sheath in the lower mattress sutures (Fig. 2633).

The distinguishing features of Kocher's and Macewen's methods consist chiefly in their treatment of the sac.

**Kocher's Method.**—The aponeurosis of the external oblique is exposed but not divided. The sac is separated from the cord and the separation is carried up to the internal ring where the sac is ligated. A forceps is now thrust through the external oblique aponeurosis above Poupart's ligament and the sac is caught and drawn out of this opening. It is then laid on the surface of the aponeurosis, which is plaited over it with a sort of Lembert suture. These sutures also narrow the canal (Figs. 2634 and 2635).

**Macewen's Method.**—In this method the sac is folded with a sort of accordion plait by means of a suture, passed from its extremity back and forth through both its walls; the suture is then continued through the transversalis fascia and the muscles above the internal ring in a direction from within outward. The sac thus forms a pad at the ring. The internal ring is then narrowed by suturing the transversalis fascia above it to Poupart's ligament with a mattress suture. Several stitches may be inserted.

The objection to these last two methods is that the sac, when stripped, and especially when ligated, is practically effete material, and it is unsurgical to retain it in the body.

**Fowler's Method.**—The posterior wall of the canal, consisting of the transversalis fascia and peritoneum, is divided from the internal ring inward to the border of the rectus, and the cord is displaced to this point. The internal ring and the transverse incision are then closed. The incision divides the deep epigastric vessels. The canal may be closed by suture of the internal oblique to Poupart's ligament. This procedure is of particular value in cases associated with undescended testicle, in order to obtain additional length of cord.

**Lucas Championnière's Method.**—The peculiarity of this method lies in the manner of closing the canal. The muscles and aponeurosis of the upper lip of the wound are brought down over the aponeurosis of the lower lip and retained by mattress sutures, thus producing an overlap.

**Remarks.**—The chief accidents happening from operations for radical cure are injury of the vas deferens, hemorrhage from omental stumps, to be avoided by including only small masses, pneumonia following the anæsthesia, and sepsis. The occurrence of sepsis largely increases the percentage of relapses.

The mortality is slight. Bull and Coley<sup>17</sup> have found it to be 0.9 per cent. in 10,000 operations performed between 1886 and 1897. In 2,000 later operations the mortality was less than 0.2 per cent. No operations for strangulated hernia are included in these lists.

As a rule children under four years of age and adults over fifty should not be operated upon, inasmuch as many children are cured by the wearing of a truss, and in the aged the hernia can be controlled by truss with less inconvenience than in the younger and more active, while the dangers of operation are greater. Patients with bronchitis should defer operation; but in cases of chronic respiratory diseases, and when the necessity presses, it may be done under local anæsthesia after Cushing's method. As before stated, large irreducible herniæ are not suitable for operation. The best results are obtained in children and young adults.

**Choice of Methods.**—The most desirable operation is one that combines simplicity with the best results in the hands of a large number of operators.

The Bassini operation seems to meet these requirements better than any other. The percentage of relapses after this operation is probably not greater than 5 in good hands. Coley<sup>18</sup> reports 500 cases traced with 6 relapses

only. Galeazzi<sup>19</sup> has collected 1,334 cases operated upon by surgeons out of Italy, with only 2.16 per cent. of relapses. The Halsted method has given 6.5 per cent. relapses, but better results are reported since the veins of the cord have been excised as a routine measure.

The methods of Macewen, Kocher, and Championnière, although each gives as good results in the hands of its originator, have in other hands given much poorer results than the Bassini.

**Hernia Associated with Undescended Testicle.**—The treatment of this condition is still the subject of considerable controversy. The weight of opinion seems to be that children under ten or twelve years of age should have mechanical treatment if possible, as the truss can be constructed so as to crowd the testicle down. In all cases of operation the testicle should be preserved if possible.

Anchoring of the testicle to the bottom of the scrotum is useless, it should rather be crowded down by passing deep sutures through the deep fascia.

