HERNIA

BY

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PREFACE

I have written this book for two reasons. Firstly because it gives me the chance to assemble a number of scattered contributions that I have made in the past. Secondly because I believe that there is room in this branch of surgery more than any other for a review that is personal and dogmatic rather than transcriptive and obsequious. Having taught anatomy for three years and worked at general surgery for ten times that period, I have formed views about the anatomy of the inguinal canal that I know to be unorthodox but that I believe to be sound. Having operated on many herniae I have arrived at methods of repair that I consider to be rational and that have, in my hands, stood the test of time. I cannot claim a complete follow up, a luxury that is possible only to those who have University Grants or a large private income, but I have made a sincere effort to encourage the reporting of failures. In two closed communities that provide most of my hernia patients I think I have succeeded. I have tried to give reasons for my recommendations, and equally to give reasons for my dislikes.

I have re-used some ideas, and occasionally re-used phrases, that appeared for the first time in my section on Hernia in Maingot's *Post-Graduate Surgery* in 1936. I am very grateful to Mr Rodney Maingot for permission to do this.

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CHAPTER 1

The Place of Apparatus

A hernia is defined as the displacement of an organ from the cavity in which it is usually contained, through an opening in the walls of that cavity. The term is normally used in connexion with herniation of the abdominal contents through the abdominal parietes, and the opening through which herniation occurs is either a natural foramen or channel through which blood vessels or other structures leave the abdomen, or the site of some injury. Thus the common hernial sites are the inguinal and crural canals, the umbilicus, the oesophageal hiatus in the diaphragm, and the scars of operations or war wounds. When, however, prolonged or repeated increase of abdominal pressure coincides with general wasting, almost any of the fibrous junctions in the abdominal wall may give way. Thus in the old and debilitated inmates of geriatric institutions, whose abdominal walls, wasted by disease and malnutrition, are subjected to the strain of constant coughing, it is not uncommon to find four distinct hernias in each groin, protrusions through the linea semilunaris and under Poupart's ligament lateral to the femoral artery, in addition to the more common inguinal and femoral ones.

A patient sometimes comes for advice about a large hernia which he has noticed accidentally only within the last few days, though he has clearly had it for months or years. Another will say that he has known of the swelling for several years, but he did not report it earlier because it has given him no trouble and has not increased appreciably in size. Usually, however, a hernia causes some disability from the start. In any case when a surgeon has discovered a hernia, whether or not it appears to be giving trouble, he must advise control or cure; that is, some retentive or protective apparatus, or an operation. No hernia, left to itself, will undergo cure, nor can it be guaranteed to remain stationary, or even tolerable, for any length of time. The hernia is the result of abdominal pressure acting on a weak spot. Abdominal pressure is a continuous force, keeping the viscera in position against

the force of gravity, driving the blood in the great veins back to the heart, and aiding the return of the diaphragm after its descent. It is increased in order to expel the contents of the abdominal or thoracic viscera, in vomiting, micturition, defaecation, parturition and coughing, or to fix the trunk as a base for the limbs in muscular work. With this force constantly acting any hernia is bound to increase in size, and the hernia in turn will tend to inhibit or interfere with abdominal movements, and to give a sense of insecurity during any strenuous exertion. To these disabilities is added the danger of strangulation, present at all times in some herniae, appearing only later in others. Thus no hernia may safely be disregarded, and some form of treatment should be urged as soon as the diagnosis is certain.

Because it is inherent in human nature to avoid any course that involves risk, pain, expense, or loss of time, many patients will wish first to discuss the question of a truss. The success of surgical repair in herniae of moderate size is sufficiently well known to induce the majority of active and healthy men to demand operation. On the other hand the skilfully worded advertisements of those who claim to "build up the tissues" by patent apparatus, most of which are rather clumsy trusses relying on rubber bands instead of springs, oblige the surgeon to discuss in simple terms the pros and cons of treatment by apparatus.

