A CRITICISM OF THE BASSINI OPERATION AND ITS MODIFICATIONS

BY

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In 1883 Bassini published the description of his operation for the repair of inguinal hernia. It constituted a real advance in the surgical treatment of hernia at that time, and has since been in common practice. During the past 20 years many have inquired into the rationale and results of the operation, and there has been a tendency on the part of more and more people to criticize it adversely.

A school of thought has arisen following upon the work of Hamilton Russell (1906, 1922, 1925; Ogilvie, 1937) which teaches that, for those cases of indirect inguinal hernia in which the sac is congenital, the muscles of the canal powerful, and the muscular rings competent, it is better to perform a modified operation consisting of simple herniotomy and with as little disturbance to the integrity of the canal as possible. Where there is an indication for repair, preference is given to fascial sutures or a fascial graft. The exponents of this school of thought condemn the Bassini operation, and their views contrast strangely with those of many reputable surgeons who find it satisfactory. The exchange of correspondence in recent issues of the *Journal* has raised the old question of hernia repair again, and has prompted me to write this paper, in which the Bassini operation is discussed on the basis of the experiences of many workers that have been published during the past 62 years. The operation is here considered from the point of view of theoretical soundness and practical results. The statistics given have been taken from papers in which the authors' claims as to recurrence rates appear to be accurate, follow-up of the cases has been carried out, and the criteria of cure have been exacting.

In a paper published by Randall (1930), Deaver, professor of surgery, University of Pennsylvania; Harvey, chief surgeon in New Haven (Connecticut) Hospital; McGuire, professor of surgery, Vanderbilt University, Nashville, Tennessee; Phemster, professor of surgery, University of Chicago; White, surgeon to Washington University, Washington, D.C.; and Morgan, of Tahon Springs, Florida, all condemn the hernia operations of Bassini and his successors in letters to Randall which are quoted in his article, and admit to a 25% recurrence rate on the average. Cowell (1930) stated that "the Bassini operation is now obsolete and only of academic interest."

On the other hand, a great deal of confidence is reposed in the Bassini operation by many workers (Farr, 1927), and some even claim only 2 or 3% recurrences with it. A great gulf separates the two extremes of thought. Some idea of the value of the Bassini operation and its modifications to-day may be gained by an examination of the writings and experiences of the last half-century.

Multiplicity of Modifications

One of the most damaging pieces of evidence which can be laid against the Bassini operation is the fact that so many surgeons have adopted their own modifications. The reason for this surely must be that in their hands the results of the Bassini operation were unsatisfactory. Unfortunately, none of the modified operations give uniformly better results than the original (Turner, 1937). In an extensive survey of the literature I have found over 70 modifications of the original Bassini. Many of these are almost identical and have been claimed as original by their designers, unaware that others at an earlier date had tried the method and found it wanting. No useful purpose is gained by listing those many suggestions, but it may be said that they have concerned each and every possible anatomical structure in the region of the inguinal canal, and altered each structure in ways as ingenious as they are numerous. But most of the modifications have one common factor—an attempt at union between the conjoined tendon and Poupart's ligament. It is reasonable to believe that in that step may lie the reason for the indifferent results found by so many people.

Indications for Reinforcing the Posterior Canal Wall

In a small or moderate-sized indirect hernia, where the muscles are undamaged by distension and the rings are sound, the posterior wall of the canal is generally found at operation to be strong enough to fulfil its functions of support. Why, then, should any endeavour be made to strengthen it? In cases where the sac is of the congenital type, or where the history leads one to believe the condition is congenital, if the muscles are sound there is no need to strengthen them. Nature is better than man at guarding anatomical danger spots. In any case 75% of the recurrences after Bassini operations take place at the internal ring—the spot, or one of the spots, which the operation has been designed to protect (Turner, 1937). In many cases the precipitating cause of the hernia lies probably in some unexpected strain imposed on the internal ring taking the muscle sphincters unawares. If the congenital sac is removed in these cases, any tear of the fascia transversalis repaired, and the lateral pillars of the internal ring sutured to narrow the opening, the probability is that a good result will be obtained (Fallis, 1936).

Abnormalities of the Conjoined Tendon

Support requires to be given to the posterior wall in all cases of direct hernia, and in those in which the muscles are weak and stretching of the canal has followed. But in these circumstances the conjoined tendon is generally also atrophied to a greater or less degree, and is unsuitable as a medium for support to the weakened area. Moreover, it may not insert into the pubis, but may show an abnormal insertion into the rectus sheath some distance above the pubis. This type of abnormality has been discussed by Polya (1906, 1912), Foldes (1920), and Skillern (1922), and is more frequent than is commonly realized.