The cord should not be transplanted, as length can be

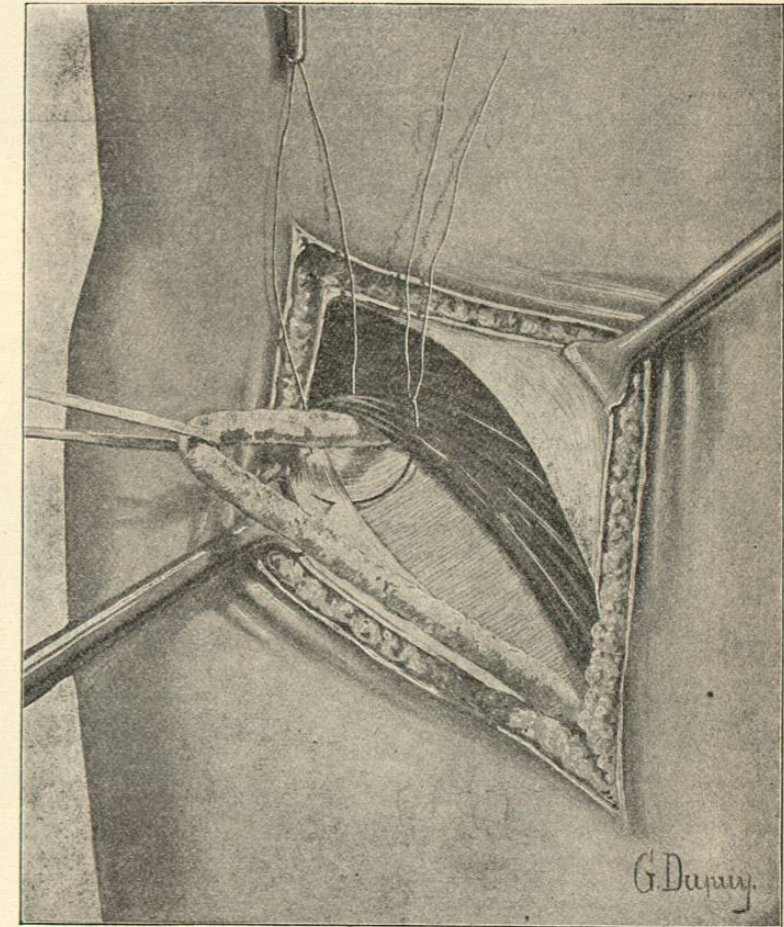


FIG. 2628.—Operation for the Radical Cure of Inguinal Hernia. Bassini's Method. Sac removed, cord drawn aside, and lower fibres of the internal oblique and transversalis muscles stitched to Poupart's ligament from without inward. The transversalis fascia appears at the deepest part of the field of operation.

gained otherwise. Possibly Fowler's method would give still greater length.

Operations in children under fourteen years as a rule give the best results, as the testicle is more likely to be

come scrotal if retained outside the external ring before the changes incident to puberty have taken place.

*Post-Operative Treatment.*—The patient remains in bed

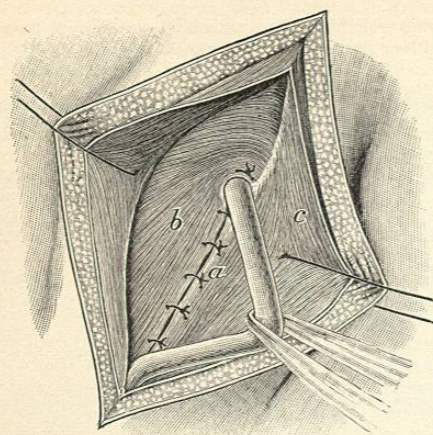


FIG. 2629.

Fig. 2629.—Operation for the Radical Cure of Inguinal Hernia, Bassini's Method. Arched muscular fibres and conjoined tendon (b) sutured to Poupart's ligament (a). c, Aponeurosis of external oblique muscle.