In general terms it must be pointed out that a truss must not be expected to cure a hernia but merely to retain it. It must be worn permanently, not merely for the rest of the patient's waking active life, but in most cases at all times of the day and night. It is therefore irksome to an extent that varies with the sensibility of the patient, the type and strength of the apparatus that he requires, the nature of his work, and the delicacy of his skin. It is effective only if it is made exactly, worn constantly, kept in repair, and renewed when weak. It is more effective in some types of hernia than in others, but in all it is liable to produce some degree of pressure atrophy, and therefore to become less effective with time. On these general grounds alone the adoption of apparatus should be discouraged in the young and healthy.

The place of the truss

Two questions are often asked. "Can a truss cure a hernia?" and "Can a well made truss retain a hernia, prevent it enlarging, and allow work in reasonable comfort without the risk of strangulation?"

A truss may be able to cure an inguinal or an umbilical hernia in an infant, but these alone. A congenital inguinal hernia is due to the persistence, in whole or in part, of the processus funicularis or the canal of Nück, diverticula from the coelomic cavity that normally remain patent till just before birth. Persistence of the peritoneal pouch after this somewhat arbitrary date is evidence of delay, but not necessarily of failure, in the process of obliteration, which may take place some weeks or even months later. Such a natural cure is possible only if the empty sac is never distended. A truss must therefore be well made, and must be worn day and night for the first year. A "skein of wool" truss is perfectly useless. If the hernia comes down during this trial period, the chance of cure is probably lost, and if it appears after a year natural closure is no longer possible.

It has been stated that the prolonged wearing of a truss may bring about the natural cure of an inguinal hernia even in adult life, through the obliteration of the sac at its neck by adhesions. It is, however, most unlikely that adhesions will occur exactly at the ring, or that they will obliterate the lumen completely. Adhesions that follow the wearing of a truss are usually between the sac wall and its contents, and not at the neck of the sac, but half an inch or so farther down; further, they are usually bands or partial adhesions. Such attempts at repair have no value in preventing the entry of bowel into the sac, but rather favour strangulation if it does come down.

The second question, whether a truss can retain a hernia with comfort and safety, can only be answered with regard to particular herniae.

Oblique inguinal hernia

If the hernia is an early one, that is if the neck is small, the internal ring neither stretched nor displaced inwards, and if the muscles are good; or, put in another way, if the hernia, when reduced with the patient standing will not come down unless he coughs, strains or walks about; it can be retained by a well fitting truss against any but the most violent straining efforts. On the other hand, this type of hernia is normally seen in healthy young men, it is one for which a simple type of operation is sufficient, and in which a permanent cure is almost certain. In proportion as the hernia is old, the internal ring enlarged, the muscles weak, or the patient's occupation a strenuous one, a truss will be less effective. The continued pressure of a truss tends in time to produce atrophy of the inguinal muscles, thickening

of the sac near the internal ring, and adhesions between the sac and its coverings and contents. Such changes have two results. Abdominal contents coming down into a hernia pressed on by a truss are more likely to become strangulated, and an operation for repair, when it is required, cannot rely upon simple removal of the sac, but must include some plastic manœuvre to reinforce the inguinal canal.

Direct inguinal hernia

A direct hernia, unless it is really large, is particularly suitable for a truss. It appears late in life, it tends to enlarge very slowly, it can be retained by the simple backward pressure of a pad, and when so retained it will not enlarge appreciably over many years. The sac is a wide-mouthed bulge, and there is no tendency for adhesions to form in or around it, or for bowel to be trapped in it. Many seamen and general labourers are able to carry on their strenuous callings wearing double inguinal trusses for direct hernia without appreciable loss of efficiency.

