LECTURES

ON

HERNIA AND ITS RADICAL CURE.

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LECTURE III.

Anatomy of the Parts of Crural Hernia.—Cause and Formation of the Rupture.—Operation for its Radical Cure.—Sources of Failure and Danger.—Operation for the Radical Cure of Hernia after Kelotomy for Strangulation.—Unbilical Hernia.—Evolutionary Failures.—Anatomy.—Varieties.—Taxis.—Operation for Radical Cure.—Choice of Cases.—Review of the various Methods of Attempting a Radical Cure of Hernia in Ancient and Modern Times.—Classification of Cases for Selection of Operation.—Conclusion.

Anatomy of Crural Hernia.—In the hollow of the groin below the inner extremity of Poupart's ligament, and forming, with the deep and superficial abdominal rings, an inverted triangle, of which it is the apex, lies the saphenous opening.

Formed by the separation of the fascia lata into two layers, of which the outer or iliac part is advanced forwards by its attachment along the whole length of Poupart's ligament, and the inner or pubic portion, covering the sloping surface of the adductor and pectineus muscles, is attached to the pectineal line, and continued behind the sheath of the femoral vessels to be continuous with the ilio-psoas fascia, and connected with the capsule of the hip-joint; the saphenous opening presents an oval outline, looking forwards and a little downwards and inwards. The outer border curves sharply inwards in a falciform manner, lies in front of the femoral vessels, and is attached to and blended with Gimbernat's ligament by a process about half an inch wide, Hey's ligament, important to surgeons, because it crosses the upper part of the crural canal, and may be the seat of strangulation. Below, the falciform edge passes under the saphena vein, which curves over it to join the common femoral vein, receiving, as it does so, the veins which accompany the superficial branches of the common femoral artery, namely, the two external pubic, the epigastric, and the circumflex iliac. The first two pass inwards, the next upwards, and the last outwards. They supply the numerous lymphatic glands which lie in two groups in this situation, the upper directed obliquely along Poupart's ligament above and invested by Scarpa's fascia, and the lower lying parallel and internal to the saphena vein. Nearly all the afferent ducts of these glands pass in a body through the saphenous opening, the inner part of the femoral sheath, and the crural ring, to join the deep iliac and lumbar glands. The saphenous opening is covered in by a layer of fascia connected with its borders, called, from the numerous holes which transmit these lymphatics and some of the vessels, the cribriform fascia. This is blended, superficially, with the deep layer of superficial fascia of the thigh, and, deeply, with the inner part of the sheath of the femoral vessels.

By detaching Hey's ligament from Poupart's, and turning down the fascia lata and cribriform fascia, the sheath of the femoral vessels is brought to view. It is arranged in three compartments; the outer for the common femoral artery, the middle one for the vein, and the inner one, smaller and funnel-shaped, is filled up by the afferent lymphatic ducts. On clearing these, it is found that they are held in position by a thin horizontal layer of perforated fascia containing a lymphatic gland, derived from, and continuous with, the subperitoneal fascia and fat of the iliac fossa, attached externally to the strong longitudinal septum, covering and protecting the femoral vein, and, internally, to Gimbernat's ligaments. This is the septum crurale of Cloquet, and is of little or no surgical importance.

If the finger be pushed upward into the iliac fossa, it will pass through the crural ring. Arching over it, in front, will be felt a curved border, formed by the union of the fascia transversalis with the deep fibres of Poupart's ligament, the deep crural arch. This is the usual seat of strangulation in crural hernia. Outside is the femoral vein, covered by its septum; inside, the edge of Gimbernat's ligament, to which the deep crural arch is attached; and behind is the hinder part of the crural sheath, resting upon the pectineal line of the

pubis, and the pectineus muscle arising from it, and covered by the strong pubic portion of fascia lata. Above and externally, the epigastric artery arises from the external iliac trunk. Sometimes this gives origin to an irregular obturator artery, which may then descend into the pelvis close behind the border of Gimbernat's ligament.

Sometimes this branch arises from the external iliac itself, and then it passes down external to the crural ring altogether, and the precautions taken to avoid injuring the iliac vessels will also avoid the irregular branch. It is but rarely, however, that this vessel is cut in relieving the strangulation of a crural hernia. It yields readily to pressure in the loose subperitoneal investment. If the hernia-knife be not too sharp, it will cut the tense fibres of Gimbernat's ligament without injuring the loose yielding and elastic artery. In dividing the strangulating portion of the crural ring, the knife is usually directed inwards.

On opening the peritoneum and dissecting the crural ring from the abdominal cavity, it will be seen that a depression is formed opposite to that opening, internal to the iliac vessels. When the os pubis presents a salient border or projection at the pectineal line, as in old age, it becomes more easy for the bowel, by its pressure, to obtain a purchase or hold for the formation of a hernial sac. It will also be seen that the peritoneum around is more closely attached to the subjacent structures than in the inguinal region. Hence the sac of a crural hernia is rarely so large as that of an inguinal one. The aspect of the crural ring is more horizontally placed than the deep inguinal ring. It faces upwards and downwards, with a slightly forward direction. The best guide to it is the pubic spinous process, which is about half an inch internal to, and a little above, it; while Poupart's ligament is directly above.

