ON
RESECTION OF THE INTESTINE AND
IMMEDIATE SUTURE
IN THE TREATMENT OF GANGRENOUS HERNIA.

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THE treatment of gangrene of the intestine resulting from acute or prolonged strangulation in hernia, is a subject which is still fraught with interest to every surgeon, a subject upon which surgical opinion is still strongly divided, and a subject in which we are again reminded that finality in surgery has not yet been reached. Therefore, in bringing before your notice the details of a case which presents several features of unusual interest, I shall ask your permission to use it as a text upon which to hang some observations upon the subject of the treatment of gangrenous hernia in general, and to use it as an illustration of what I believe I have sufficient material to

prove, that in dealing with gangrene of the intestine in a hernial sac, the more radical operation, the more ideal procedure of immediate restoration of the intestinal canal to its normal state, is at the same time, in the large majority of cases, the best for the patient, both as regards immediate safety and as regards the ultimate results. The notes of the case are as follows :

Miss E—, an unmarried woman æt. 30, was admitted to the Adelaide Hospital on the 22nd September, 1891. Of her family history there is little to record, except that her father died of apoplexy when over eighty years of age, and her mother of cancer of the stomach at the age of forty. Her brothers and sisters are quite healthy. She had never had any serious illness herself until the present trouble began. About three months previous to her admission to hospital she for the first time noticed a small swelling at the umbilicus, which came on after lifting a heavy weight. She could easily push back this swelling into her abdomen without the least trouble or pain. She consulted a lady friend about it, who gave her an abdominal belt, which she had worn for a month before I saw her. During these three months she had suffered much from headache, and complained of a good deal of tenderness over the abdomen, which she found was enlarged.

At 4 a.m. on the morning of the 22nd of September, 1891, she awoke suddenly with a violent pain in the abdomen, and putting her hand down she discovered a large hard swelling at the umbilicus, which she tried in vain to reduce. Vomiting soon set in and was frequent. Dr. Jones of Rathmines saw her about 11 a.m. ; he, at once recognising the urgency of her case, sent her into the Adelaide Hospital, where she arrived at 2.30 p.m. I saw her at 5 o'clock, and found her in the following condition. She was a fairly well-nourished, healthy-looking woman, but she appeared to be in a very excited state. Her face was very flushed, and wore an anxious expression. She seemed to be in great pain, which she referred to the

abdomen. Her tongue was furred. She did not appear to be at all collapsed, her pulse was full, regular, and non-compressible. The temperature was normal. Her breathing was rather shallow, and she complained of its being difficult. She stated that she had had an action of the bowels the previous morning, but none since then. The urine was acid, sp. gr. 1030 ; urates were abundant, but there was no albumen or sugar. On examination I found that the abdomen was uniformly enlarged, and sufficiently tense to prevent any examination of the contained organs. On percussion the flanks gave a dull note ; the rest of the abdomen was tympanitic. At the umbilicus there was a tumour about the size of an orange. It consisted of two parts ; the upper one small, with a raised rim, depressed in the centre, immediately corresponding to the umbilicus. It was of a reddish colour, evidently acutely inflamed. The lower one, larger, and a little to the right side, was globular, extremely tense, and was of a bluish-black colour. It was hard, very tender to the touch, and firmly gripped at the base. A hard, ring-like mass could be felt encircling its base. No impulse on coughing. The abdomen generally could be manipulated gently without pain, except in the immediate neighbourhood of the tumour. The patient was given a sixth of a grain of morphia hypodermically at 4 p.m. and again at 11 p.m. She vomited a few times during the night, but it was not stercoraceous. She slept at intervals.

Next morning, September 23rd, at 10.15 a.m., 30½ hours after the onset of the symptoms, the patient was placed under anæsthesia by Dr. Piel with his usual skill ; and assisted by Mr. Heuston, I proceeded to operate. I made a median incision directly over the tumour, and when the skin and fascia including the sac, which was adherent, were opened, a loop of small intestine was exposed. It was deeply congested, and at one place was quite black. Several constricting bands were successively divided, and the smaller tumour upwards and to the left

was opened. It appeared like a small pouch, and contained a small portion of intestine. The umbilical ring was very thick, almost cartilaginous. When it was divided the circulation gradually returned to the greater portion of the intestine, but the black portion was quite unaffected, and was evidently beginning to be gangrenous. After a short consultation we decided to perform enterectomy,—in the first place because the intestine seemed incapable of recovery; and secondly, because the portion involved belonged to the jejunum, and an artificial anus, if established, would only at best postpone a fatal issue.

Accordingly I proceeded first to enlarge the original opening at the umbilicus by incising the tissue downwards towards the pubes for about three inches. This was done to enable me to draw out the intestine so as to have sufficient room for suturing. When this was done a quantity of semi-gelatinous clear fluid escaped from the wound. It was so abundant that it was impossible to proceed with the operation until the greater portion of it had been removed. I then inserted my hand into the abdomen to ascertain the cause of this unexpected flow, and I discovered within the abdominal cavity a fairly large ovarian tumour, about the size of a foetus at full term, attached by a very broad pedicle to the broad ligament at the left side. It was a multilocular semi-solid cyst. We determined to leave it alone for the present. We considered that the length of time necessary to resect the intestine, and to suture the divided ends, together with the inherent dangers of such an operation, constituted a sufficient amount of risk in themselves, without exposing the patient to the danger of prolonging the operation and of adding to it the risks of an ovariectomy.

When a sufficient amount of the glairy fluid had been got rid of to allow us to proceed with comfort, the congested loop of intestine was drawn well forward, and then the abdominal cavity was shut off from the field of operation by means of two large flat sponges, placed one on each side of the intestinal loop, and clamped together

with forceps both above and below the loop. As it is essential in resection of the intestine to cut into absolutely healthy tissues, I determined to divide the gut well above and below the whole strangulated portion ; $23\frac{1}{2}$ centimetres ($9\frac{1}{4}$ inches) had thus to be sacrificed. No clamp was used to occlude the intestine, but this end was admirably attained by Mr. Heuston, who grasped the intestine both above and below in his fingers, and thus secured the field of operation against the risks and inconveniences of faecal contamination. The intestine was divided first above and then below with scissors, and a corresponding wedge-shaped piece was cut out of the mesentery, the divided vessels being secured. Then the edges of the mesentery were united by means of a fine catgut continuous suture. Great care was taken to close accurately the triangular spaces on each side where the mesentery divides to enclose the gut. The method employed was this :—A suture was passed through both layers of the mesentery close up to the intestine on one side ; it was then passed similarly through both mesenteric layers on the other side, and firmly knotted. This not only obliterated the triangular spaces, but helped to hold the divided ends of the intestine together. The remaining portions of the intestine were united by means of fine silk (Chinese twist), passed according to Gély's plan. This method differs from the ordinary methods chiefly in this, that the sutures are passed transversely to the long axis of the gut, instead of in a direction parallel to it. The suture only penetrates the peritoneal coat, and although continuous it was knotted at every point of emergence. Only the one row of suture was employed ; but in addition, at the convexity of the gut, three Lembert sutures were passed.

The parts were then thoroughly cleansed and replaced within the abdominal cavity, where they lay upon the upper portion of the ovarian tumour.

As much as possible of the glairy fluid in the abdominal cavity was then drained off, and the remainder sponged out. The abdominal wound was closed, and a

glass drainage-tube passed down through the upper portion of the wound. The parts were covered with sterilised sal-alembroth dressings. The patient did not appear at all collapsed after the operation, which occupied an hour and a half. She had a good colour, and the radial pulse was excellent. At 1 p.m. she got $\frac{1}{8}$ grain of morphia hypodermically, and was allowed to suck a little ice. The morphia was repeated at midnight, after which she slept well and had a good night. The subsequent history of the case may be epitomised. The morning following the operation the dressings were changed. They were pretty well saturated with discharge; by means of a syringe and india-rubber tubing $8\frac{1}{2}$ ounces of thick yellowish fluid were sucked up through the glass drainage-tube. The next morning the dressings were again saturated, and $4\frac{1}{2}$ ounces were sucked out. On the fourth day, as no fluid could be drawn out of the drainage-tube, it was removed. The wound healed throughout by first intention, even the track of the drainage-tube closed immediately.

During the period of recovery the diet was limited and very carefully apportioned. From the first day she was allowed a teaspoonful of white wine whey every two hours, and occasionally a little brandy and water. On the fifth day she got a teaspoonful of Denayer's peptonised meat. On the sixth day she was allowed four ounces of milk every four hours, and a teaspoonful of the peptonised milk every eighth hour. On October 1st she got tea and toast, and on October 5th, the thirteenth day, she was put on regular meals. During this period nutrition was maintained by means of nutrient enemata and zymine suppositories alternating every fourth hour. On the day following the operation she passed some flatus, and again on the morning of the fourth day. On the fifth day a warm water enema was administered, which returned almost immediately with scarcely any faecal matter, but the bowels moved again slightly five hours later, the motion being fluid. The bowels acted with-

out assistance once or twice a day from this date onwards.