Femoral hernia

In inguinal hernia a truss is often effective, and it is discountenanced merely because it is unwise. In femoral hernia, on the other hand, a truss should be recommended only for exceptional reasons. The hawker of patent apparatus will claim to cure all herniae, femoral as well as inguinal, but a survey of the anatomical features of femoral hernia will throw considerable doubt on the ability of any apparatus, however ingenious, to control such a hernia.

The inguinal canal belongs to the trunk, and a well fitting truss embracing the pelvis will lie secure during all movements, and maintain a constant and even pressure on the weak spot. The femoral canal is in the thigh, and all movements at the hip joint must necessarily displace a pad lying over the saphenous opening and attached to a spring or girdle encircling the trunk. Even were it possible to maintain even pressure by a truss on the crural canal (as it would be for instance in a patient with an ankylosed hip joint) such pressure would be effective only on the fundus of the sac and the distal half of the canal. The neck of the sac and the abdominal end of the canal lie behind and above Poupart's ligament, where any pressure short of that which would obstruct the femoral vein, is powerless to prevent the entry of abdominal contents into the hernia.

The potential dangers of a femoral hernia are far greater than those of any other type. Strangulation is common, progresses more rapidly to gangrene, and is more fatal in its outcome. A truss should never be ordered, or allowed even if the patient suggests it, except in the unusual case of a wide-mouthed and easily reducible swelling in a patient so old and feeble that an operation, even under local anaesthesia, is considered unsafe.

Umbilical hernia

In the umbilical hernia of infants, a belt with a pad, or even a home-made retentive apparatus of strapping, will normally retain the protrusion and effect a cure by the end of the first year. Here the abdominal wall is normal right up to the edge of the orifice, there is little subcutaneous fat, and the pad will remain in position over the opening and keep the sac empty.

The umbilical herniae of adults are a different problem. The whole abdominal wall is sagging, the linea alba is stretched, the hernial orifice is a somewhat indefinite opening in the fascial layer, often multiple, and lying beneath a thick layer of fat, the sac is lobulated, and the contents are usually adherent to it and reducible in part only, if at all. It is difficult to maintain a pad in the correct position or to apply its pressure to the ring, and even if the hernia can be reduced and kept back, it will slip past the pad with any extra exertion, or sudden movement of the abdominal wall. Because of the liability of these herniae to strangulate, and the high mortality of strangulation, a truss should be advised only for small and completely reducible swellings in cases where the risk of operative repair is considered prohibitive.

Incisional hernia

The efficiency of a belt depends entirely on the size and character of the hernia. A wide bulge involving the whole scar can normally be retained by a belt alone, or by a belt with a pad over the protrusion. It will not increase in size and the belt will allow a fairly normal life and a considerable degree of exertion. When, on the other hand, the sac has a large fundus with a narrow neck passing through a small aperture in rigid scar tissue, control by any form of pad is uncertain, and strangulation, on account of the deficiency in the peritoneal lining and the many adhesions, is extremely likely.

The place of apparatus in the treatment of hernia

The foregoing remarks may be summed up as follows:

1. *A truss should be ordered*

(*a*) As a possible method of cure in all inguinal and most umbilical herniae of infants during the first year of life. Operation should be undertaken during this period only for progressive increase in size in spite of conscientious use of the truss by the mother, for inability to wear the truss owing to skin soreness or other reasons, or for threatened complications.

(*b*) To prevent increase in size and avert the risk of strangulation in cases where operation will be undertaken at a later date.

In inguinal and umbilical herniae of infants from the end of the first year (after which a cure can no longer be expected) till the earliest suitable age for operation (in my opinion four years for inguinal and two years for umbilical hernia).

In reducible oblique hernia in adults when operation is advised, but postponed for social or economic reasons, or on account of local or general disease.

(*c*) As a safeguard after an emergency or limited operation which cannot be regarded as a radical cure. In many operations undertaken for strangulation, or in the aged for threatened strangulation, the sac is removed, but the measures that would appear necessary to render the hernial opening proof against future yielding have not been carried out because of the condition of the patient. In such cases a truss with quite light pressure is usually sufficient to prevent a recurrence.