The most frequent seat of strangulation is at the deep crural arch, or in the neck of the sac, at that point thickened by the continued pressure. Next frequently, the strangulating point may be the edge of Hey's femoral ligament, when the sac and bowel are bent outwards at an acute angle. Ill-directed attempts at taxis may here do much harm, and may even cause ulceration of the bowel at the point of constriction. This is especially apt to occur in elderly females, whose tissues are thinned and delicate, and the edges of the fasciæ and pectineal line sharp.

In a large crural hernia, the manipulation of the taxis should be at first directed inwards and downwards, and then backward, with a slight upward inclination of the neck of the sac. It is rare that directly upward pressure is required.

Formation of a Crural Hernia.—First, the sac is pressed downwards and slightly forwards, dilating the canal, along the lymphatic compartment of the femoral sheath, pushing before it the septum crurale, and spreading out the lymphatic ducts. It is then directed forwards, pushing before it the front wall of the innermost compartment of the femoral sheath and the cribriform fascia, and forming a tumour in the groin below Poupart's ligament and inside the femoral vessels. It then passes outwards and a little upwards, across the femoral vessels, where the fascial connections of the falciform process are weaker and looser than on the inner side, which is, moreover, supported to some extent by the numerous small vessels and lymphatic ducts before described. Finally, it lies with its fundus placed upon and above Poupart's ligament under the integuments, and its neck considerably in front of, and close to, the femoral vein.

In the course of the formation of a large hernia, Poupart's ligament is bulged forwards, and the groin loses more or less of the hollowness that it presents normally over the saphenous opening. The greater length and slenderness of Poupart's ligament in females, with the greater width of the pelvis and of the hips, render them more liable to this form of rupture than the male sex; while the latter, from the presence of the spermatic cord, are more liable to open abdominal rings and inguinal hernia.

The coverings of a crural hernia are: 1, the integuments, often thickened by the presence of a deep layer of fat, which may mask the position of Poupart's ligament and render the diagnosis somewhat difficult; enlargement of the femoral glands in these tissues may also tend to obscure the diagnosis, and mask the saphenous opening; 2, the cribriform fascia, recognised by the perforations of the lymphatic ducts, often also obscured by fat and glands; 3, the fascia propria, or crural sheath, recognised by its superior density and fascial appearance; 4, the septum crurale, or subperitoneal fascia, covering the sac, recognised by its greyish blue, sometimes greenish colour; 5, the sac itself is often thickened, wholly or in part, sometimes presenting an hour-glass shape, from the crossing of vessels, regular or irregular. In one case, the shape was due to an irregular origin of the deep epigastric by a common trunk with the obturator from the common femoral, the former crossing and deeply indenting in

front a crural hernial sac, and thus forming a very dangerous irregularity. The crural hernial sac and its contents are more liable to adhesions and abnormal positions of the omentum and bowel than an inguinal hernia.

Thickening of the sac at the neck and adhesive bleedings of the covering structures and glands may render it difficult to discriminate the tissues during operation. Or a varicose condition of the saphena or femoral vein may give rise to great difficulty, and need careful precautions. By drawing down the sac and exposing Poupart's ligament and the pubic spine clearly, a good guide is obtained in difficult cases. In large and old standing cases, very often no discrimination between the different layers of covering is possible. In operating, the femoral vein should be carefully protected by the finger or a small spatula, and both Poupart's ligament and the pectineal fascia should be kept distinctly in view, as well as the edge of Gimbernat's ligament.

Operation for the Radical Cure of Crural Hernia.—The skin of the groin being shaved and washed with carbolic lotion, and the patient anaesthetised, a fold of skin over the site of the hernial tumour should be pinched up, and a scalpel or tenotomy-knife carried with its edge upwards, cutting towards the surface in a vertical line. This will usually expose the cribriform fascia. In a stout subject it is better to dissect down, through the fat, in successive layers. The deeper tissues are then cut through, down to the sac, which is to be opened by pinching up a portion, lateralising of the knife, and, with or without director, slitting it up vertically. With the handle of the knife the sac is then carefully separated from the surrounding structures; then it is opened, the contents examined, and thickened, elongated, or adherent omentum removed, after ligature of the vessels separately with thin catgut. The sac, being carefully emptied, is to be transfixed at the neck with the handled hernia-needle, carrying a stout tendon ligature, tied on each side, and cut off close.