On the 27th October, five weeks after the performance of the enterectomy, the patient was in such a very satisfactory condition of health and strength that I considered it would be unwise to delay further the removal of the ovarian tumour. My chief fear was that if I delayed any adhesions which had formed as a result of the former operation would become organised and firm, and would materially increase the difficulties and risks of the operation, especially as, from the position in which the sutured gut lay in the abdomen, the adhesions would form between it and the upper portion of the tumour.

Accordingly, the patient being prepared in the usual manner and placed under anæsthesia, an incision was made from the umbilicus to a point an inch above the pubes. As soon as the peritoneum was opened there was a copious discharge of the same thick gelatinous-looking fluid as at the former operation. The tumour at once appeared, a semi-solid multilocular cyst. The largest cyst was drained through a Lawson-Tait's cannula. The opening in the cyst-wall was then enlarged sufficiently to allow the introduction of the hand, so as to break up as many of the smaller cysts within the tumour as was necessary. When sufficiently reduced in size the whole tumour was drawn out of the abdominal cavity. There were numerous soft adhesions between the cyst-wall and the intestines above, which readily yielded to the fingers. The tumour was attached by a broad pedicle to the whole length of the left broad ligament. There was also a strong broad adhesion binding it down to the right side of the pelvis, almost constituting a second pedicle. Both of these were transfixed and ligatured in sections, and the tumour was then cut free. When it was ascertained that hæmostasis was complete the abdominal cavity was well flushed out with warm boracic solution, 4 per cent., and then carefully sponged dry. I then searched for the sutured intestine. It was impossible to detect it with

the eye, but I soon recognised it by touch. The line of union was so perfect that not even a contraction or depression on the surface marked the line of suture, but with the fingers a thickening beneath the smooth surface could be felt. When the piece of intestine had been examined by my colleagues who were assisting me, the abdomen was closed in the usual manner. The subsequent progress of the case need not be detailed further than to say that on the fourteenth day, November 9th, the patient was allowed up on the sofa, and at the end of four weeks from the time of the second operation she left hospital perfectly recovered. I had an opportunity of examining her six months later. The abdomen was perfectly flaccid, soft, and natural. There was no sign of protrusion at the umbilicus. She was in perfect health, except for occasional twinges of abdominal pain, probably due to flatulency.

The case which I have reported above furnishes us with two distinct subjects which merit consideration. The first of these relates to the co-existence of an ovarian tumour and ascites with strangulated hernia; the second raises the question as to the best means of dealing with the intestine in gangrenous hernia.

I will in the first place allude shortly to the first of these considerations. It is a remarkable fact that the question of how far and under what circumstances the presence of ascitic fluid in the abdominal cavity may influence formation of hernia, has received but little attention. Excluding, of course, the occurrence of acute inflammatory ascites, which may supervene as a result of peritoneal irritation consequent on strangulation, medical literature, by its scantiness, declares that the concurrence of ascites and hernia is sufficiently uncommon. The only attempt at dealing with the question with which I am acquainted is contained in a paper by Prof. Jeannel,¹ of Toulouse. In it he relates a case which in many respects is analogous to mine. The patient, an unmarried woman

¹ 'Revue de Chirurgie,' 1890, vol. x, p. 20.

aged twenty-six, came under his care in 1888 on account of an abnormal enlargement of the abdomen. The abdomen was so distended with fluid that an exploratory puncture was made, and 12 litres of a clear lemon-coloured fluid were evacuated, but all the liquid was not removed. It was then found that the cause of the ascites was a tumour in the left iliac fossa. Two days later, whilst straining at stool, an umbilical hernia, which she had had for eighteen months, became suddenly strangulated. Four hours later, taxis having proved unavailing, herniotomy was performed, and the gut liberated. The incision was then enlarged so as to admit of the removal of the tumour, which proved to be a parovarian cyst of the left side. In closing the abdominal wound a radical operation for the cure of the hernia was performed. The patient made a good recovery.

I have epitomised this case because it so closely resembles the one I have just reported; only in Jeannel's case, the strangulation having only existed for four hours, it was possible to relieve the patient by a simple herniotomy, without having to interfere with the intestine itself.

Although in some works on hernia the presence of ascites is mentioned as a predisposing cause of hernia, it is interesting to note how very few cases of this actual condition are reported.

Professor Jeannel has succeeded in collecting only eight cases, two of them reported by himself; and I have only been able to add one¹ to the list in addition to the one case I have observed myself, although I have searched the 'Index Medicus' and many other sources for cases of this kind, but without success.

Of these ten cases we find that eight were umbilical, one inguinal, and one crural. The preponderance of umbilical cases is what one would suspect. In fact, it would seem that fluid in the abdomen would tend to prevent inguinal or crural herniæ. In nearly all the

¹ Case 118 in tables.

usual positions of the body the weight of the fluid, gravitating downwards, would displace the intestines, and keep them away from the femoral and inguinal rings. The tendency of the intestines to float on the fluid, while saving them from the dangerous proximity of these lower rings, would, on the other hand, approximate them to the umbilicus. Their movement in this direction is limited only by the length of the mesentery; and should this be normal we can understand how a very abundant ascites, enormously distending the abdominal wall, might prevent a hernial accident at the umbilical ring which a more limited amount of fluid would promote.

In fact, in the cases quoted by Jeannel we find that the amount of fluid was not excessive. In some it had never been in great quantity, whilst in others strangulation of the hernia ensued after the abdomen had been partly evacuated. Hence, as Jeannel points out, "it seems that in ascites, strangulation of an umbilical hernia is specially to be dreaded when the ascitic fluid is but scanty, or when, having been evacuated, the abdominal wall is but slightly distended."

I will now pass on to the consideration of the larger, and perhaps the more vital question, namely, the best method of dealing with gangrenous intestine in a hernial sac.

Perhaps the most commonly employed method up to recent times is that with which the name of Sir William Lawrence is identified: it consists in "a free incision through the mortified part, in order to unload the distended intestinal canal; or, if the gut should have already given way, to divide freely the integument and sac, and to leave the subsequent process of cure entirely to nature."¹

The principle which underlies this method of treatment has been very generally adopted, but many modifications have from time to time been introduced, which have been received with more or less favour. Thus some advise that the gangrenous loop should be left *in situ* unopened, as

¹ 'A Treatise on Ruptures,' 5th edition, 1868, p. 364.

this gives better opportunity for plastic exudation to seal the parts, and so prevents the poisonous materials entering the abdominal cavity. As far as relieving the obstruction is concerned, it matters little whether the intestine be opened or not, as if left to itself the gangrenous portion will crumble away within thirty-six hours. Many operators recommend that the stricture should be divided in order to give free vent to the contents of the bowel above the seat of strangulation, and to allow the unhealthy portion of intestine to be well drawn out. Others, again, as strenuously oppose this procedure. "My own very strong opinion is," says Mitchell Banks,¹ "that the stricture should be left alone. . . . I maintain that any dividing of the stricture, involving as it does the risk of opening a passage into the peritoneal cavity from the putrid external wound, is apt to provide a channel for the subsequent leakage of septic materials into that cavity. . . . Slit up the gut, take off all tension, and let its juices run out, and there will soon be plenty of room for flatus and fluid fæces to escape."

On the other hand, Professor Spence said, "I divide the constriction freely, and draw down the gangrenous portion of gut beyond the stricture, and leave it in the wound merely covered by lint soaked in warm water. Some hours afterwards I open the gut and cut off the gangrenous portion, so as to allow the fæces to escape. By that time lymph has been effused around the protruded gut, and the risk of fæculent fluid passing back into the abdomen is very much lessened."

A step further in the treatment of these cases on Lawrence's principle consists in opening the intestine and suturing it to the wound. As recently as 1888 we find this treatment recommended by Mr. Jordan Lloyd,² who successfully treated a lady aged forty-five by this method. I shall have occasion to refer to this case again further on.

These various methods of dealing with gangrenous

¹ 'Proceedings of the Medical Society of London,' vol. viii, 1885, p. 289.

² 'Birmingham Medical Review,' vol. xxiv, 1888, p. 158.

herniæ agree in this, that they all aim at establishing an artificial anus, and they leave it to nature to perform. It was felt, however, that in many cases surgical art could do better than nature, and this led to perhaps the most important modification of Lawrence's method, namely, the immediate formation of an artificial anus by the surgeon's skill. Shortly, it consists in at once excising the damaged piece of intestine and suturing the healthy ends of the gut to the incision in the skin. This is the method which is perhaps most frequently adopted at the present day. But is it the best?

There is one great disadvantage under which all operations for the establishment of an artificial anus for the cure of a gangrenous hernia, labour, namely, that a second operation for the cure of the artificial anus becomes a matter of necessity. The irritation and excoriation of the skin around the anus, caused by the continual passage over it of the fluid contents of the small intestine, make life frequently unendurable; whilst a much more serious danger not uncommonly presents itself in the rapid exhaustion of the patient from mal-nutrition caused by shutting off a long piece of intestine from the food channel, and consequently leaving a diminished area in the intestinal tract for absorption.