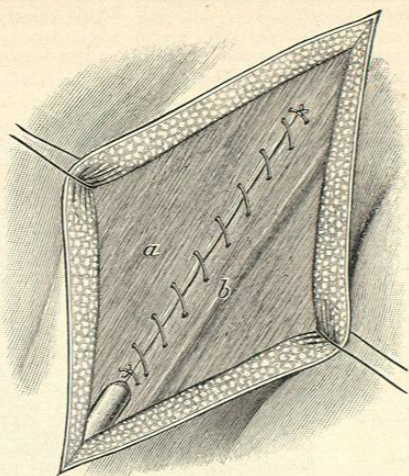


FIG. 2630.

in the reclining position for eighteen days, but is usually able to be up and around on the twenty-first day. This may be stated as the time necessary after operation for any variety of hernia, although sometimes for special reasons a longer period may be desirable.

*Trusses After Operation.*—In children and young adults in whom there is good muscular development and the hernia has not been very large, a truss is unnecessary. Each case has to be judged by itself.

**FEMORAL HERNIA.**—A femoral hernia is one that descends in or alongside the femoral sheath. The most common form is that in which the gut or omentum descends through the crural or femoral canal, which lies at the mesal side of the femoral vein. In rare cases the hernia may descend in front of the vessels or even on their lateral aspect.

*Anatomy.*—The femoral sheath is formed by the funnel-shaped process of the transversalis fascia, which is prolonged from the abdominal cavity downward dorsad to Poupart's ligament into the thigh to form the sheath of the femoral vessels. The sheath is too large for the vessels at its commencement but contracts at the saphenous opening to enclose them snugly. Thus a space not occupied by the vessels is left on the mesal side of the vein, and is known as the crural canal. Its ventral boundary is Poupart's ligament; its mesal Gimbernat's ligament; its dorsal the ilio-pectineal line, Cooper's ligament, and the pectineus muscle; and its lateral the femoral vein from which it is separated by a septum of fascia. The space is filled with loose areolar tissue, the septum crurale, and a small lymph node (Fig. 2636).

The deep epigastric artery passes up on the lateral aspect of the canal. In about thirty per cent. of cases the obturator ar-

tery is given off from the deep epigastric and then is in relation with the crural canal; although it generally passes downward to the obturator canal on the lateral aspect of the crural canal, yet in three per cent. of all cases it passes down on its mesal aspect and is then subject to injury in herniotomy.

A hernia descending through the crural ring acquires as coverings the peritoneum, the subperitoneal fat which is usually very thick, the septum crurale, the transversalis fascia derived from the femoral sheath, the cribriform fascia, and the superficial fascia and skin.

The protrusion appears in the thigh below the fold formed by Poupart's ligament and below and laterad to the pubic spine. It is usually small and globular or hemispherical in shape. It may extend down the thigh as far as