Next, the needle is carried through the deep layer of the crural sheath and the pubic portion of fascia lata, entering an inch below the crural ring, and emerging close up to the pectineal line, at the side of the femoral vein, which is to be carefully protected by the finger or a spatula. The needle is then carried through Poupart's ligament, emerging at the upper part of the incision. It is then threaded with one end of the same stout piece of tendon used to ligature the sac, which is then drawn down, emerging at the lower part of the incision. The needle is then again to be passed at the inner side of the wound, through the pubic fascia lata, skirting Gimbernat's ligament, and transfixing a second time the inner end of Poupart's ligament. The other end of the tendon ligature is then attached to the eye of the needle, and brought down, and the two ends are tied with a double surgeon's knot, or, if wire be used, twisted by two turns. The effect will be to draw, backwards and downwards to the os pubis, the inner end of Poupart's ligament, and to close up the crural ring completely. A piece of small drainage-tube, or horsehair, is then placed along the wound, from the ring to the lowest angle; the wound is closed by closely applied interrupted sutures, and gauze or cotton-wool dressing applied in the usual manner. Latterly, I have found the use of tendon ligature so satisfactory, that, for this operation, I prefer it to wire. The wound usually closes over it and heals by adhesion at once, and there is not the pain and inconvenience of the withdrawal of the wire. So far the endurance of the tendon, when buried in the tissues, has been long and satisfactory enough to maintain the cure, which has been watched and noted in some cases for above two years.

Operation for the Radical Cure of Hernia after Kelotomy for the Relief of Strangulation.—At the meeting of the British Medical Association at King's College, London, in August, 1873, in the address given by me to the Surgical Section, I described an operation, performed in March of the same year, for the closure of the inguinal canal and rings, after relief of the strangulation by kelotomy. The hernia was a large one, the bowel was strangulated to a chocolate colour, and the sac contained inflammatory serous effusion. The case did excellently well; no peritonitis ensued; and the patient was shown to the members of the Association, wearing no truss. The steps required, in addition to the ordinary operation of kelotomy with opening of the sac, consisted in ligature of the neck, and the application of wire for the closure of the canal and rings, in the same way as in the subcutaneous method. In all cases, I have ligatured the neck of the sac flush with the peritoneal opening, and in some removed it altogether, and then laced up the canal and rings with wire or tendon-ligature.

I have operated for the radical cure of strangulated hernia, after kelotomy, in sixteen cases—namely, eight inguinal and eight crural. Seven were done by ligature of the neck by catgut and entire removal of the sac, with the closure of the canal and rings by wire-lacing, and nine by the use of tendon for all these purposes. Of these, one case

of inguinal hernia in a male, and one of crural in a female, died from the effects of the strangulation upon the bowel. In neither did the removal of the sac or the closure of the canal appear to add to the risk of a fatal result, inasmuch as none of the *post mortem* morbid appearances implicated the rings or the canal, but were confined to the bowel, omentum, and visceral layer of peritoneum. Such, indeed, is usually the case in the cases of death from the operation for the cure of hernia. It is rare to find any amount of peritonitis, and still more rare to find morbid appearances affecting the sac or canal.

The history of hernia shows that the sac may be twisted, perforated through and through, injected with irritants, ligatured or removed altogether, or may slough off, without any appreciable amount of peritonitis; and that death, when it ensues, is far more often from blood-poisoning, erysipelas, and such diseases as may occur from any operation, than from peritonitis. We may, therefore, conclude that, antiseptic means being employed to prevent such results, the attempt should be made to cure the patient of the hernia after kelotomy, in all cases where the condition of the bowel renders it safe to return it into the peritoneal cavity, after the relief of the strangulation. The omentum may be dealt with more freely than has heretofore been done. If it be sphacelated or suspicious in appearance, the vessels may be taken up in a healthy part above, tied with small catgut, and the doubtful part removed by tearing, or with a pair of blunt scissors. This may be done by spreading out the omentum, and taking up the vessels, which are usually plainly seen from the congestion of the veins, with a piece of thin catgut, applied by a common suture-needle, an aneurysm-needle, or a common pair of dissecting-forceps.

In a very few cases, indeed, a cure of the hernia may occur after kelotomy, where no attempts have been made to close the sac or canal; but, ordinarily, the division of the strangulating structures leaves the hernial aperture much more patulous, and the hernia larger and more uncontrollable by trusses than before. To prevent this by an addition to the ordinary operation of kelotomy, which does not appreciably increase the risk, and is effected while the parts are exposed by that operation, seems to be a course which will commend itself to most surgeons.

Umbilical Hernia.—The anatomy of the umbilicus is sufficiently simple. An opening left in the linea alba at the site of the exit of the omphalo-mesenteric duct, between that and the closed urachus, from imperfect development, sometimes permits at the period of birth a portion of bowel to protrude into the substance of the umbilical cord during the pressure and struggles of parturition.

On examining the infant before the application of the ligature to the navel-string, the appearance of the latter should be carefully noticed when the infant cries. If any swelling take place, or the cord appear thicker than normal, the sac, which is composed of the tissues of the funis, lined by a thin layer of serous membrane, should be carefully compressed, so as to exclude the bowel, if present, and a broad ligature placed nearly flush with the surface of the integuments. By this means the rupture may be at once cured.