(*d*) As the only possible safeguard in all reducible herniae when operation is out of the question.

2. *A truss may be permitted*

In most direct inguinal herniae, and many incisional herniae where the patient is a poor operative risk.

3. *A truss should be discouraged*

In oblique inguinal hernia in a healthy patient.

4. *A truss is dangerous*

In femoral hernia, in the umbilical herniae of adults, in irreducible inguinal herniae, and in incisional herniae with a large sac and a small rigid opening.

CHAPTER 2

General Principles in the Operative Repair of Hernia

Hernia surgery is highly important, but it is not dramatic surgery. Some operations save life or restore a sick man to reasonable health and adequate working capacity by recasting the anatomy and function of the parts affected by disease. Hernia surgery restores form and function to normal, and returns a temporarily incapacitated human being to full health and earning capacity.

Hernia operations require no special technique beyond that of good surgery: the division of structures by clean cutting, the definition of planes without blunt dissection or forcible retraction, the avoidance of nerves and major blood vessels, meticulous haemostasis, and the obliteration of dead space and the approximation of divided structures without tension and without strangulation by sutures of the finest diameter compatible with strength.

The basic principles of hernia surgery are simple, the removal of the sac to its neck and the closure of the hernial opening at its commencement. Of these two demands the second is the more important. There may be no sac, the sac may have no neck, or it may be so short and wide that removal is unnecessary; but, except in certain instances, secure closure of the hernial orifice is an indispensable step without which removal of the sac is of no more than temporary value.

The chief exception is an oblique inguinal hernia with a congenital sac into which contents have only recently or occasionally descended. In such a hernia there is no "hernial orifice" in the sense of an abnormal opening. The internal inguinal ring is a normal structure that only becomes abnormal when it is stretched. In a hernia of the type under discussion, it is only the structures passing through the ring that are abnormal. There should be vas, vessels and nerves only, but in such a case there is, in addition, a thin-walled and collapsed peritoneal tube. If this peritoneal sac is removed without trauma all abnormality is removed with it, and the inguinal region becomes normal.

In all other cases, however, the opening is an abnormal one which must be securely closed after removal of the sac. The method required for closure will depend upon the size of the opening, the nature and strength of the tissues that bound it, and the strain to which they are subjected. In some cases the tissues in the neighbourhood, drawn tighter by absorbable sutures, will provide satisfactory repair. In others the closure must be reinforced by drawing down adjacent tissues or by turning in flaps from structures in the neighbourhood. In others, free transplants of living connective tissue from some other part of the body may be used to repair the defect. In others again, unabsorbable foreign material may be used. The principles alone of these different methods can be discussed here, their detailed application must be left to the sections dealing with individual herniae.

In most surgical operations catgut is used today for all deep sutures. The value of catgut is that it is absorbed when its work is done, leaving nothing but living tissues at the site of operation. It must be pointed out that the work of catgut, indeed of all sutures, is one of approximation only. No sutures, even unabsorbable ones, can keep tissues together against a tension tending to separate them, for more than a short time. In the presence of continued tension, sutures, if not absorbed, will cut out, and the parts will return to their original site unless they are fixed by the permanent agency of living connective tissue. Thus there is little value in the stouter sizes of catgut; indeed in this material size is little indication of strength. In my experience No. 0 and even No. 00 is usually as strong as No. 1, and the sizes above No. 1 are often weaker and more unreliable than the finer ones, while they cause a greater reaction. Kangaroo tendon provides an absorbable suture material of greater strength than catgut. While this strength gives it a place in bone surgery, its bulk and the insecurity of the knots tied with it make it unsuitable for use in hernia repair. Soft tissues should never be subjected to a tension greater than can be exerted by sutures of No. 1 catgut.