In a series of 100 consecutive operations by myself upon the inguinal canal for primary indirect inguinal hernia, the nature of the insertion of the conjoined tendon was noted. In 46 cases the structure could be observed attaching to the pubis and forming a stout posterior wall to the medial part of the canal. In 20 the tendon inserted into the rectus sheath at least 1 in. above its lower extremity, and in the remaining 34 the tendon was inserted to the rectus in its last inch. In 15 of these there was poor connexion, by atrophic fibres, to the pubic crest. Therefore, in only 46% of cases in that series were the correct anatomical findings, as described by Gray (1942), found to be present. In 20% the insertion of the conjoined tendon was abnormal, and in the remaining 34% abnormality to a greater or lesser degree existed.

It may be argued that, in the cases examined, abnormal anatomy was sure to be found owing to the presence of a hernial sac, and that this in effect produced the abnormality. As against that argument it may be stated that those cases which showed the abnormal insertion of the conjoined tendon were in eight instances associated with small sacs and that the operation performed was simple herniotomy. Six of the remaining 12 were associated with large herniae in which it was not possible to distinguish cause from effect, and the remaining six were classified as moderate in size. There a repair was performed, but it was considered that the presence of the hernia had not caused atrophy of the conjoined tendon, and that probably the abnormality described owed nothing of its origin to the hernia.

Thus, even where there is an indication for strengthening the posterior wall, the Bassini operation is unlikely to give a satisfactory result owing to the poor material at hand for use in repair. Where the posterior wall is reasonably normal, further support to it by a Bassini operation does not give the necessary added support to the internal ring or area lateral to the pubis (Turner, 1937), which are the fundamental weak spots and sites of the majority of recurrences.

Stein (1942) states that suture of the conjoined tendon to Poupart's ligament is wrong also, because of the fact that nowhere in human economy is muscle used as a buffer, as its functions are motion, locomotion, and stabilization.

Site of Recurrence

Three-quarters of the recurrences of Edwards's (1943) series took place after a Bassini repair. The most common sites of

recurrence are : (a) the internal ring ; (b) immediately lateral to the pubis ; (c) through the posterior canal wall (Watson, 1925). Of these three, only the last is well protected by a Bassini type of repair. If the conjoined tendon is atrophied or abnormal in its insertion the medial part of the canal cannot be effectively guarded, as it is not possible to bring down the medial limit of the tendon to Poupart's ligament.

Recurrence Rate for the Bassini Operation

Study of recurrence statistics is interesting, but is confusing owing to the wide variations in results of different clinics over the world. This applies to statistics regarding any type of hernia repair. Very many variable and uncontrollable factors influence the statistical analysis. First, the question as to what constitutes a recurrence. To the critical eye a small bulge may be accepted as a failure, while a larger one may by others be considered as within normal limits (Grace and Johnston, 1937). Many cases which recur do not return to the same clinic for further treatment, and in the absence of an efficient follow-up system the recurrence figures for the clinic may be gratifyingly low. Certain people state that, this being so, any given clinic has its quota of recurrences arising from other places, and that these migrant recurrent cases cancel each other out from a statistical point of view. This is a beautiful thought but not sound deduction.

The question as to length of time after operation before re-examination is important. Randall (1930) takes the view that success can be based only upon the results of a five-year period or over. This is not the general opinion, and Taylor (1920), Patterson (1928), Fallis (1940), Joyce (1940), Gould (1940), Edwards (1943), and others consider that the vast majority, up to 80%, recur within the first year, while many believe that the majority recur within the first six months. This is the opinion of Coley (1924). My own view is that the recurrence rate rises slowly with every year after operation, but that for practical purposes the majority of recurrences take place within the first year. In my own experience most have recurred within six months.

Many follow-up statistics are based upon a written questionnaire sent to the patient and returned with his own findings. This method is apt to give a low recurrence rate, as a substantial number of people are unaware at first that they have a recurrence. Nevertheless, bearing in mind the many variable factors, there are published figures which appear to be as accurate as is possible, and for the Bassini operation and its modifications Table I contains representative figures taken from many different clinics. The figures are for oblique inguinals.