To tie the cord at a distance from the navel is in these cases to invite the occurrence of an umbilical hernia; while no harm can result from the application of a thick silk ligature in the way just described, if the swelling be carefully manipulated to exclude any bowel which may be present in the sac. Often the weakness at the navel opening is unobserved, or the treatment by a pad and belt is discontinued too soon; and the result is the appearance of an infantile umbilical hernia, when the muscular system of the child becomes more powerful and the efforts in crying more continuous. Sometimes, although no hernia may at once ensue, a weakness is left at the site of the aperture, and a piece of omentum may pass in and out of the sac, preventing the circular contraction of the tendinous cicatrix, which should seal up the opening and cure the hernia. The original weakness may persist, and the first occurrence of the hernia, though this is not commonly the case, may happen in adult life or even in its decline. At this time, the accumulation of intra-abdominal fat, the occurrence of pregnancy or ascites, or the habitual distension of the bowels by air, may produce a rupture here. In such cases, the navel-cicatrix never presents the cup-shaped depression of a strong and healthy development. The peritoneum covering the inner surface of this point, when healthily developed, is tough, grayish-white, and presents small puckerings, produced by the contraction of the cicatrix, which binds the margins of the umbilical aperture together. In hernial cases this part is looser, more bulgy, and less firmly adherent. As the hernia becomes larger by the intrusion of omentum, the peritoneum becomes stretched, and finally so much attenuated as to be incapable of demonstration, so that we may look in vain in a long established case for a real peritoneal sac. The sac is a blending of the stretched and attenuated cicatrix with the remains of the peritoneal structure.

The abdominal wall gives way, in fact, at its weakest part, under the distension. In such cases, that part lies in the navel, and not in the groins. In some instances the small apertures in the middle line aponeurosis, which usually transmit the small intercostal vessels and nerves, may become dilated by the growth of pellets of fat, which gradually enlarge them, and finally may permit (when the patient from any cause becomes afterwards thin) the occurrence of a rupture close to the navel, and apparently (at first sight) umbilical. It will be found, on close examination of such cases, that the aperture is on one side of the real navel. The umbilical hernia of adults is always formed in one of the ways just described, but most frequently in the way first mentioned, and usually there is a history of an infantile or congenital weakness in the part. From the exposed and prominent position of the rupture, the part is liable to the results of pressure and friction, or injury. The sac may be rendered irregular in shape, bulging out on all sides, like a mushroom, and thickened irregularly by hypertrophy. The omentum within is very liable to become adherent, or thickened in lumps of fibrinous effusion. Or the bowel may be adherent to the omentum or sac.

Such changes are more commonly found at the lower part of the sac. This is brought about by the weight and pressure of the contents downwards upon the sharp lower curved edge of the hernial opening; while the pressure of the clothing, or even of a belt or truss worn to support the rupture, but often ill-fitting, pressing downwards instead of lifting upward, and uncomfortable to the patient, as well as injurious, produces a constant irritation and shifting of the pressure.

Hence it is found that the strangulating part of an umbilical hernia is placed at the lower edge, with the bowel hanging over it, and sometimes sharply ulcerated through, with extravasation of fecal matter into the sac. Not uncommonly, however, the strangulating part is intrasaccular, produced by the adhesions or omental openings, and may be, during operation, difficult to find and to separate from the matted tissues.

The transverse colon is usually involved in an umbilical hernia, but by no means invariably so. Frequently the small intestines are found in the sac, generally the omentum; in a few instances, a portion of the stomach and spleen.

In applying the taxis or any supporting apparatus to a large umbilical hernia, the pendulous position of the fundus must be carefully borne in mind. The pressure should be a lifting pressure towards the umbilical cicatrix. If this be not attended to, the bruised and damaged bowel is pressed and rubbed upon the cutting lower edge of the hernial aperture, and still further damaged, or even ruptured. The fundus should be placed in the hollow of the hand, and lifted up gently, while the fingers of the other hand manipulate the neck of the sac by a gentle kneading motion.

Operation for the Radical Cure of Umbilical Hernia.—As a rule, a congenital umbilical hernia, more even than other varieties, has a strong tendency to get well by the progressive contraction of the ring-like cicatrix around. In this it follows the law of all circular cicatrices, which, unless prevented by other conditions, tend to contract towards the centre, and close up the aperture. Time should, therefore, in all cases, be allowed for this beneficent action of the *vis medicatrix nature* to exert its influence, favoured, as far as possible, by properly fitting pad and belt. But in some, either from early weakness of constitution, hereditary predisposition, frequent crying, or the neglect of proper support, the rupture remains uncured up to the adult period, or becomes so large as to be dangerous and unsightly. This constitutes a serious danger in both sexes: in the male, from the disability and weakness thereby ensuing; and in the female, from the liability to pregnancy.

In only two cases have I thought it advisable to interfere by operation for the cure of umbilical hernia in adult males. One was a finely grown young man, aged 22, with a protrusion of the size of a small apple. He much wished to serve in the army, but was refused admission by the medical examiners. He was operated on June 16th, 1883, made a good recovery, had no unpleasant symptoms at all, and was finally admitted into the service, where he still remains cured. The other case was about the size of a walnut, in a lad aged 14, who had been rejected by the medical examiners for the navy. The cure was as perfect as in the last case, and no symptoms worth mentioning occurred.