The secondary operation may follow the lines laid down by Dupuytren, and the continuity of the canal may be restored by the use of an enterotome. This method finds favour with many, because this secondary operation is apparently a comparatively safe procedure. In the forty-one cases reported by Dupuytren¹ in his 'Leçons orales' but three deaths occurred, or 7·3 per cent. On the other hand, however, it is not by any means always successful. It is not uncommon to find in the record of cases so treated, in recent years, the statement made that the patient "continues to have a preternatural anus." In Dupuytren's forty-one cases the anus persisted nine times, or in other words the operation failed in 21·9 per cent.

¹ 'Leçons orales,' vol. ii, 1832, p. 286.

Instead of resorting to the enterotome, secondary resection and suture may be adopted. In favour of this method we may point out firstly, that it seldom fails to effect its object. Thus in the list of cases collected by Mr. Makins,¹ the operation failed only three times among 39 cases, that is a percentage of 7·7 per cent. That is, the treatment by the enterotome for the cure of artificial anus fails about three times as frequently as when secondary incision and suture are employed. Secondly, when a cure is obtained, it is brought about in a much shorter space of time by means of resection. Three to four weeks is generally sufficient for cure; whilst with the enterotome the operation has frequently to be repeated, and the cure when effected takes months. Thus in Mr. Jordan Lloyd's case, already referred to, it was nearly twelve months before the fistulous opening was finally closed.

On the other hand, the cure of artificial anus by resection has a much higher death-rate. In Mr. Makins' table, containing 39 cases, death occurred fifteen times, which gives a percentage of 38·4. Among 29 cases collected by Bouilly,² the operation failed only once, but death occurred in 11 cases, a percentage of 37·7. These statistics so nearly agree, that I think we may fairly assume that the death-rate of enterectomy and suture for the cure of artificial anus is about 38 per cent.

In estimating the relative value of the different methods of treatment, and in endeavouring to arrive at truthful deductions, it is perfectly fair to draw comparisons between these two methods of dealing with an artificial anus resulting from gangrene of the intestine in hernia; because they both start from the same point, and they both seek to arrive at the same end. The conclusion which we may, therefore, draw between these two operations is, that for the cure of artificial anus resection of the intestine and suture is far more fatal than Dupuytren's

¹ 'St. Thomas's Hospital Reports,' vol. xiii, 1883.

² 'Revue de Chirurgie,' vol. iii, 1883, p. 549.

method, but on the other hand it yields more certain and quicker results.

In competition with all these methods of treating gangrenous hernia, is the plan which has been employed, if I may so say, sporadically for a great number of years, but which has only in recent years received consideration as an operation which deserves to be employed more generally than has hitherto been the rule, and that it should not be reserved merely for exceptional and rare cases.

It is acknowledged on all hands that resection and immediate suture in gangrene of the bowel in hernia is, in the words of Helferich, "a perfectly ideal operation."¹ When successful, the patient is well and restored to his normal condition in from three to four weeks. He has no secondary operation to undergo. This operation, then, should obviously hold the first place, if we could show that the risks attending it were not greater than the risks of forming an artificial anus and subsequently curing it. The question, then, as to which operative procedure should, as a general line of practice, be adopted, resolves itself mainly into a question of statistics, and I hope to show that in this matter statistics speak with no uncertain sound.

The opinion generally held, certainly in these countries, is that the mortality following resection and immediate suture is sufficiently greater than the mortality following the older operation to outweigh the obvious advantages of the former method, and therefore the rule in general force is to restrict the operation of resection and immediate suture to the exceptionally favorable and more promising cases, and in the large majority of gangrenous herniæ to establish an artificial anus.

I shall presently discuss the soundness of this view, but before doing so I should like to point out the extremely faulty premises upon which this conclusion is based. I have already pointed out that it is perfectly legitimate to compare the results of secondary suture for

¹ 'Archiv für klinische Chirurgie,' Band xli, 1890, p. 337.

the cure of artificial anus with the employment of Dupuytren's enterotome, and to draw conclusions from the comparison as to the relative merits of the two procedures. But it is illegitimate to compare the results of primary resection and suture for a gangrenous hernia with secondary resection and suture for artificial anus, the result of a gangrenous hernia, and because we find the mortality of the former is higher than the mortality of the latter, to at once jump to the conclusion that the establishment of an artificial anus is the safer method of treating a patient whose hernia has become strangulated and gangrenous.

If we are to compare the mortality of the two procedures, we must place on one side the percentage of deaths following the primary operation of resection and suture. On the other side we must place first the mortality which follows on the operation for forming an artificial anus ; to this we must add the mortality of the secondary operation. When this is done we shall be in a position to compare the two operations. But this is not the basis upon which the conclusion which is so generally accepted rests. It would seem as if many writers on this subject, and men whose views carry weight, look upon this matter as if, in dealing with these cases, the surgeon had three alternatives from which to choose,—whether he would form an artificial anus, whether he would resect and suture at once, or whether he would resect and later on suture or use the enterotome. Whereas it is obvious that he has practically only two, to do the whole operation at once, or to divide it into the two parts ; and the mortality of the first must be compared to the combined mortality of the operation *à deux temps*. I lay particular emphasis upon this point because I find in English literature it is so frequently ignored. For instance, one of the most frequently cited statistics in the English language is quoted from a valuable paper in the ' St. Thomas's Hospital Reports ' by Mr. G. H. Makins.¹ In this paper the author, referring to the

¹ Vol. xiii, 1883, p. 193.

table of cases which he himself had collected of gangrenous hernia treated by excision and immediate suture, says, "In the table below are 55 cases with 29 deaths, a percentage of 52·7, against a percentage of 38·4 in cases of resection for artificial anus. . . . A glance at the statistics serves to show the very great advantage of carrying out the resection of the intestine when it is in a comparatively normal condition, and *hence they favour very decidedly the older method of establishing an artificial anus* in cases where the condition of the gut precludes any idea of its return into the abdominal cavity."

Now this last deduction does not follow as a logical consequence of the statistical premises. It simply assumes that the mortality attending the operation for the formation of an artificial anus is *nil*, or so small that it may be neglected altogether. I will give another illustration. In the 'Edinburgh Medical Journal'¹ Mr. J. M. Cotterill relates a very interesting case of gangrene of the transverse colon in an umbilical hernia, in which he excised 15 inches of the colon and formed an artificial anus. Over five months later he resected 7 inches more and sutured, the patient recovering. Commenting on this case he says: "It has been established chiefly by statistics that the best results after resection of intestine are obtained in cases of operation for the cure of artificial anus. . . . In other words, it appears less hazardous to do the operation in two stages rather than complete the operation at the time of the removal of a gangrenous portion."

This is again clearly a case of *non sequitur*, and yet it is based upon such arguments as these that the opinion prevails that resection and immediate suture in gangrenous hernia is more fatal than forming an artificial anus and subsequently curing it. Thus Mr. Mitchell Banks² writes: "We have to consider which is the better plan, to procure

¹ 1889, vol. xxxiv, pp. 602—607.

² 'Proceedings of the Medical Society of London,' vol. viii, 1885, p. 285.

a patient an artificial anus and cure him of that subsequently, . . . or to subject him at once to an operation *more fatal, it is true*, but which in all other respects manifestly has the advantage."

I have given these extracts in order to show how deep rooted is the belief that the immediate plan of treatment is more fatal than the operation divided into two stages. Now let us sift this matter carefully and see what the truth really is.

When I first began examining the statistics of these operations, I was quite unprepared for the extraordinarily high death rate which follows the operation for establishing an artificial anus in cases of gangrenous hernia.

A collection of isolated cases from all sources sometimes gives a false impression as to the mortality of a given operation. It is always open to an objector to say that especially in any novel operative procedure, the successful cases are nearly always published, the fatal cases frequently escape appearing in print. In the present instance we shall fortunately escape this objection. I have made no attempt to tabulate isolated cases of gangrenous hernia treated by the formation of artificial anus, but I can give the results of this method as tested by individual operators in various large hospitals and kliniks, where each operator records, not isolated cases but every case treated by this method under his own observation. Such statistics are of the greatest value and can be relied on.

Thus Korte¹ records 28 cases of gangrenous hernia in the Bethenien Hospital, which were treated by the formation of an artificial anus; 10 died shortly after the operation, either from collapse or peritonitis; of the 18 remaining, 6 died (three from infection of the wound, two from intercurrent diseases, and one from inanition). Death-rate, 16 in 28 cases or 57 per cent.

In the 'Friedrichshain' at Berlin 26 cases of gan-

¹ 'Deutsche med. Wochensch.,' No. 41, 1888.

gangrenous hernia were treated by artificial anus, of which 20 died, a mortality of 76·9 per cent.

Poulsen¹ records 29 similar cases of which 25 died, a mortality of 86·2 per cent.

Of 15 cases treated by the formation of artificial anus by Reichel in the klinik at Breslau, 12 died, viz. 80 per cent.

Kocher of Bern, who has recently published all his cases of gangrenous hernia, operated seven times by forming an artificial anus. Of these 7 cases only 1 recovered, showing a mortality of 85·7 per cent.²

Cohn³ has recently given the results of all his herniotomy cases, 220 in number, treated between the year 1880 and the summer of 1888; 26 gangrenous cases were treated by the formation of an artificial anus and 21 died, a mortality of 87·7 per cent

Such are the results when the artificial anus is made by the surgeon; but are the results any better when the formation of abnormal anus is left to nature.?