TABLE I.—*Recurrence Statistics for Indirect Inguinal Hernia treated by a Bassini Operation*

Surgeon	Operation	No. of Cases	Recurrence Rate (%)
Fallis (1940)	Halsted	1,386	8.6
Fallis (1940)	Modified Bassini	214	13.4
Oudard and Jean (1922) ..	Modified Bassini	French Navy	10.0
Coley (1924)	Classical Bassini	332	8.7
Massachusetts General Hospital (Andrews, 1924)	Modified Bassini		9.0
Bellevue, N.Y. (Andrews, 1924)	" "		7.5
Johns Hopkins, Boston (Andrews, 1924)	" "		10.9
Max Page (1943)	Bassini	London Police	20.2
Selinger (1927)	Classical Bassini	266	18.0
Erdman (1923)	Modified Bassini	1,093	6.67
Taylor (1920)	" "	816	5.6
Average recurrence rate (%)			11.8

This figure, 11.8%, is the average culled from several sources, and corresponds closely with the general experience of recurrences for indirect herniae in adult males treated by the Bassini operation, classical or modified.

The technique of a Bassini is more likely in theory to afford support to the canal which is the site of a direct hernia. Table II gives an analysis of results with direct hernia from various clinics.

The figures of Gibson and Felter (1930), with those of Coley (1924), are remarkable for being so much better than those of other workers. The explanation for this is hard to seek, as it is improbable that they are technically superior to many others among their gifted colleagues. There is no evidence that

TABLE II.—*Recurrence Statistics for Direct Inguinal Hernia treated by the Bassini Operation*

Clinic or Author	No. of Cases	Recurrence Rate (%)
Erdman (1923)	—	16.1
Massachusetts General Hospital (Andrews, 1924)	—	1.5
Johns Hopkins Hospital (Andrews, 1924)	—	29.1
Taylor (1920)	77	22
Watson (1924)	75	20
Lyle (1928)	—	13
Fallis (1940)	154	11.6
Lameris	102	28.4
Bruehor	171	18
Taylor	265	18
Coley (1924)	280	5
Max Page	London Police	25.8
Gibson and Felter (1930) ..	427	6.5
Average recurrence rate (%)		17.6

Coley and Felter selected their cases, and, according to their account, they conduct a thorough follow-up examination at least one year after operation. Still, the results they submit for direct hernia are superior to those of most other workers. One feels that there must be a reason for this which has so far not been made clear. If their results are due to the excellence of their technique they have much whereon to congratulate themselves.

From an impartial consideration of results from many reputable sources it is shown that the Bassini operation carries with it a recurrence rate, on the average, of 11.8% for indirect inguinal hernia and 17.6% for direct. These figures are too high to be satisfactory.

Union of Conjoined Tendon to Poupart's Ligament

It has been mentioned that all the Bassini operations have one step in common—union of muscle, usually the conjoined tendon, with the inguinal ligament. Therein may lie the source of failure, and extensive investigations have been conducted into the rationale of this step in the technique. Doubt has been expressed whether satisfactory union can be achieved by attempting to unite muscles with tendon. The subject must be approached from both the clinical and the experimental point of view. It should be noted that the structure described as conjoined tendon is tendinous only near its insertion and that in the main it is composed of muscle fibres. It extends from the internal ring medially to the pubic tubercle.

Clinically, Edwards (1943) noted at operation on 53 recurrences after Bassini operations that the internal oblique in most cases was a thin attenuated sheet of pale-brown muscle, and he considered it was unlikely that it could afford much protection to the internal ring or the posterior wall. The findings after recurrences for simple herniotomy showed healthy muscles. He concluded that the Bassini sutures lead to muscle atrophy and result in a weakening of the canal. The evidence of Max Page (1943) supports Edwards's opinion. Page contrasted his figures of 1934, with a 20.5% recurrence rate after Bassini repairs, with those for 1943, when he had improved his results to 12% failures as a result of adopting more conservative methods of treatment, and using herniotomy rather than hernioplasty in those early cases in which muscles were sound. Moreover, in his series there was no selection of cases, and the results are a fair comparison, showing improvement only because of the new method used in treatment. Turner and Eckhoff (1929) give a recurrence rate of 3% for 98 simple herniotomies. These compare very favourably indeed with the figures for the Bassini lists in Tables I and II.

It is not reasonable to blame the attempt at union of conjoined tendon to Poupart's ligament for the high incidence of failures unless experimental and pathological evidence confirms this. Seelig and Chouke (1923) attacked the problem experimentally, and found, when they sutured a flap of fascia lata in a dog to the underlying muscles, that the sutures were liable to cut out. Even where they did not cut out, union took place only by means of thin scar tissue which was easily stretched.