In both cases, the operation was done with wire, in the following manner. A small semicircular needle, with a handle and the eye near the point, and sharp enough to pierce easily the very tough and resisting cicatricial tissue around the neck of the sac, and copper wire silvered, and rather thinner and more flexible than that used for inguinal hernia, were the only instruments used in the operation. The sac

was first pinched up with the thumb and fingers, and carefully emptied of its contents. It was then invaginated upon the forefinger, which was placed under the edge of the hernial opening on one side. The point of the needle was then made to transfix the tendinous margin about half an inch from the edge. The point of the needle, on raising and before perforating the skin, was then carried round a quadrant of the circular opening, and made to emerge at the upper pole of the vertical diameter. The bent end of the wire was then hooked on, and drawn back with the needle. The same manœuvre was then gone through on the opposite side, the upper end of the wire hooked on, and drawn through. The invaginating forefinger was then carried down to the lower pole of the vertical diameter, the needle passed through from behind, and then turned under the skin, so as to be made to emerge where the wire came out through the lateral puncture. The wire was again hooked on, and drawn down, a loop being left so as to emerge at each of the punctures. The same manœuvre being accomplished at the opposite side, the ends of the wire were left emerging at the lowest puncture, while a loop of wire was found at all the other punctures. The ends of the wire and the upper loop were then drawn upon, until the lateral loops sank under the skin. The invaginated skin and sac were drawn out of the aperture by traction with a pair of hooked forceps. Then, by twisting down into the punctures the upper loop and the ends of the wire below, the sides of the hernial opening were drawn powerfully together in a vertical line coinciding with the linea alba.

The application of tendon may be accomplished in the same manner, the ends of the ligature being tied firmly below at the lowest puncture, while the loops are all sunk into the other punctures, so as to disappear in the tissues. The method of application of the constricting ligature was, in fact, almost exactly the same as the subcutaneous ligature for nevus, which I have used for many years.

The wire was left in for a fortnight; much thickening ensued along its track. It was finally withdrawn by untwisting the upper loop and lower ends, cutting off the latter short, and drawing upwards the former. The wire, on being straightened by stretching, came out easily.

If the rupture be a large one, it would be better to keep all the loops, the lateral ones as well as the upper ones, and twist them all down into their respective punctures. The prepared thick tendon-ligature may be used in this operation, instead of wire. It is durable enough, if properly prepared, to endure until it becomes organised, and does not require removal. After the operation, the sac of the hernia projects as a vertical ridge, which can afterwards be removed, if desirable, with a pair of scissors, when the cavity is permanently closed at the neck. A pad of gauze, placed vertically on each side, with another thick one over them, covered with oil-skin, and held on by a broad body-bandage, is all the dressing required.

In three other uncontrollable cases in children, I have operated without any serious symptoms. One was by the use of the angular pins locked together. The result in this case was not satisfactory; the rupture returned. The others were operated on by the use of the thinner wire; they were completely successful. No death, or indeed any serious symptom, ensued. The hernial opening into the peritoneal cavity was in each case closed by adhesive effusion, and the wound scarcely even suppurated. But, in the unsuccessful case referred to, the adhesions were not strong enough to prevent a return of the rupture.

Review of the Various Methods of Attempting a Radical Cure of Hernia.—I can only briefly allude to the numerous fellow-workers who have followed this line of surgical improvement. Scarcely any subject in the whole department of surgery has been more discussed or more written about. Not any has been more soiled by the practices of mountebanks and charlatans from the earliest dawn of the history of medicine.

The want of permanent success has been almost universal, and the danger to life of many of these proceedings too often demonstrated. Of the ancient methods many owed their fame to extreme ignorance on the one hand, and impudent charlatanism on the other. Plasters and ointments of elecampane, caustics and the hot iron, and especially the application of oil of vitriol, brought fame and money to an impudent quack.

Excision of the sac and its covering, and in many cases of the testicle also, was practised by Celsus. Galen and Paulus Ægineta ligatured the sac at the superficial ring, and tied up also the cord and skin. Centuries after their time this was practised by continental quacks, as mentioned by Dionis and Scultetus. Then was introduced the milder and more scientific proceeding of opening the sac freely, and stitching its edges close. This was called the royal stitch, because it qualified the king's lieges for military service. The punctum aureum, as described by Ambroise Paré, consisted of passing a golden or leaden wire

behind both sac and cord, at the superficial ring, and twisting it down tight enough to close the hernial sac, without stopping the circulation through the testicle. In more modern times, Schmucker and Langenbeck exposed the sac by a free incision at the superficial ring, and ligaturing it without enclosing the cord. The fatality of this method (3 in 10 cases), and the failure of most attempts to cure in the hands of such men as Anel, Armont, and Petit in France, and Abernethy and Sharp in this country, led to the general professional opinion of the uselessness of such operations to produce a cure, and to their actual condemnation as very dangerous to life. The efforts of surgeons then turned in the direction of truss pressure as a means of radical cure. Richter employed a strong and tight truss, with a hard pad of wood; and this method was employed by L'Estrange, of Dublin, who has been followed by many Irish and American surgeons. The injurious pressure upon the spermatic cord, resulting, it seems to me, from the shape of the pad employed, has been marked in some cases I have seen and heard of. The pain and suffering inflicted during the lengthened period necessary for a cure, and the want of skill and care of the patient in adjusting the pressure, and the difficulty and expense of a continual supply of new trusses, combined to prevent a greater success than 10 or 15 per cent. of uncertain cures by this plan. But undoubtedly cases of cure by a skilful and prolonged use of an efficient truss have occurred to myself and many other surgeons. In children's cases especially, it is much more frequently effected; and it might be much more common if nurses and parents were as skilled as surgeons and instrument-makers in adjusting the trusses. But too often, especially in hospital practice, the attempt to cure by this method is hopeless; and the rupture, when brought for radical cure, is large, uncontrollable, and difficult, requiring sometimes two or even three operations.