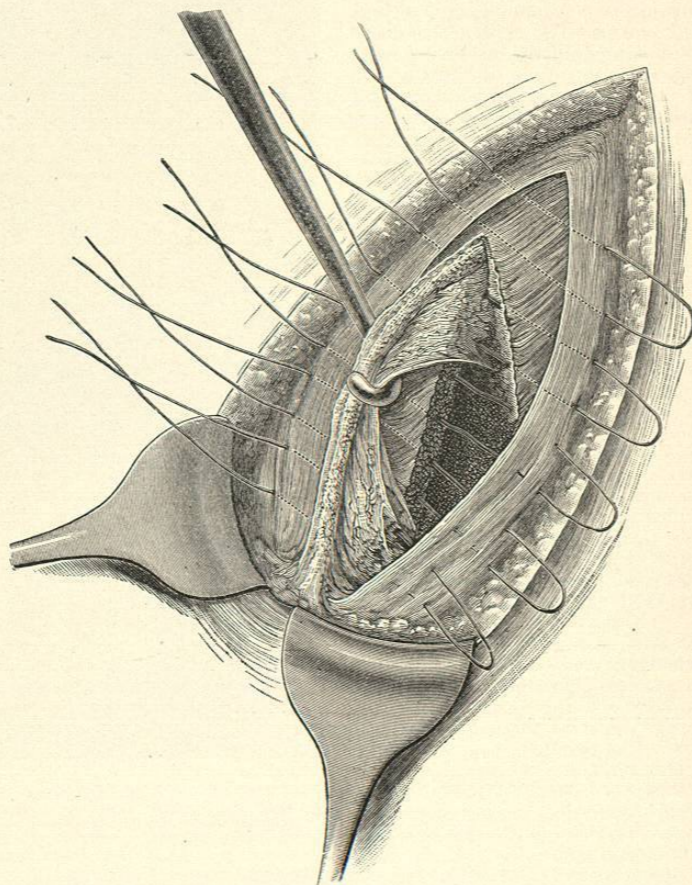


FIG. 2631.—Operation for the Radical Cure of Inguinal Hernia, Halsted's Method. Veins ligatured and resected. Mesocord torn only at its centre. Silver sutures inserted, one above and four below the cord. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

its middle or even farther. Occasionally it turns upward, and passing above Poupart's ligament may be mistaken for an inguinal hernia. Very rarely it may become scrotal or labial. The contents of the sac are more com-

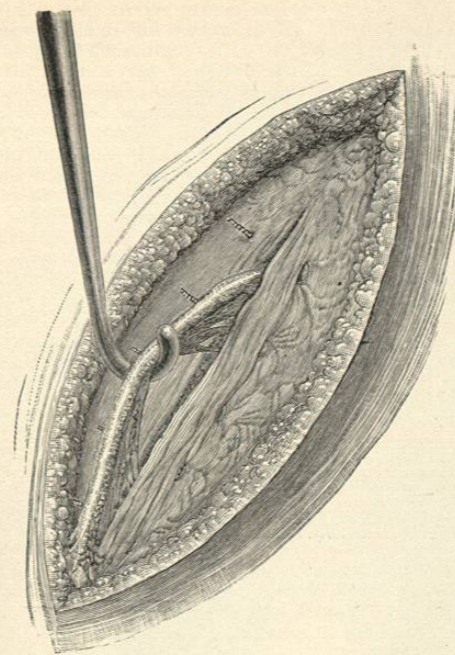


FIG. 2632.—Operation for the Radical Cure of Inguinal Hernia, Halsted's Method. Aponeurosis or external oblique closed by silver-wire mattress sutures, ends bent down and buried. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

monly entirely omental than in inguinal hernia. The omentum usually becomes adherent early, especially at the neck of the sac. The intestine is more apt to become strangulated than in inguinal hernia, and gangrene supervenes more quickly.

*Occurrence of Femoral Hernia.*—Femoral hernia occurs more commonly in women than in men, the ratio being about 3 to 1 in persons under fifty years of age. After this age the proportion of women ruptured decreases so rapidly that the relative frequency in the two sexes is nearly the same. As compared with inguinal hernia the frequency is 1 to 17 according to the statistics of the Hospital for Ruptured and Crippled,<sup>15</sup> according to Macready<sup>1</sup> the ratio is 8 to 92. According to the same author, of 100 men ruptured, 97.5 per cent. have inguinal and 2.5 per cent. femoral hernia. Of 100 women ruptured 60.3 have inguinal and 39.7 per cent. femoral hernia.

As to the period of incidence, it is uncommon in early life, but occurs with greatest frequency in persons between sixteen and fifty years of age.

Causes predisposing to it are weakening of fascia resulting from stretching of the abdominal wall in pregnancy, and the greater size of the crural canal in women.