Burdick (1928) found that suturing fascia to muscle led to healing by means of delicate scar tissue, which developed from the areolar membrane investing the surfaces and from the loose connective-tissue stroma separating the bundles of fibres. He

stated that the scar is not strong, and if subjected to strain slowly stretches. Where linen or silk was used instead of catgut the tendency to stretch was not so marked, but often the linen cut out and gave the same result as when catgut had been used. Scarification of the tissues before stitching increased the density and strength of the scar, but prolonged and unusual strain still resulted in its yielding. Side-to-side suturing, as when conjoined tendon is applied to Poupart's ligament, never resulted in permanent adhesions, but yielded after slight strain.

MacGregor (1930) has stated that in his opinion muscle will not act efficiently when sutured so as to alter the direction of its normal line of fibres. Fibrous degeneration, he says, follows at an early date. He also believes that firm union is possible only when fascia is stitched to fascia or muscle to muscle, but not when muscle is stitched to fascia. Koontz (1926) further investigated the problem, but failed to verify Seelig and Chouke's findings in their entirety. He showed in one series of experiments that muscle did unite to fascia, but only when the areolar tissue had been thoroughly removed before suturing. The strength of the resulting scar depended on the intimacy of contact between the two structures. If this union was not close enough, stretching took place at a later date. Rosenblatt and Meyers (1928) also succeeded in promoting union between muscle and fascia, verifying the work of Koontz, but suggested that the main factor in effecting it is tight tying of the sutures. This, they said, induces a fibrin reaction which is later transformed into connective tissue.

A further contribution by Rosenblatt and Cooksey (1927) described the findings in 21 operations on dogs wherein the internal oblique or rectus muscle was sutured to the inguinal ligament with silk gut. It was found 40, 60, and 70 days later that there was firm union between the muscle and fascia in all cases. The union did depend, however, on complete removal of all areolar tissue, and the strength of the scar also had a relation to the area of the surfaces in contact. They stated that to permit the areolar tissue to remain is to invite the situation which exists in a joint—that is, non-adherence of insulated structures. The union takes place when, by removal of all this areolar tissue, there is intimate contact between the muscle bundles and the adjacent fascia or tendon. The muscle bundles are surrounded by a sheath of white fibrous connective tissue, and each muscle fibre has its neighbour bound to it by the same element. The entire muscle or group of bundles is also held together by white fibrous tissue. The elements for a connective-tissue union therefore are present, and explain how union does take place. The muscle is united to the fascia or tendon by scar tissue. There is no conversion of muscle cell to fascia.

G. W. and K. Roberts (1925) agreed with Seelig and Cooksey, and stated that it is rarely possible to achieve sound union between elements which are of different structure. They, with Cowell (1930), stated that as Poupart's ligament is of white fibrous tissue, and conjoined tendon is of red muscle, union by firm scar tissue cannot take place. The experimental findings are somewhat conflicting, but the consensus of opinion is that union does occur, only under definite conditions which demand that all areolar tissue is removed from the areas to be approximated, and that the sutures be applied under tension. Union then takes place by scar tissue, which is apt to stretch under strain. On the practical side further evidence comes from the operating theatre. It is recognized that in many cases of repair Bassini sutures are applied to tissues which are reasonably well developed and that apparently a firm reinforcement of the entire posterior wall will be effected. Yet, when operating on the same cases again for recurrence, the lower part of the conjoined tendon is found to be atrophied, and recurrence has developed just lateral to the pubis. This can be considered only as a pressure atrophy due to necrosis at the site of the tight sutures. This observation has been made in the literature by several writers (Fantino, 1912; Fairfield, 1915; Burian, 1919), and my own experience confirms it.

It may be stated, after consideration of the practical and experimental evidence, that in this step common to all Bassini operations there may be one reason for their comparative failure in some hands. It is probable that areolar tissue is left in many cases and prevents firm union taking place between the conjoined tendon and Poupart's ligament. Secondly, the anchoring

sutures may cause necrosis of the muscle, or, alternatively, they may not be tied tightly enough to maintain muscle and ligament in apposition.