A class of operations dealing with the interior of the sac by injection of irritants like iodine and tincture of cantharides was practised unsuccessfully, and sometimes fatally, by Velpeau and Pancoast. Another, dealing with the sac by introducing solid substances, such as threads or sponge, or gold-beater's skin, with the same object, was practised, with equally bad results, by Schuh, Belmas, and Riggs. The method of invagination of the skin of the scrotum into the canal, and endeavouring to plug up the rings permanently, was then brought into vogue by Signoroni and Gerdy. This plan was followed by another, namely, the use of a hard wooden plug, forced along the canal, originating in Wutzer, and practised by Rothmund, Sigmund, and Spencer Wells.

In all these methods it was found that, after a greater or less period of time, the plug, at first apparently satisfactory, gradually made its way, pushed by the recurring hernia, down into the scrotum. In many, excessive suppuration brought on burrowing of pus towards the abdomen, and fatal results. The apparent cures were in a great majority of cases temporary and illusory, and the operation fell into discredit. A revival of the injection method not into, but around the neck of the sac, using astringents such as solution of oak bark, has been practised in America by Heaton, and followed by Warren and Bull.

Since the publication of my treatise on Rupture in 1863, fresh methods of proceeding have been originated. Mr. Spanton has invented a new instrument for uniting by adhesion the pillars of the ring. It is shaped like a corkscrew and is introduced from the groin above downwards into the scrotum, guided by the forefinger, passed through a scrotal incision, into the canal. It is removed after a week or fortnight, according to the action set up. Mr. Fitzgerald, of Melbourne, Australia, laces up the pillars of the superficial ring with a continuous gold wire suture, which he leaves in the tissues in the hope that it may permanently fulfil its functions. Professor Dowell, of Texas, sews subcutaneously the pillars of the ring with silver wire, and claims to have done 100 cases with 60 permanent cures.

It will be observed that, in all of this class of operations, the anterior wall of the inguinal canal and its superficial ring are the only parts really affected by the operation. The hinder wall and the deep ring and neck of the sac are unaffected. The result is, that sooner or later the hernia makes its way behind the adhesions or the permanent wire suture, separating the former, and by constant pressure causing the latter to cut its way slowly through the tissues and become useless. In the case of the latter plans also, there is the manifest probability of a truss being inapplicable if the hernia return, or a weakness or bulge remain, requiring another operation for the removal of the wires within a few months. The same result will undoubtedly occur if the operation which goes by my name be imperfectly done, and the pillars of the superficial ring only be sutured. A misapprehension which may easily arise from a want of familiar and practical knowledge of anatomy, has led to the application of the name to operations in which all my precautions were neglected; and also to the employment of a part of my

operation only as the basis for a new method. The result has been, in many instances, a want of success, for which the operator, and not the operation, is really responsible.

Reasons, somewhat like the foregoing, have led to what is called the open method, or the method by dissection, for the radical cure of hernia. It will be well to state here that, with the protection of the spray and the careful use of antiseptic dressings, I by no means object to, but have often employed, this method of operating. But the real factors in the production of hernia should be properly and securely dealt with. An operation which has been practised by men of ability and professional position cannot be lightly considered by anyone. As present workers in this field of surgery I may mention the names of Professors Sir J. Lister; Annandale, of Edinburgh; and Stokes, of Dublin; Sir W. Mac Cormac; Macleod and Buchanan, of Glasgow; Mitchell Banks, of Liverpool; and Charles Steele, of Bristol, the first, I believe, who operated for the radical cure of hernia with all the antiseptic precautions.

Professor Annandale, of Edinburgh, opens the canal, ties the neck of the sac, and removes it bodily, and then stitches together the margins of the opening. In the *Edinburgh Medical Journal* for December, 1880, he published a case of strangulated crural hernia, operated on in January, 1872, in which he tied the neck of the sac with catgut and removed it with some adherent omentum. In a case of irreducible crural hernia, operated on in January, 1880, he stitched the margins of the crural ring to the stump of the sac in addition.

Professor Stokes, of Dublin, opens the sac freely, stitches up the neck, and then, without removing the sac, draws together the canal and pillars of the ring by chromicised catgut, carbolised silk, or silver wire. He considers the removal of the sac to be a risky and unsurgical proceeding. Mr. Mitchell Banks, of Liverpool, opens the canal freely, ligatures the neck of the sac, and divides it, detaches the fundus and removes it, and then sutures up with catgut the pillars of the ring.