Catgut and kangaroo tendon, though they can be absorbed, are not received kindly by tissues. Being foreign proteins, they provoke a considerable reaction, as any surgeon who has been obliged to reopen a wound during the first ten days after suture will have been able to ascertain for himself. In the presence of infection they resist absorption and prolong local sepsis till they are discharged.

Sutures of living fascia were introduced by Gallie and le Mesurier

in 1921. These surgeons showed that free transplants of connective tissue could remain alive and keep their structure and strength indefinitely, and become united to their surroundings by fibrous tissue. However, if this connective tissue bond was small in amount, or if it was subjected to strain, the union between the graft and its bed became stretched. By using strips of fascia woven into the receiving tissues instead of patches stitched to them, the graft became incorporated into its bed by a living union and displacement was impossible.

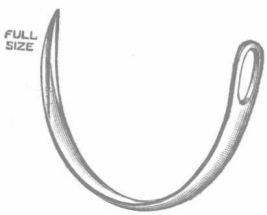
Gallie sutures are usually taken from the fascia lata on the outer side of the thigh. The sutures, strips about $\frac{1}{4}$ in. wide and the greatest length that the fascia will allow, are removed through an incision about 12 in. long down to the fascia lata, the superficial fascia being reflected backwards and forwards for the requisite distance. Alternatively strips of fascia may be removed through a small incision at either end of the ilio-tibial band by an instrument designed for the purpose. These fasciatomes are seldom satisfactory, since they are apt to bring out irregular wisps of inadequate length with muscle and fat adhering to them. When a number of full-width and full-length sutures are desired, direct exposure is best.

The fascial strips are used with special needles with a wide eye (Fig. 1). One end of the suture is passed through the eye and tied to itself with fine silk; the free end is similarly tied with silk to prevent splitting. "In taking the first stitch the needle is passed through a portion of the edge of the gap to be closed, and then through the terminal end of the suture (Fig. 2). In this way a slip knot is produced that forms an excellent anchor. The suture is woven strongly into the edge with as many bites as seem necessary, and passed backwards and forwards across the opening until its whole length is used up. Owing to the slippery character of the fascia it will be found useful to anchor the sutures at every second or third stitch by some form of knot (Fig. 2). We usually combine a single loop-knot with transfixion. When the first suture has been used up a second may be attached to it in the same way as pieces of tennis gut are fastened together, and the sewing continued. In this way one suture after another may be inserted until the opening is completely closed. The suture is finally ended by splitting its terminal portion into two strands, which are tied together about the suture with a triple knot. This knot should be made secure by transfixing it with a catgut ligature which will hold its loops in contact until they become firmly healed together."

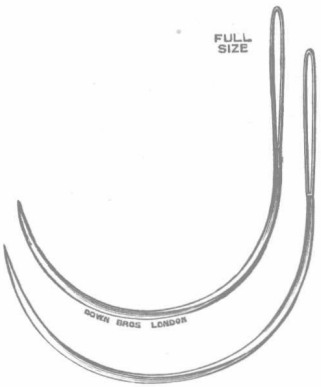
Ogilvie needles No. 4 (left) and No. 5 (right)

Gallie's needle (small)

Colt's cutting needle



Gallie's needle (large)



Lane's fascial needles

FIG. 1. Needles used in hernia surgery

There is, of course, no particular merit in the fibres of the iliotibial band beyond their length and number. For limited operations, suitable aponeurotic strips may be cut from the tissues in the immediate neighbourhood of the operative field, such as the external oblique aponeurosis. When only a single living suture of great strength is required, the plantaris tendon is even better than a fascial strip.

In summing up the place of fascial sutures in hernia surgery, I can only express a personal opinion based on considerable experience. I

think they have had their day as a universal method, and they should now be reserved for problems that cannot be met in any other way. To the scientifically trained theorist fascial sutures are ideal. The material is an autogenous transplant which retains its strength and microscopic structure unimpaired, and which is woven into the tissues and becomes incorporated by living bands into their substance, which, when so incorporated becomes part of them, and so shares their resistance to later infection. To the practical surgeon, who is forced to admit that even the teachings of experimental animal surgery must be correlated with clinical experience, there are disadvantages.