The Bassini Operation and the Small Indirect Hernia

There still is one factor which may help to explain the failure of the Bassini: its application to cases which do not require plastic repair at all. It cannot be over-emphasized that if the muscles and rings are competent there can be no indication for plastic repair of any kind. Removal of the sac is sufficient in these cases (Russell, 1906, 1922, 1925; Ogilvie, 1937), and the performance of Bassini repairs is not only useless but actively harmful, predisposing to recurrence by causing atrophy of the lower fibres of the conjoined tendon.

Reasons for Failure of the Bassini Operation

The Bassini operation may fail for the following reasons:

1. Because it is applied to cases not requiring plastic repair.
2. Because when used—as, for example, in direct hernia—the conjoined tendon may be so atrophied that it is of but little value as a means of support.
3. Where it is used with normal muscles it predisposes to recurrence through causing pressure necrosis and atrophy of the lower fibres of the conjoined tendon.
4. Because even when used in cases worth repair it still fails to guard the medial portion of the posterior wall of the canal, and may also not guard the internal ring.
5. Because frequently the conjoined tendon is sutured to Poupart's ligament before all the areolar tissue over the parts has been removed with meticulous care, thus achieving poor union.
6. Because the sutures have been tied too slackly.

It follows from discussion of the available facts that the Bassini operation is found wanting from points of view of end-results, rationale, and technique—at any rate, in the opinion of a considerable number of workers. There are, of course, many other causes of recurrence, common to almost all operations for hernia, but the purpose of this paper is only to discuss the steps in repair which are peculiar to the Bassini operations. Therefore, failure to remove the sac completely or to ligate it properly, the missing of a second sac, and so on are not considered in this contribution.

In view of these considerations, some alternative method must be adopted for those cases requiring plastic repair, and before it can be claimed superior to the Bassini it must from every point of view be demonstrated to be of greater soundness.

It seems from the evidence to hand that, despite the satisfaction in the Bassini operation or its modifications expressed by many surgeons, the operation fails in its results when compared with those of other methods. Where repair is called for the results of living fascial sutures are superior. There is not space in this communication to give the case for fascia as opposed to the Bassini, but Andrews (1928), Lyle (1928), Cattell and Anderson (1931), Foster (1936), Robins (quoted by McClosky and Lehman, 1940), Gray (1940), Edwards (1943), and many others have found in fascia the answer to the problem.

Where the hernia is small and the muscles are sound Max Page (1943) and others have noted an improvement in their results by abandoning the Bassini operation in favour of a more conservative procedure.

Conclusions

The Bassini operation is criticized on the following grounds:

1. The conjoined tendon often inserts abnormally into the lower part of the lateral aspect of the rectus sheath rather than the pubis, and thus when stitched to Poupart's ligament leaves a deficiency medially in the canal through which the recurrence may take place as a direct hernia.
2. In large and in direct herniae the conjoined tendon is frequently atrophied to a greater or less degree and is unsuitable material for reinforcing the posterior wall of the canal.
3. Even where the conjoined tendon is suitable for repair, union with Poupart's ligament can take place only by means of scar tissue, and then only when all areolar tissue has been removed from the surfaces that are to be united. The scar tissue readily stretches.
4. In the small type of hernia and where the muscles of the area are sound, experience has demonstrated that better results are obtained by simple removal of the sac and, if necessary, by reinforcing the fascia transversalis.

5. The clinical results of the Bassini operation in repair of direct inguinal hernia are associated with a recurrence rate which is too high for satisfaction and which is higher than the recurrence rate associated with fascial repair.

6. The clinical results for indirect inguinal herniae which need repair are associated with a recurrence rate again too high for satisfaction, and higher than that associated with fascial repair.

The fact remains that many workers maintain that the Bassini operation or one of its modifications gives good results in their hands. This contrasts with the experience of many sound surgeons and of important teaching centres where the operation has been tried and found wanting. The reason for this conflict of thought is obscure and probably insoluble.

It may be said that no expression of opinion in regard to the efficiency of an operation is of value unless supported by careful follow-up examination not only for recurrence but for late post-operative morbidity. Papers have been published describing the late morbidity after operations for the repair of hernia by several methods, and again the conclusions in regard to the Bassini are somewhat less satisfactory than those for fascia (Bloodgood, 1899; Erdman, 1923; Russell, 1925; Lyle, 1928; Patterson, 1928; Gibson and Felter, 1930; Foster, 1936; Fallis, 1940).

Although opinions differ in regard to the treatment of hernia there is agreement, at any rate, about one thing—that the treatment of hernia is highly controversial, has been for many years, and is likely to remain so for many more. Such a state of affairs can arise only where the results of treatment fail to reach the highest levels of satisfaction; and until some advance is made which will conclusively and universally solve the choice of operation for hernial repair controversy is likely to rage.