Mr. Alexander, of Liverpool, opens the canal by dissection, and ligatures the neck of the sac with catgut, making a point of tying it so that it shall be flush with the peritoneum internally, so as to leave no digital depression. He then divides the neck of the sac below the ligature, and leaves it in the wound, without suturing the pillars of the ring. In one of the two cases of crural hernia, operated on by him in June, 1880, and reported in the *Liverpool Medico-Chirurgical Journal*, the fundus of the sac afterwards sloughed out. Sir William Mac Cormac has followed this plan, I believe, in a good number of cases. Professor Buchanan, of Glasgow, in cases of congenital hernia, cuts down to the sac, slits it up longitudinally on each side of the cord, then divides the front part horizontally, rolls up the upper half, and with it plugs the deep ring, turning down the lower half to complete the "tunica vaginalis" above.

Many of these surgeons appear to take little pains to close up the inguinal canal, as distinguished from the superficial ring. At the deep ring, some close the neck of the sac, without closing the margins of the fascia that forms the ring proper. In an irreducible hernia, it is, of course, necessary to open up the sac freely, and in many cases the inguinal canal also, in order to remove the sac entire. I accomplish this, if found necessary, by extending my usually limited incision upwards from the scrotum. The entire removal of the sac is always a tedious, severe, and often a difficult, operation, if due care be taken to preserve intact the spermatic cord. It must be accomplished by much dragging and tearing and separating a great number of vessels. The spermatic cord is sometimes found spread out, and its constituents separated widely apart. In two cases of irreducible direct inguinal hernia, I found it placed in front of, instead of behind, the sac—the vas deferens towards the inner, and the spermatic vessels to the outer side. In other large cases, I have found the vas deferens projecting before it into the interior the wall of the sac, with a sort of mesentery thrown around it. Much care is required in dealing with a large sac for its entire removal, and a good deal of extravasation of blood into the penis and scrotum follows in many cases—with, often, retention of urine. Banks states that it requires a good deal of "mauling;" while Stokes considers the process as "unsurgical," if not "repulsive and barbarous." It may certainly be considered as a most difficult and prolonged operation, and the increased mortality which follows it shows that its effects on the system are serious. It is only very weighty reasons which would justify its performance.

With respect to the supposed advantages of the open method, enabling the surgeon to see the parts on which he operates, I have myself found that, after the first cut and the application of the sponge, the parts became so bleared with blood, that I was obliged to rely mainly upon the aid of the sense of touch, before I ventured to pass a needle through Poupart's ligament, the conjoined tendon, or the pillars of the

ring. My experience is that this operation can be all done, and has been very frequently done by me, when the sac to be removed is not very large, through a scrotal incision, two inches long, reaching up to the superficial ring. The mobility and elasticity of the integuments is such, that the aperture thus made can be drawn up so as to lie over the hernial opening, which is itself dilated and large enough to permit the sac to be followed, drawn out, detached, tied, and divided close to the deep ring, without any important division of the intercolumnar fascia, which necessarily weakens the abdominal wall.

A fallacy which some operators seem to entertain is, that, by stitching the pillars of the ring only, the canal is also closed. The layers formed by the walls of the inguinal canal, and the spermatic groove above Poupart's ligament, in fact, remain as loosely connected with each other, when the parts are well healed, as they did before the operation. They are movable upon each other, and slide and give way before the soft pressure of the sac to form another hernia. Abundant material for a fresh sac is found in the peritoneum forming the false ligaments of the bladder. The plans for simply tying the neck of the sack, and either cutting it off or leaving it and the sides of the canal to heal up as they lie, are simply resuscitations of the older mediæval plans, about which the late Sir William Lawrence argued "that it was futile to close up or cut off the neck of the sac, while the openings in the abdominal wall remained to admit a fresh sac, which the peritoneum was apt and ready to furnish."

Conclusion.—It appears indubitable, from the results of the last twenty or more years' experience of the radical cure of hernia, that the position of those surgical writers who have maintained that the radical cure should not be attempted, except in the severest cases, is untenable. The operation has given as great relief and exemption from the minor troubles and worry which make life miserable as any operation associated with prolapse, such as hæmorrhoids, and is even more safe. It is certainly quite as much called for, on the score of relief from pain and inconvenience, as most other abdominal operations. Though it may not, like ovariectomy, remove the certainty of a speedy death, and may, like colotomy, be called an operation of convenience or expediency, it often relieves suffering as severe as that for which colotomy is performed, and is attended by far happier results.

The justification of the operation being admitted, it remains to consider what cases are most appropriate for it, and which of the many we have passed in review is most proper and applicable for the cases chosen. The rules I have observed in my own cases have been as follows. The subcutaneous plan has been adopted :

1. In cases of children above 5 years old, in whom trusses are useless and unavailable because of neglect, violent coughing and crying, sore groins, rapid increase in the size of the hernia, and interference with micturition.