Ill⁴ collected 29 cases treated in this manner in the United States, and in these 25 patients died, giving a mortality of 86·2 per cent. These statistics may be objected to on the ground that they are isolated cases, and do not represent all the cases operated on. But we can refer to statistics on this point which are above suspicion. In a most valuable communication read before the Royal Medical and Chirurgical Society in March, 1891, Mr. C. B. Lockwood has given us the results of all the cases of hernia in which the strangulated gut was ulcerated or gangrenous, and all of which had been treated in St. Bartholomew's Hospital during the past seventeen years by free incision. He found 35 cases so treated, besides 2 in which he had employed the same method himself. Added to these there were 5 operated on in this way in

¹ 'Hospitals Tidenda,' 1889.

² 'Deutsche Zeitschrift für Chirurgie,' Band xxxii, 1891, p. 182.

³ 'Berliner klin. Wochensh.,' 1889, Nos. 20 and 21.

⁴ 'Med. Record,' Sept. 22nd, 1882.

1890, making a total of 42 cases. Of these 38 died, showing a mortality of 90·5.

In the accompanying table in which I have arranged these statistics, I find that out of 202 cases treated by the formation of an artificial anus 163 died, giving a mortality of 80·7 per cent.

Table of Cases of Gangrenous Hernia treated by the Formation of an Artificial Anus.

	Cases.	Recovered.	Died.
Korte	28	12	16
Friedrichshain . .	26	6	20
Poulsen	29	4	25
Reichel	15	3	12
Kocher	7	1	6
Cohn	26	5	21
Ill	29	4	25
Lockwood	42	4	38
Total	202	39	163
		19·3 %	80·7 %

Let us now consider what is the death-rate following the operation of resection and immediate suture in cases of gangrenous hernia.

Owing to the fact that very few operators have had a sufficiently large experience of this method to enable us to draw conclusions from the work done by a single operator or in a single hospital, I have been obliged to depend mainly upon the results as shown by a collection of all the cases I could find recorded in medical literature up to date.

I have succeeded in tabulating 222 cases, of which 104 died, which gives a mortality of 47 per cent. But it may be said that this does not represent the true death-rate, as many fatal cases are unreported. Among the list of operators, however, we find the names of three who have had exceptional experience in this operation. Kocher of Bern, Hagedorn of Magdeburg, and Mikulicz have recently published all their cases of resection of the intestine.

The cases extracted in my tables comprise only those in which resection and *immediate* suture were employed in gangrenous hernia, and in which a cylinder of the whole circumference of the gut was removed. I have thus tabulated 19 cases by Kocher, of which 9 recovered and 10 died, a mortality of 52·6 per cent. Sixteen cases by Hagedorn, of which 7 recovered and 9 died, a death-rate of 56·25 per cent. Twenty-one cases by Mikulicz, of which 14 recovered and 7 died, a death-rate of 33·3 per cent.

Putting all these cases together, as we have done in the case of artificial anus, we find a total of 56 cases by these three operators, of which 30 recovered and 26 died, or a death-rate of 46·43 per cent. This substantially agrees with the percentage of deaths obtained from the larger table of 222 cases.

But it must be acknowledged that the death-rate is materially improved by the brilliant results obtained by Mikulicz; but even if we rely on the results of Kocher and Hagedorn, and accept the mortality following this operation in their hands as the probable death-rate which attends resection and immediate suture, we have a mortality of 54·3 per cent. at most. Compare this with the death-rate attending the formation of artificial anus, which we have shown to be 80·7 per cent., and I think we must agree that it is unnecessary to add to this latter the death-rate of the second operation which is then necessary, either of secondary resection and suture, or of the use of the enterotome, to convince us that primary resection and suture is not only a more ideal operation, and has in every other way the advantage, but as regards risk to life it is immeasurably superior to the method of establishment of an artificial anus, independently altogether of the fact that the latter necessarily involves a second operation later on.

It may be objected, however, that the difference in the death-rate between these two operative procedures depends upon the nature of the cases in which the operations are performed. It is laid down by many writers that resec-

tion and immediate suture should be reserved for the more favorable class of cases, whilst in all the more severe forms an artificial anus should be established.

Bouilly¹ formulates the conditions under which resection and immediate suture may be undertaken.

1st. When the state of the patient is not so bad as to make us fear the length of time required by the operation, and the prolonged administration of anæsthetics.

2nd. When a careful examination allows us to reject the existence of a generalised peritonitis, or of any serious complication.

3rd. When we can assure ourselves at the time of operation that there has been no extravasation of fæcal matter into the abdominal cavity.

4th. If we believe we can with ease draw out the whole of the gangrenous portions of intestine and mesentery and resect in healthy tissue.

5th. If we can re-establish in a solid and efficacious manner the continuity of the intestine without being hampered by too great a difference between the calibre of the two ends.

These conditions, sufficiently rare to meet with in gangrenous hernia, have been accepted as the canons of practice by most operators hitherto. They are well expressed in the words of Coppens² of Lille :

1st. " Simple enterotomy, followed by the formation of artificial anus, should be the operation of choice in gangrenous hernia.

2nd. " Intestinal resection, more dangerous, should be reserved for absolutely special cases, and should be considered as an exceptional procedure."

Now I think these canons will have to be revised and considerably modified. It may have been true that resection has been reserved for those cases which promised well, but it is not true generally to-day. For look at the brilliant results obtained by Kocher and

¹ ' *Revue de Chirurgie*, vol. iii, 1883.

² ' *La Clinique*, 3e année, Nos. 10 and 11.

Hagedorn, both of whom have practically abandoned the operation for the formation of artificial anus, and resect and suture in every case, even in the most unpromising. I think their results show that there are a large number of cases in such a condition of collapse or of septicæmic poisoning when they first present themselves, that they are beyond the reach of surgical skill; but if any such cases are to be saved at all, they run a better chance with resection and immediate suture than if an artificial anus be formed. Far be it from me to say that in no case should an artificial anus be established. There are extreme cases where the condition of the patient is such that the smallest amount of surgical interference or of anæsthesia can be badly borne; in such cases we must do what we can—relieve the obstruction,—but we can have but little hope in a successful issue.

Looking at the statistics I think what they mean is this, that the death-rate which follows resection represents fairly accurately the number of cases that will die in gangrenous hernia, whatever method be adopted for their relief; and that the difference between this mortality and the death-rate following on artificial anus indicates the number of cases which might be saved by the former operation. We might then formulate our conclusions thus:

1st. Intestinal resection and immediate suture should be the operation of choice in gangrenous hernia.

2nd. Simple enterotomy, followed by the formation of artificial anus, should be reserved for absolutely special cases, and should be considered as an exceptional procedure.

I am aware that these views are not shared in by many of our most eminent surgical confrères; but I think this is mainly due to the fact that the conclusions to which the statistics point have not been appreciated, and in the absence of full statistics, it is natural to suppose that removing a piece of intestine and sewing the divided ends together at once must necessarily be a more dangerous proceeding, than simply to incise the

intestine and relieve obstruction in the most simple manner possible. If the real state of the case had been known, I do not think Mr. Jordan Lloyd,¹ for instance, in publishing a case in which he formed an artificial anus, and subsequently succeeded in closing it by Dupuytren's method after a treatment which lasted nearly twelve months, would have written:—"I am led to publish this case chiefly on account of the successful result of the treatment, because there is a growing tendency (amongst that school of surgeons who regard operation as 'the all and the everything') to deal with gangrenous intestine *by more radical and more rapid and certainly more risky methods.*"

There are several great dangers to be encountered, and, if possible, avoided in cases of gangrenous hernia. The first of these is the great distension of the afferent piece of intestine, which is generally filled with great quantities of fæces and gases. As a result of this distension we may find this portion of the intestine in a paralysed condition, incapable of maintaining the circulation of its contents, even after the obstruction has been relieved and the continuity of the canal restored. We find then that the symptoms of obstruction persist after all our attempts to relieve it. In such cases it is recommended by Julliard to form an artificial anus, and to resect and suture in two or three weeks. But in many of these severer cases the exhaustion of the patient steadily increases when an artificial anus is formed, and hence Riedel proposes, and he is supported in his recommendation by many of the most experienced operators, that after an artificial anus is formed, secondary resection and suture should be carried out at the earliest possible moment. In the investigations I have made for the purposes of this communication, I have come upon many cases in which secondary resection and suture has been done within twenty-four hours, and frequently with gratifying results. Kocher, however, prefers to resect and

¹ 'Birmingham Med. Review,' vol. xxiv, 1888, p. 162.

suture at once. He considers that as it is necessary to draw the loop of intestine well outside the abdominal cavity, it is easy to empty the afferent portion of gut of its contents after it has been divided and shortly before the application of the sutures. Another modification has been proposed. It was originally suggested by Helferich¹ in cases where the exact condition of the intestine was doubtful, and it was not considered wise or safe to return it to the abdominal cavity at once. He advised to leave the suspected gut outside the abdomen, well protected with dressings, after having performed intestinal anastomosis between the efferent and afferent portions of intestine. This suggestion, which has been favorably received, promises to be of use in the class of cases we are considering. Should this exposed loop prove to be gangrenous it can be excised the following day without recourse to anæsthesia, and the ends of the bowel inverted and closed by Lembert sutures. Helferich has tried this method twice, once with complete success, the second case dying in a few hours of collapse.