*Diagnosis.*—Psoas abscess, inguinal hernia, and saphenous varix may be confounded with reducible femoral hernia, inflammation and new growths of the lymph nodes with the irreducible form. In fat females the diagnosis between femoral and small inguinal hernia is not always easy.

*Treatment.*—Unless contraindicated by general considerations, all femoral hernia should be operated upon for the following reasons: They are more dangerous than inguinal hernia, they are practically incurable by mechanical means, the operation is simple, and by it permanent cure is nearly always obtained.

*Bassini's Method.* The sac is exposed by an incision parallel with and slightly below Poupart's ligament. Having been cleared of fat and separated from the canal, the sac is drawn down as far as possible, transfixed, and ligated, after reduction of its contents, and the stump is allowed to recede into the abdominal cavity. Poupart's ligament, the pubic portion of the fascia lata, and the canal having been well cleared of fat, interrupted sutures are now introduced so as to unite Poupart's ligament with the pubic portion of the fascia lata covering the pectineus muscle, care being taken to avoid the femoral vein.

The upper sutures are inserted parallel with Poupart's ligament and pass into the pectineus muscle. The lower sutures unite the falciform process to the pubic portion of the fascia lata. The canal is thus closed (Fig. 2637).

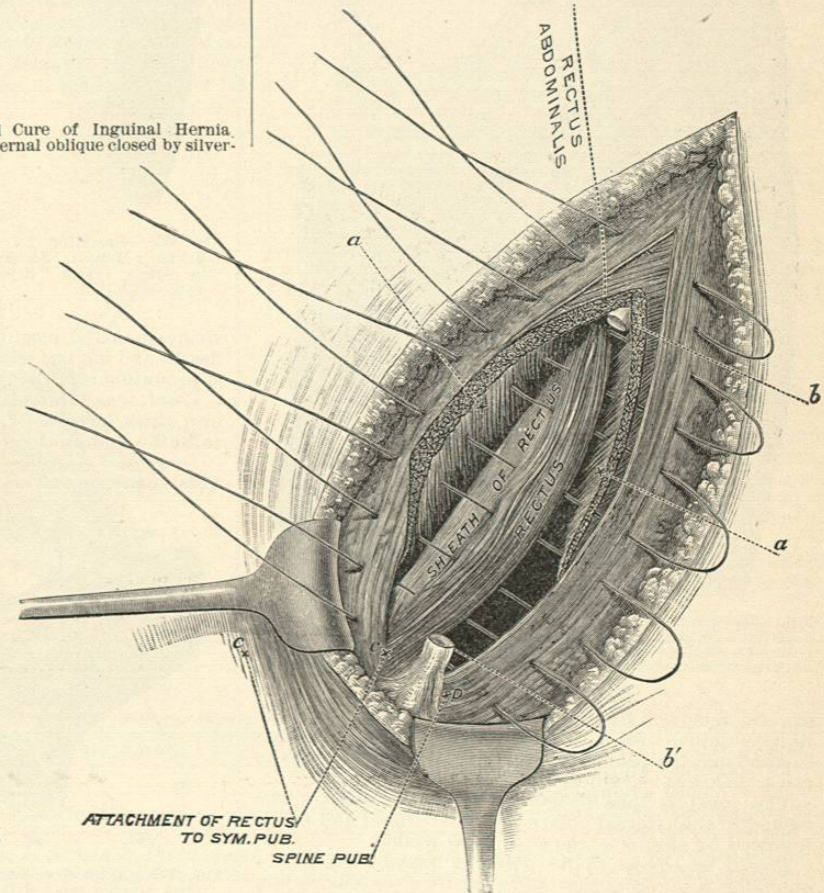


FIG. 2633.—Operation for the Radical Cure of Inguinal Hernia, Bloodgood's modification of Halsted's Method. Cord removed so as not to obscure demonstration. a, a, Divided borders of internal oblique muscle; b, b', ends of resected cord. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)