2. In cases of young adults, or boys under 14, whose prospects in life as candidates for the naval, military, or engineering professions, or for colonising, are seriously impaired by the hernial condition. Such persons may be far from surgical assistance when the exigencies of duty or occupation may produce strangulation, or the breakage of a truss may leave them defenceless; they are subject, also, to increased life-assurance-rates, from which the operation, when successful, relieves them. It should be done in able-bodied working men, generally, whose various laborious employments may place them continually in danger of strangulation, and whose strength and usefulness are impaired by the hernia. The extent of the necessity for a radical cure of rupture, and the patriotic and social motives which demand it, are clearly made manifest by the estimates of the number of recruits and conscripts rejected for this complaint. Malgaigne states that one in every 13 Frenchmen is ruptured; Arnaud, one in every eight. During the civil war in the United States, 38,132 were rejected in two years. In this country, it is said that one in every 20 males is ruptured. The bodily ailments and mental worry which this condition and its consequences entail upon this large number of human beings, make up a very impressive total of suffering. And the mortality from it must be also considered. In 1879, according to the Registrar-General's reports, as given by Mr. Spanton, no fewer than 1,119 deaths occurred from hernia, of which 23.5 per cent. had undergone operation for strangulation, etc. The average rate of mortality of the operation of colotomy in 11 large hospitals is given by the same author as 41.8 per cent. The proportion of the mortality from hernia increases with age to a marked degree. The importance of a permanent cure effected during youth for so large and useful a class as this, when thus viewed, rises to the point of a national demand.

3. In reducible cases, where the sac is thick and indurated from

truss-pressure, or where the omentum is continually slipping down under the truss, showing thereby that it is abnormally elongated, I open the sac, tie the vessels of the omentum separately, and remove it below the ligatures; tie up the neck of the sac flush with the peritoneum at the deep hernial opening, and apply wire or tendon-ligature to the canal and rings. When, from any cause, a first operation fails in effecting a satisfactory cure also, I open the sac, inspect its interior to discover any special cause for the failure, tie and remove the sac, and lace up the canal and rings with especial care and security.

4. In all favourable cases of strangulated hernia, both inguinal and crural, the coverings and front wall of the canal being necessarily divided to search for the constricting tissues, I open the sac, examine the contents, remove adhesions and doubtful portions of omentum, then tie up the neck of the sac, cut it off short, and remove it altogether (except in congenital hernia), and secure the walls of the canal and rings, as in the subcutaneous method. Of course, a wrong diagnosis of the condition of the bowel or omentum, and of their fitness to be returned into the abdomen, or some other cause arising from the strangulation, may, in these cases, result in a fatal issue. But I believe strongly that, if drainage be free, and skilfully arranged, no increase of risk ensues from the attempt to produce a radical cure. Quite lately, I have done this in a case of *reductio en bloc* in a man who is now convalescent in the hospital.

5. Cases of irreducible hernia, and of large and unmanageable cases of reducible hernia, in patients otherwise in a good state of general health, and not above the age of 60, and in which truss-pressure entirely fails to render the patient comfortable and free from danger, seem to me to justify and to require operation, if the patient wish for the benefits which he may reasonably expect from a carefully conducted operation, under strict antiseptic methods. In all cases he should have the chances fairly laid before him, in a way that he can understand, and then have the option without bias or persuasion.

In these cases, as in the last class, the operation necessarily assumes more or less of the character of an open operation under spray. The sac is freely opened, and is tied and removed, but the suturing of the canal and rings is effected as in the subcutaneous method.

In bringing my allotted task to a conclusion, I am deeply conscious that a very considerable part of these lectures have gone over ground which has been elementary enough to re-echo the household words of every dissecting-room and tutor's class. In extenuation, I have to plead that the subject demanded a good deal of such anatomical repetition, to preserve its coherency, and to make it understood.

After all my efforts, I fear that there still remains much room for elucidation; and I have been led to think so because men who have arrived at considerable position in the profession have declared to me that they were unable to comprehend my method of operating, until they had seen it done by me, and that it was much more simple to see and to do it than to describe it.

At the risk of being tedious to the more experienced of my hearers, I have endeavoured to be clear to those less learned and less experienced. I have some fear that there is no doubt about the first, but that I may not have succeeded in the last as fully as I could have desired. At any rate, I have done the best that was in me to ascertain the exact truth about the possibility of a permanent cure of hernia, to prove it as convincingly as I was able, and to state it as simply as I could, and as shortly and completely as the scope of these lectures has demanded.

The last part of my duty now presents itself, and that is to thank you, Mr. President and gentlemen, most sincerely for your presence and kindness during my lectures.

[Cases of the radical cure of hernia, of 23 years' duration and downwards, were shown at the close of each lecture.]

DISINFECTION OF RAGS BY STEAM.—All rags sent to New York are disinfected in the following manner. They are arranged in bundles, and placed in an impermeable receptacle, into which overheated steam is introduced (330° Fahr.). In about five minutes, the temperature of the bundles is so high that it does not fall below 100° Fahr. until two hours have elapsed. The experiments that have been made prove that this process destroys completely all germs contained in the rags.

SMALL-POX IN THE POTTERIES.—The outbreak of small-pox which has taken place at Burslem has spread to Tunstall and Fenton, and serious alarm is experienced in the other towns of the Potteries, which are all grouped together. Eighteen cases have been under treatment at the tent-hospitals at Flagstaff Field, Bradmell Hall Farm, Burslem. There are six fresh cases in the town, and two persons at Tunstall are suffering from the disease.