Another source of danger which may present itself in cases of gangrenous hernia is the severely damaged condition of the walls of the afferent portion of the intestine, which are frequently cedematous and congested, sometimes bordering on gangrene. It is extremely difficult always to estimate with any degree of certainty the exact limits of the injury. We find, in many of the fatal cases reported, that the cause of death was attributed to gangrene spreading upwards in the afferent portion above the seat of suture. On the other hand, we find that recovery has followed when large portions of the intestine have been removed. Thus Ramdohr's case (No. 1) in which he excised 2 feet, Rydygier's case (No. 29) in which 54 cm. were sacrificed, Rushton Parker (No. 89) who cut out 12 inches, Walter (No. 103) who removed 2 feet 4 inches, and lastly Kocher (No. 165), whose patient left hospital perfectly well on the eighteenth

¹ 'Archiv für klin. Chirurgie,' Band xli, 1890, pp. 337—345.

day, after having had 1 m. 60 cm., about $5\frac{1}{4}$ feet, of intestine removed. All these patients recovered. Thus we see that great danger may result from removing too little, but that within limits the risk is not increased by removing a long piece of the intestine. Therefore, in excising the damaged loop in gangrenous hernia, we should not hesitate to sacrifice all that appears in the slightest degree suspicious. The gut should be divided on both sides through absolutely healthy tissue. To obtain good rapid union and to avoid leakage the sutures must always be passed through healthy intestine.

If there be any doubt about the security of the suture, any risk of leakage, it becomes a matter of importance to diminish as far as possible any pressure of fæces and gases which the intestine may contain. With this object in view Bouilly¹ has recommended a "mixed method." He first resects in the usual way, then he sutures the ends together by Lembert's plan the whole way round, with the exception of a piece about one centimetre in length on the convex border of the intestine, opposite its mesenteric attachment, where he leaves a small opening. The edges of this opening he sutures to the abdominal wound, thus forming a fæcal fistula, which Bouilly maintains will close spontaneously in a short time. Whilst approving of this principle in certain cases of forming a "ventilator," Kocher prefers to make a very small opening in the healthy intestine above the situation of the fully completed suture. The suture-line will thus be less liable to be disturbed by the fæces.

I do not purpose in this communication to discuss the causes of death in gangrenous hernia when treated by resection and immediate suture. Fatal results due to faulty technique are, as experience grows, becoming rarer, and the statistics are to a certain extent from this cause improving, and there can be little doubt that they will in the future bear even higher testimony to the care and skill of the surgeon. But the high mortality attendant

¹ Loc. cit.

on gangrenous hernia is due mainly to two causes which the operator cannot remove, but which medical practitioners generally would do well to lay to heart. They are (1st) the length of time strangulation of the bowel is allowed to go on before surgical assistance is sought, and (2ndly) the injudicious use of taxis. These points are well emphasised in Kocher's cases. The duration of strangulation did not exceed three days in any of the cases which recovered after resection and suture, with one exception, a remarkable case of Littré's hernia, in which the strangulation had lasted for seventeen days. On the other hand, it is remarkable that death occurred twice only in herniæ which had been strangulated for only two days. In both of these cases, however, the patient had been subjected to prolonged and fruitless attempts at reduction by taxis before seeking surgical aid in the hospital.

Thus Bardeleben¹ says in his surgery, "One may assert with justice, that among ten unfortunate results of operation, nine are due to waiting too long and to too violent and forcible attempts at reduction by taxis."

So much has been written of late years as to the various methods of suturing the intestine, and as to the best means of carrying out the different technical details, that it is unnecessary for me to discuss them at length. I need not do more than point out what experience seems to indicate as the best methods to adopt.

In dealing with the mesentery it will be observed that in most of the earlier cases a wedge-shaped piece has been excised. Where portions of the mesentery are gangrenous, this is probably the best plan; but where the mesentery is sound, it is now generally advised that no portion of the mesentery should be sacrificed, as any interference with its vessels tends to increase the risk of gangrene in the portions of the intestine sutured.

Kocher's method is to ligate the mesentery, either singly or piecemeal according to the length of intes-

¹ Vol. iii.

tine to be removed, parallel to the gut. Hagedorn's plan, described by Habs,¹ is to transfix the mesentery about two centimetres from the gut opposite the centre of the portion to be excised, and by passing ligatures through the mesentery to ligate it piecemeal, the last knot being tied at a spot about one centimetre distant from the place where the intestine is to be divided at each side. The object of thus stopping short of the site of division is to protect as far as possible the sutured ends of intestine from becoming gangrenous. The mesentery is then divided close to the intestine through the whole length of the piece to be excised. This is also the method adopted by Mikulicz in all his cases, and has the great advantage of being rapidly performed.

Of all the various methods of suture the one most in favour is unquestionably Lembert's. Some prefer to use an interrupted suture, some a continuous, sometimes both are used in the different rows, but in suturing the serosa Lembert's method is, in the great proportion of cases, adopted. Hagedorn always employs a continuous suture, and, as it seems to me to be a form of suture that will find favour with many surgeons on account of its simplicity and the rapidity with which it can be introduced, I will shortly describe it. The ends of the intestine are cut across obliquely, so that more is taken from the convexity than from the concave or mesenteric side. For suturing the mucosa a strongly-curved needle (half circle) is used ; for the serosa a less-curved needle (three-eighths of a circle). The first or mucous suture begins at that portion of the intestine corresponding to the mesenteric attachment. The needle transfixes, beginning from within outwards, first the mucosa, then the muscularis of one side, then back again through the muscularis and mucosa of the other end of the intestine. The suture is then knotted, but the ends are not cut off. The two ends of the intestine are now sewn together with a continuous

¹ "Bericht über 200 Herniotomien," 'Deutsche Zeitschrift für Chirurgie,' Band xxxii, 1891, p. 357.

stitch until half of the circumference has been gone round, transfixing always in the same order, viz. mucosa, muscularis—muscularis, mucosa. So far the suture has been applied, sewing from the inside. When the centre of the convexity has been reached the order must be reversed, as we must sew from the outside. The needle, therefore, transfixes one side only, about 1—2 millimetres back through the mucosa and muscularis. The continuous suture is now carried on round the other half of the circumference in the reversed order, viz. muscularis, mucosa—mucosa, muscularis, until the mesenteric border is again reached. The suture is now knotted to the end left free at the first knot. This ensures that the knot shall be drawn within the lumen of the gut, or with a blunt instrument it can be pushed in. The blunt probe now pushes in the edges all round, to make certain that mucosa shall lie against mucosa and muscularis against muscularis. The second or serous suture is also continuous. It begins at the mesenteric border, and is carried the whole way round and finally knotted at the mesenteric border. It is applied according to Lembert's plan. This method of suture has been employed in all Hagedorn's cases, and, as will be seen by consulting the column "Remarks" in the table, even in the fatal cases the suture never failed.

The material employed for suturing the intestine seems to be a matter of choice. Many surgeons, among whom is Kocher, prefer silk; catgut has an equally strong clientèle. Hagedorn always employs catgut, for he says that union is so rapid between the serous coats of the two ends, that catgut holds quite long enough, and it is less likely to give rise to subsequent trouble.

A great many new and ingenious methods have lately been described for performing enterorrhaphy, mainly with the object of preventing a narrowing or constriction of the gut at the site of suture. Among these may be mentioned F. B. Robinson's¹ invagination method; Bowreman

¹ 'Annals of Surgery,' 1891, vol. xiii, p. 81.

Jessett's¹ method, a form of invagination with the assistance of decalcified bone tubes; and lastly, a method of suturing the ends together, giving one end a half twist so as to bring the mesentery of one cut end in apposition with the convex surface of the opposing end, described by Connell of Milwaukee.² But ingenious as these methods are, I doubt very much if they are ever likely to supplant the more simple methods of either the interrupted or continuous Lembert's suture. I have performed enterorrhaphy three times, though only once for gangrenous hernia, and in each case I have used Gély's suture, and I have found it on each occasion to have been perfectly efficient, but I should feel strongly tempted in my next case to employ Hagedorn's method, as being probably safer and possibly more rapidly applied.

However, we must bear in mind in discussing the question of the material to be used for suture and the method of applying it that these are matters of secondary importance. The point of importance above all others is not what one sews with, nor even how one sews, but the tissue into which we put our stitches. No sutures are good which are inserted in diseased parts. We should first make sure that we have removed all the suspicious portions of the intestine—better too much than too little. When this point is settled, next in importance is the care we exercise in putting in our sutures, whatever method we adopt. After these two, the question of the material we should employ sinks into significance, and it matters very little whether we use catgut or silk.

In conclusion, I think I am justified in summarising the points raised in this communication thus:

1st. The presence of ascitic fluid is not a common cause of strangulated hernia. It predisposes to umbilical hernia if the fluid is not too excessive; it tends to prevent strangulation at the inguinal or femoral rings.