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E. J. Donovan and T. V. Santulle (*Amer. J. Dis. Child.*, 1945, **69**, 176), who record ten cases, state that, though gastric and duodenal ulceration are rare in infancy and childhood, the diagnosis would probably be made much more frequently if it were realized that it may occur at this age. Haemorrhage, which is the commonest complication, was found in six out of the ten cases. Perforation and pyloric stenosis were also observed. Malignant disease was not encountered.

BASSINI'S OPERATION FOR INGUINAL HERNIA

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During the last few years the value of Bassini's operation for inguinal hernia has been deprecated, and many alternative procedures have been recommended. In my view there is, however, still a wide field of usefulness for Bassini's method, and, provided the technique is skilfully applied, the results are as good as, if not better than, most of the other procedures. Naturally, this operation is not indicated in every case of hernial repair, and its choice in any particular instance can as a rule be definitely decided only when the canal is exposed. In the young or even in the middle-aged, with good musculature and a well-formed inner ring, usually no more is required than a thorough removal of the sac, but in patients with poor musculature, a weak transversalis fascia, and a large internal ring Bassini's operation gives very satisfactory results. The following is the procedure usually adopted.

Technique

After the usual skin toilet an inguinal incision is made, 3 to 4 in. long, in the line of the inguinal canal; a good length of incision is advisable for proper exposure. Haemostasis must be complete throughout and, where possible, vessels are picked up before division; this prevents staining of the tissues and allows clearer differentiation of the various structures. The external oblique aponeurosis is then divided by making a small incision 2 in. from the external ring and, with a pair of scissors, cutting from this incision along the line of the fascia to the centre point of the external ring and upwards as far as the level of the internal ring. Both upper and lower margins of the fascia are picked up by two pairs of pressure forceps. Traction through these forceps is now applied to the upper layer, and with a gauze swab it is freed from the underlying internal oblique and rectus abdominis, as far as this can be carried out without undue force. The lower layer is pulled down and the upper surface of the inguinal ligament is well exposed by gauze dissection of the areolar tissues. At this point two nerves are noted—the ilio-hypogastric and ilio-inguinal; the latter, lying along the cord usually on its anterior surface but occasionally on its lower and posterior, is picked up, divided, and ligatured at both ends, as there is usually an accompanying vessel; the ilio-hypogastric, running superior to the cord below the external oblique aponeurosis, may have to be treated in a similar fashion if it is so low that it might be included when suturing this later.

The cremasteric muscle is divided along the line of the cord and the latter is lifted from its bed, two small gauze swabs being passed below it to allow light traction. Below the cord, where it lies over the pubis, the areolar tissue is cleared, either by gauze or scissor dissection, depending on its thickness, until the inner end of the inguinal ligament, the pubic spine, and the approximating area of the pubis are clearly exposed. Dissection of the cord in the usual manner is carried out until the sac has been well separated, and this is ligatured as high above the neck as possible, the internal oblique being retracted to enable this to be done satisfactorily. It is possible that retraction of the epigastric vessels may also have to be carried out to give good exposure for this procedure.

The cremasteric muscle and fascia are now dealt with. This muscle is very variable, sometimes being exceedingly thick and tending to interfere with proper repair. In some cases it is not necessary to remove it, but in the majority it is better to do so completely, as this allows closer approximation of the internal oblique to the inguinal ligament. If the remaining part of the cord is still very thick or contains a large mass of veins, portions of these should be removed to allow more accurate closure of the external ring. For obvious reasons care should be taken not to remove too much of the pampiniform plexus. Running over the transversalis fascia are some veins which, at times, may be very large and closely adherent to the cord at the level of the external ring, and it is as well to ligature these in two places, removing the intervening portion and leaving the bed of the canal clear.

One is now ready to carry out the repair. Using No. 1 or No. 2 chromic 20-day catgut, interrupted sutures are inserted at 1/2 in. intervals. The first of these takes in the lower portion of the rectus, the conjoint tendon, and the periosteum of the pubis close to the pubic spine. The next includes the conjoint tendon and inguinal ligament, and the remainder the internal oblique, transversus abdominis, and inguinal ligament; with each a good bite of the muscle is taken, the needle being inserted 1/2 to 3/4 in. from its lower border. The last suture closes the internal ring until only the tip of the forefinger can be inserted comfortably; occasionally,