Fascial suture adds an operation on the leg to one on the hernia. It adds its time and severity, and almost prohibits the use of local anaesthesia. The thigh incision does not often give trouble, but working men sometimes complain of pain and weakness. In post-operative infection fascial strips will slough like any other suture material. Perhaps the most obvious disadvantage is in the size of the sutures themselves, their excessive width and their inadequate length. These strips, which must be $\frac{1}{4}$ in. in diameter, and the coarse needles required to carry them, make a sorry mess of the delicate structures of the inguinal canal, particularly Poupart's ligament, which is easily separated thereby into disconnected longitudinal strips. They are too short to bridge

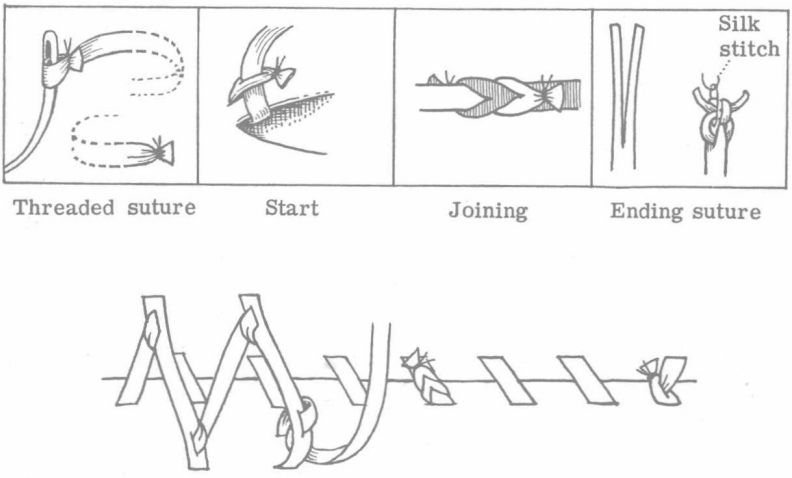


FIG. 2. To illustrate the methods of fascial suture

the zone of failure in a large direct hernia, which extends from Poupart's ligament to the rectus sheath.

In my own opinion fascial strips are unsuitable for the repair of inguinal hernia. Recurrence is frequent and strangulation through a chink in the lattice of tendinous bands is not uncommon. Further, the destruction of Poupart's ligament by the sutures makes any further repair very difficult indeed. Fascial strips are excellent for the repair of tendons, ligaments and the capsules of joints, and of traumatic herniae in the abdominal wall and diaphragm whose margins consist of tough scar tissue.

Unabsorbable suture material

Because of the mechanical disadvantages of living sutures, unabsorbable sutures are being used to an increasing extent today in hernia surgery. The materials to be considered are:

Mesh materials	*Monofilament materials*
Silk	Silkworm gut
Cotton	Nylon
Linen thread	Wire—silver, stainless steel,
Braided nylon	tantalum

I would first put forward some general observations on these substances, based on my own experience, and expressing my personal views.

In hernia surgery we must consider suture materials from two points of view. Their ability to stimulate a fibroblastic reaction, and their liability to provoke infection.

The ability to stimulate a fibroblastic reaction is almost entirely a property of the minute structure of the material. All unabsorbable materials are treated by the body as foreign substances and walled off by fibroblasts. The reaction against them is at first violent, and later, when the process of encapsulation is complete, it is limited to the immediate neighbourhood of the foreign body. Monofilament sutures eventually come to be enclosed in a fine avascular connective tissue sheath in which they lie unattached, like a tendon in its sheath. In this ability to lie unchanged and quiet among the tissues is their value in neuro- and thoracic surgery. Mesh suture material is invaded