2nd. Gangrenous hernia may be treated on one of two

¹ 'Brit. Med. Journ.,' April, 1892, p. 703.

² 'Medical Reprints,' Oct. 15, 1892, p. 133.

principles—either by resection of the affected portion and immediate suture, or the formation of an artificial anus.

3rd. The establishment of an artificial anus necessitates a secondary operation for its cure. This may be accomplished by secondary resection and suture, or by Dupuytren's method.

4th. It is illogical to compare the mortality following primary resection and suture with the mortality following secondary resection and suture, and thence to conclude that the establishment of artificial anus is preferable to primary resection and suture.

5th. To compare the death-rate of these two methods of treating gangrenous hernia, we should compare the death-rate following primary resection and suture with the death-rate following the formation of an artificial anus *plus* the death-rate of the secondary operation required for its cure.

6th. The mortality in cases of gangrenous hernia, treated by the formation of an artificial anus, is 80·7 per cent.

7th. The mortality of secondary resection and suture for the cure of artificial anus is 38 per cent.

8th. The mortality of treating an artificial anus by getting rid of the épéron (Dupuytren's method) is 7·3 per cent.

9th. The mortality which attends resection and immediate suture in gangrenous hernia is shown in the table of 222 published cases to be 47 per cent.

10th. The statistics show—(a) That intestinal resection and suture should be the operation of choice in gangrenous hernia ; (b) that simple enterotomy, followed by the formation of artificial anus, should be reserved for absolutely special cases, and should be considered as an exceptional procedure.

11th. In excising a portion of intestine it is of the greatest importance to resect through healthy tissue.

Hence it is better to sacrifice too much than too little of the gut.

In the accompanying tables are recorded some details of 222 cases of gangrenous hernia treated by resection of the intestine and immediate suture; and I gladly take this opportunity of acknowledging with gratitude the assistance I have received in their compilation from Dr. T. E. Gordon of Dublin, and Mr. H. Stansfield Collier of St. Mary's Hospital. I am also indebted to the valuable paper by McCosh in the 'New York Medical Journal,' 1889, for the greater portion of the earlier cases.

Table of Two hundred and twenty-two Cases of Gangrenous Hernia treated by Resection and Immediate Suture of the Intestine.

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
1	Ramdohr, 1727	'Moebius disput. Anat.,' Göttinge, 1751, vol. vi	Inguinal hernia	—	2 feet	Wedge removed	Invag. of upper end in lower; silk sutures	R.	—	—
2	De Vernalé, 1728	'Observ. et remarq. de Chirurg. Pract.,' Mannheim, 1767	Do.	—	2½ inches	—	Invag. of upper in lower end; silk sutures	R.	—	—
3	Duverter, 1737	Louis, 'Mém. de l'Acad. roy. de Chir.,' 1757, p. 188	Do.	—	2 inches	—	Ends sewed with silk sutures over trachea of calf	R.	—	Trachea of calf passed per anum on 21st day.
4	Schmidt, Jos., 1759	'Dissertatio de Ileo,' Wien., 1759	—	—	6 inches	—	Silk sutures	R.	—	—
5	Nayler, 1794	Cooper, in 'Anat. and Treat. of Hernia,'	Inguinal hernia	—	4 inches	Wedge removed	Silk sutures; mesen. held against abd. wound by sutures	R.	—	Faecal fistula on 2nd day, which remained.
6	Cooper, A., 1806	Cooper on 'Hernia,' p. 147	Femoral hernia	—	2½ inches	—	—	D.	—	—
7	Do.	Loc. cit., p. 148	Do.	—	¾ inch	—	—	D.	Recovered from primary operation, but death in 2 months, due to closure of intestine	On 8th day fecal fistula formed.
8	Diffenbach, 1836	'Wochenschr. f. gesan. Heilkunde,' 1836, No. 26	Inguinal hernia	—	3 inches	Wedge removed	Lembert's suture (silk)	R.	—	Patient died in 4 weeks from intest. obstruct. well above sutures.
9	Von Langenbeck,	'Arch. kl. Chir.,' vol. xix, p. 410	Pro-peritoneal	—	20 cm.	—	Invag. (Ramdohr), with separation of	D.	Delirium tremens and	Line of suture did not leak.

1875	inguinal hernia		4 cm.	Wedge removed	mesentery and Lembert's sutures of catgut with catgut	D.	exhaustion	
10 Kuester, 1877	Femoral hernia	'Verh. der Gesellsch. f. Chir.,' 1879, p. 83	—	—	Lembert's sutures with catgut	D.	Septic peritonitis	Two sutures had given way, and leakage taken place.
11 Czerny, 1878	Do.	'Berl. klin. Wochensch.,' 1880, p. 638	F., 43	Do.	Two rows of silk sutures (24)	R.	—	—
12 Kuester, 1877	Ing. hernia. Before opera- tion faeces had escaped in perito- neum	Report by Made- lung in 'Arch. f. Chir.,' Bd. xxvii, p. 84	5 cm. by laparo- tomy	—	Lembert's suture (catgut)	D.	Septic peritonitis	8 hours after operation.
13 Kuester, 1878	Inguinal hernia	Personal communication to Madelung 'Wien. med. Blätter,' 1879, Nos. 6 and 7	5 cm.	—	Do.	D.	—	28 hours after operation.
14 Nicoladoni, 1879	Femoral hernia	'Wien. med. Blätter,' 1879, Nos. 6 and 7	—	—	Edges inverted, and silk sutures	R.	—	Fistula formed on 5th day, but after- wards closed.
15 Wahl, 1879	Pro-perito- neal ingui- nal hernia	'St. Petersburg med. Wochenschr.,' 1879	15 cm.	Wedge removed	Lembert's suture, catgut (10)	D.	Peritonitis in 7 hours	Union of sutures good.
16 Woelfler	Femoral hernia	'Wien. med. Wochenschr.,' 1881, p. 116	F., 65	—	25 silk sutures	D.	Septic peri- tonitis due to faecal escape before opera- tion	—
17 Hagedorn	Do.	'Verh. Gesellsch. f. Chir.,' 1880, p. 64	F., 68	Wedge removed	Lembert's suture of catgut	R.	—	On 5th day faecal fistula formed.
18 Do.	Do.	Loc. cit., p. 65	F., 40	—	Do.	R.	—	On 6th day faecal fistula.
19 Ludvik, 1880	Do.	'Wien. med. Presse,' 1880, p. 743	F., 60	Cut off close to attach- ment	Upper invag. in lower end; 20 cat- gut sutures	R.	—	Stool on 4th day.

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
20	Bardenheuer, 1880	'Die Drainirung der Peritonealhöhle,' 1881, p. 218	—	—	—	—	Two rows of sutures	R.	—	Fistula formed, which healed in 4 months.
21	Czerny	'Berl. kl. Wochenschr.,' 1880, p. 45	Inguinal hernia	M., 49	6 cm.	Wedge removed	Czerny's	D. during operation	Collapse and impact of vomited matter in trachea	—
22	Heuser	'Dent. med. Wochenschr.,' 1880, p. 558	Femoral hernia	F., 73	10 cm.	Do.	Lembert's sutures, catgut (10)	D.	In 24 hours; septic peritonitis; leakage through line of suture	—
23	Gussenbauer, 1880	'Prager Wochenschr.'	Inguinal hernia	—	18 cm.	Do.	Two rows suture, Lembert's (catgut)	R.	—	On 6th day fistula formed; healed on 14th day.
24	Julliard, 1881	'Rev. med. de la Suisse romande,' June 15, 1881	Femoral hernia	—	18 cm. by laparotomy	Do.	Jobert's method (catgut)	R.	—	—
25	Jaffé, 1881	'Samml. klin. Vorträge' (Hamburg), p. 1699	Do.	F., 52	12 cm.	Do.	Czerny-Lembert (catgut)	R.	—	Radical cure. Stool (spontaneous) on 4th day.
26	Taendler, 1881	Personal communication to Dr. Nebel. Rep. by Madelung	Do.	F., 52	11 cm.	—	Ten catgut sutures between serous and muscular coats	D.	In 62 hours after operation; septic peritonitis	Sutures loose; intest. gang. six inches above.
27	Billroth, 1881	Communicated by Woelfler. Rep. by Madelung, 'Arch. kl. Chir.,' Bd. xxvii, p. 277	Inguinal hernia	M., 60	5 cm.	—	Two rows silk; outer row in Lembert's method	R.	—	Fistula formed, which closed in 3 weeks.
28	Roggenbau, 1881	'Berl. kl. Wochenschr.,' 1881, No. 29	Do.	—	32 cm.	—	Czerny-Lembert (silk)	R.	—	Stool on 5th day.
29	Rydygier	'Berl. kl. Wochenschr.,' 1881,	Femoral hernia	F., 58	54 cm.; projected	—	First row of contin. gut through	D.	Peritonitis in 20 hours;	—

p. 593	ing ends of muc. men. cut off	ser. and musc. coats; second row of Lembert's	line of suture closed	
30	Billroth (Woelfler)	'Verhand. d. Gesellsch. Chir.,' 8th Cong., p. 85	—	Do.
31	Billroth	'Wien. med. Woehens.,' 1881, No. 5 (Nittelshöfer)	15 cm.	Crural hernia
32	Billroth (Woelfler)	'Wien. med. Woeh- ens.,' 1881, No. 5, (Nittelshöfer), p. 85	—	—
33	Bryk	'Schramm in 'Przeviad Lekar- ski,' 1881, No. 22. Mentioned by Rydygier Loc. cit.	F., 36	Femoral hernia
34	Do.	Inguinal hernia	M., 29	12 cm.
35	Obalinski	Personal communi- cation to Rydygier	—	No details
36	Do.	Loc. cit.	—	Do.
37	Do.	Loc. cit.	—	Do.
38	Do.	Loc. cit.	—	Do.
39	Korzeni- owski	Loc. cit.	—	—
40	Weiss	Communication to Michl. Mentioned by Rydygier	F., 47	Inguinal hernia
41	Nichaus, P.	'Correspondenzbl. Schweiz Aerzte,' 1886, p. 70	F., 58	Femoral hernia

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
42	Kofranyi	'Wien. med. Wochensch.,' 1885, p. 965	—	F., 50	—	—	Serous coat only united	R.	—	—
43	Rosenberger	'Munch. med. Wochensch.,' 1888, p. 447	Femoral hernia	F., 40	—	—	Serous coat only	R.	—	—
44	Jones, S.	'Lancet,' 1885, p. 616	—	F., 42	—	—	Czerny-Lembert	?	Patient died at end of 15d.; supposed to be due to abortion; sept. peritonitis present	—
45	Viertel	'Deut. med. Wochensch.,' 1877, No. 10	Femoral hernia	F., 56	3 cm.	Wedge removed	Lembert, of silk (15)	R.	—	—
46	Fischer	Reported by Reichel, 'Deut. Zeitschr. Chir.,' vol. xix	Umbilical hernia	F., 55	5 cm.	—	Lembert's	D.	Septic peritonitis on 2nd day	—
47	Do.	Reichel, loc. cit.	Inguinal hernia	F., 47	7 cm.	—	Do.	R.	—	—
48	Molodenskow and Minin	'Centralbl. f. Chir.,' 1881, No. 46	Do.	M., 21	—	—	Lembert's catgut (25)	R.	—	Bowels moved 3rd day.
49	Roser	Loc. cit., No. 52	Femoral hernia	—	1½ cm.	—	Two rows; 8 in inner and 6 in outer; coats inverted	D.	In 42 hours from ileus. Valve-like swelling of mucous memb.	—
50	Aman	Schmidt's 'Jahrbuch,' 1882, p. 266	Do.	F., 63	—	Wedge removed	Czerny's	D.	In 17 hours, from peritonitis	Line of suture closed.
51	Bardeleben	'Deut. Gesellsch.	—	—	—	—	—	D.	—	No details.

52	Do.	f. Chir., Berlin, 1883	—	—	—	—	—	—	Do.	—
53	Feld	'Areh. kl. Chir.,' Bd. xxx, p. 222	Inguinal hernia	M., 33	18 cm.	—	Wedge removed	Two rows of silk interr. sutures	R.	—
54	Hofmohl	'Wien. med. Presse,' 1888, pp. 357 and 394	Umbilical hernia	F., 48	22 cm.	—	—	Three rows	D.	Peritonitis at end of 24 hours
55	Reichel	'Deut. Zeitsch. f. Chir.,' Bd. xix, p. 230	Do.	F., 56	21 cm.	—	—	Lembert's	D.	Septic peritonitis of 2 days
56	Do.	Loc. cit.	Inguinal hernia	F., 55	5 cm.	—	—	Do.	D.	Septic peritonitis on 2nd day
57	Do.	Do.	Do.	F., 47	7 cm.	—	—	Do.	R.	—
58	Do.	Do.	Do.	M., 35	37 cm.	—	—	Do.	R.	Facial fist., formed by punct. of intestine on account of obstruction.
59	Serres	'Rev. de Chir.,' 1887, p. 928	Do.	F., 69	8 cm.	—	—	—	R.	—
60	Prater	'Rev. de Chir.,' 1884, p. 859	Do.	F., 61	21 cm.	—	—	Two rows, 1 for muc. memb., and 1 for serous coats	D.	Shock at end of 24 hours
61	Ill, E. J.	'Med. Record,' Sept. 22nd, 1892	Femoral hernia	F., 24	—	—	—	Lembert's	R.	On 5th day faecal fistula formed.
62	Mazzoni	'Ital. Cong. of Surg.,' 1886, reports 20 cases done in Italy up to 1886	19 cases of strangulated hernia	—	—	—	—	—	11 R.; 8 D.	—
81	Mazzu- chelli, A.	'Gaz. Med. Ital.,' Lomb., 1884, p. 475	Inguinal hernia	M., 51	16 cm.	—	—	Czerny-Lembert	R.	Operation lasted 2 hours
82	Sobolewski	'Deut. med. Wochensch.,' 1887, p. 496	Femoral hernia	F., 26	15 cm.	—	Wedge removed	Two rows interrupted	R.	Operation lasted 1½ hour

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
83	Nedopil	'Wien. med. Wochensch.,' 1886, No. 51	Inguinal hernia	M., 52	8 cm.	Mesentery separated at attachment	Two rows; in part continuous, and in part interrupted	R.	—	—
84	Do.	Loc. cit.	Do.	F., 48	20 cm.	—	—	D.	From septic peritonitis on second day	Gangrene of intestine for 3 cm. on both sides of sutures.
85	Do.	Loc. cit.	Femoral hernia, which slipped into abdomen, and faeces escaped	F., 53	—	—	—	D.	In 6 hours from septic peritonitis and collapse	Laparotomy was performed; death not due to operation.
86	Do.	'Wien. med. Wochensch.,' 1886, No. 51	—	F., 49	6 cm.	—	Two rows of interrupted sutures	R.	—	—
87	Burekhardt	'Correspondenzbl. f. Schweiz. Aerzte,' 1887	Inguinal hernia	F., 21	—	—	Inner row continuous; outer row interrupted Czerny-Lembert;	R.	—	—
88	M. Banks	'Lancet,' 1885, p. 750	Do.	M., 25	—	Wedge removed	catgut	R.	—	Operation lasted 2 hours
89	Parker	'Brit. Med. Journ.,' Jan. 22nd, 1887	Do.	M., 50	12 inches	Do.	Two rows of inter. catgut; mucous membrane not included	R.	—	—
90	Carson, N. B.	'Journ. Amer. Med. Assoc.,' May 7th, 1887	Inguinal hernia; laparotomy	M., 12	2½ inches	Do.	—	R.	—	—
91	Stewart, J. E.	'Amer. Journ. of Med. Sci.,' 1886, p. 152	Femoral hernia	M., 68	4 inches	Removed at point of attachment	Lembert's, of catgut	R.	—	—

92	Crespi	'Bollett. Cliniche,' Milano, Sept., 1887	Inguinal hernia	F., 53	—	—	Lembert's	R.	—	—
93	Postempski	'Bollett. dell' Acad. Med. di Roma,' Dec., 1887	Inguinal hernia, right	M., 20	—	—	—	R.	—	—
94	Prati	'Centralbl. f. Chir.,' 1883, p. 45	—	—	—	—	—	D.	Shock a few hours after operation	—
95	Marcy	Rep. by Ill.; loc. cit.	—	—	—	—	—	D.	—	—
96	Rosen- berger	'Magdeburg Naturversamm.' Loc. cit.; rep. by	Inguinal hernia	—	—	—	—	D.	—	—
97	Do.	Hænel, 'Arch. kl. Chir.,' Bd. xxx, p. 395	Femoral hernia	—	—	—	—	D.	—	—
98	Kosinski	'Centralbl. f. Chir.,' 1886, p. 173	—	—	—	—	—	D.	—	—
99	Do.	Loc. cit.; rep. by Hænel	—	—	—	—	—	D.	—	—
100	Riedel	'Deut. med. Wochensch.,' 1883, p. 656	Inguinal hernia	—	30 cm.	—	—	D.	In 4 days; septic peritonitis	Intest. gang. above and below sutures
101	Wettergren	'Hygiea,' 1883; 'Centralbl. f. Chir.,' 1883, p. 784	Femoral hernia	F., 60	10 cm.	—	Catgut	D.	Septic peri- tonitis in 2 hours	In replacing gut faces escaped in abdomen.
102	Do.	Loc. cit.	Do.	F., 65	10 cm.	Wedge removed	—	R.	—	Death in 25 days from cancer.
103	Walter, K. A.	'Hygiea,' 1886; 'Centralbl. Chir.,' 1886, p. 692	Inguinal hernia	M., 52	28 inches	Separ- ated at attach- ment	Two to three rows of Lembert's suture	R.	—	—
104	Agnew, D. H.	'Med. and Surg. Reporter,' 1888, p. 321	Umbilical hernia	F.	14 inches	Wedge removed	Lembert's silk	D.	In 24 hours from hæmorrhage	1 suture torn out, but no leakage.
105	Fuller	'Med. Rec.,' vol. xxii, p. 430	Femoral hernia	F., 50	5½ inches	—	Continuous linen	R.	—	—

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
106	Richardson, M. H.	'Trans. Amer. Surg. Assoc., May, 1889 Loc. cit.	Umbilical hernia	F., 42	8 inches	Ligated with silk	Single row—Lembert	R.	—	—
107	Do.		Inguinal	F., 65	—	Continuous silk suture	Interrupted Lembert silk	D.	Exhaustion or collapse in 12 hours	—
108	Rosenberger, J. A.	'Munch. med. Wochensch., 1888, p. 447 'Correspondenzbl. Schweiz. Aertze,' 1881	Femoral hernia	F., 40	—	—	Serous coat only sutured	R.	—	—
109	Burtscher		Do.	F., 40	—	—	—	D.	On 5th day	—
110	Lange, F.	Personal communication to McCosh	Inguinal hernia	M., 45	5 inches	—	Czerny-Lembert	D.	Collapse in few hours after operation	—
111	Briddon, C. K.	Do.	Femoral hernia	F., 40	4 inches	—	Lembert's	D.	Collapse within 24 hours after operation	—
112	McCosh, A. J.	'New York Med. Journ.,' vol. xlix, 1889, p. 281	Inguinal hernia	F., 66	4 inches	Wedge removed	Czerny-Lembert; inner of silk, outer of catgut	R.	—	—
113	Feld	Klausner's paper in 'Munch. med. Woch.,' 1889	Left inguinal	M., 33	18 cm.	Small V-piece removed, and sewn with 4 "button" sutures	28 Lembert's sutures	R.	—	Had an attack of pneumonia shortly afterwards, but discharged cured in a month.
114	Hagemann	'Deutsche med. Woch.,' No. 31, 1889, p. 629	Right femoral	F., 46	14 cm.	V-piece of mesentery removed	Two rows of sutures; (1) of mucosa, (2) of musculet and serosa	R.	—	—

115	Postemski	'Bull. r. d. Med. di Roma,' 1886, vol. xii	Inguinal (? side)	F., 54	17 cm.	Divided close to gut, and its edge sutured	Prolapsed mucosa cut away. Catgut "mantumaker's" hem of all the coats, and a Lembert suture of a second row. Lot. Hyd. Perchl., 1 in 1000	R.	—	This is the 5th case reported at Rome, all successful.
116	Duranti	Loc. cit.	Right inguinal	M., 18	35 cm.	V-piece excised	Two rows of sutures. "Ippolito Palesciano mode," through muscle and serous layer	R.	—	One of the 5 cases mentioned above.
117	Gay	'Boston Med. and Surg. Journ.,' 1892, p. 207	Umbilical	F., 60	13 cm.	?	Two rows of silk continuous sutures. (1) Through muscle and serous. (2) Through serous alone	D. on 5th day	Facial extravasation at junction of gut with mesentery	Gangrenous omentum removed.
118	Do.	Loc. cit.	Do.	F., 55	More than 15 cm.	? Nearly certainly V-piece removed	Do.	R.	—	The case was complicated by large fibroid and ascites. The mesentery opposite the gangrenous gut was also gangrenous. Patient, had to complicate diagnosis, a cyst in the right labium majus. No complications.
119	Bozella	'Gazetta med. Lombard.,' 1891 p. 514	Right femoral (Richter's partial)	F., 54	6 cm.	V-piece removed	No. 1 Lister's catgut "Rem" and a second suture, also continuous, of serosa and muscle	R.	—	

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
120	Jaboulay	'Lyon Medical,' 1891, p. 436	Right femoral	M., 60	10 cm.	?	Gussenbauer's suture of silk. Lower opening of intestine smaller than upper, and therefore a small longitudinal slit was made to render the former equal to the latter	R.	—	—
121	Ransohoff	'Journ. Amer. Med. Assoc.,' Chicago, 1892, p. 198	Right inguinal	F., 56	35 cm.	Divided a short distance from gut, and united with a continuous suture	Fine silk "continuous Lembert," with additional points where they appeared to be wanted	R.	—	—
122	Klausner	'Munchen. med. Woch.,' 1889	Umbilical	F., 34	5 cm.	Probably Kocher's method	Fine silk, Lembert's suture	D. From shock next day	—	Patient was in 7th month of pregnancy, and was in bad state at time of operation. Gangrenous omentum removed.
123	Do.	Loc. cit.	Do.	F., 61	40 cm.	Wedge removed	Two rows of fine silk—(1) of mucosa, (2) of serosa	R.	—	—
124	Kohler	Loc. cit.	Right inguinal	M., adult	"Large loop"	Probably V moved	Two rows of continuous suture—(1) of mucosa, (2) of serosa	R.	—	—

125	Anderegg	Loc. cit.	—	F., 43	12 cm.	Kocher's method	Eighteen points of catgut by Lembert's method	D. From col- lapse 8 hours after opera- tion	General peritonitis	Perforation had occurred, pro- ducing intra- peritoneal extra- sation before operation.
126	Do.	Loc. cit.	—	F., 42	12 cm.	—	Immediate suture, mode not stated	D. From col- lapse 36 hrs. after opera- tion	No P.M. allowed	The sutured intestine was fixed in wound.
127	Jaboulay	'Lyon Medical,' 1891, p. 436	Right femoral	M., 40	12 cm.	?	Gussenbauer's suture, as in Case 120 from gangrenous pneu- monia 2 months later	Local reco- very. Died from gangrenous pneu- monia 2 months later	Perfect union. Seat adherent to parietes and to another loop of gut. Silk still intact	"Jaboulay prefers Gussenbauer's suture as being more rapidly accomplished than Czerny- Lembert's."
128	Dawborn	'New York Med. Record,' 1889, vol. xxxv, p. 428	Left femoral	F., 55 ("at least")	31 cm.	Catgut "cob- bler's" suture at 3/4 inch from gut and me- sentry and the sutures of 2 and 3 cut close to this line	Two rows of sutures, a Czerny and a Lembert case of Lembert's sutures "not drawn too tightly," between the sutures of 2 and 3 first row alter- nating with those of second row. Irrigation with warm salt solution	R. (But case be- tween weeks after opera- tion)	—	"This method of dealing with mesentery puckers it so that it is greatly shortened."

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
129	Park	'New York Med. Journ.,' 1889, vol. 50, p. 603	Umbilical	F., 39	Not whole circumference	Not touched	No. 1 catgut; three rows of continuous suture—(1) through mucosa; (2) through muscle; (3) through serosa	R. Well 6 mos. after	—	An ellipse to include two gangrenous spots $\frac{1}{4}$ inch apart, close to mesentery. 3 months after operation symptoms lasting 12 hours and suggesting intestinal obstruction, but passing off and not recurring.
130	Hagemann	'Deutsche med. Woch.,' 1889, No. 31, p. 627	Left inguinal; congenital	M., 12	31 cm.	Wedge-shaped piece excised	(1) Suture of mucosa; (2) a row of Lembert's Two rows—(1) continuous suture "after Rydygier," (2) interrupted suture	R. Well a year after	—	—
131	L. Frey	'Wien. med. Presse,' 1888, vol. xxix, p. 1484	Right inguinal	M., 28	33 cm.	—	A dozen Lembert's sutures	R.	—	Gangrenous omentum removed.
132	Cheever	'Boston Med. and Surg. Journ.,' vol. cxvii, 1889, p. 8	Right congenital	M., 20	9 cm.	"Mesentery secured by a running suture"	From unrelieved obstruction above cæal valve. Union good except 84 hours at one point, where edge appeared to have sloughed	D.	A volvulus undiscovered at operation below hernia, and a foot above cæal valve. Union good except 84 hours at one point, where edge appeared to have sloughed	The volvulus was bowel sharply turned on itself, thrust like a finger into right side of pelvis, and fixed by adhesions.
133	H. A.	'Philadelphia	Femoral	F.,	5 cm.	Not	Divided ends	D.	No autopsy	Walker says:—"I

Walker	Med. and Surg. Reporter, 1887, vol. lvii, p. 853	32	given	sutured with continuous catgut suture	From peritonitis 4th day	feel confident that had my antiseptic precautions been perfect in this case the results would have been different."
134 Croskey	'Philadelphia Times and Register,' 1889, p. 223	M., 29	13 cm.	Black silk Czerny-Lembert, with additional row of Catgut."	R.	Gangrenousomentum removed.
135 Moreau	'Bull. d'Ac. Med. de Belge,' 1891, p. 674	M., 33	24 cm.	—	R.	—
136 Clarke Stewart	'Internat. Journ. Med. Sci.,' vol. xci, 1886, p. 152	M., 68	4 inches	?	R.	Large soft stool on 5th day.
137 Arbuthnot Lane	'Trans. Clin. Soc. London,' vol. xxiv, 1891, p. 182	F., 53	3 inches	Ligated	R.	Left hospital in 3 weeks and 4 days.
138 Do.	Loc. cit.	F., 55	—	?	D.	—
139 Martinet	'Rev. de Chirurgie,' vol. ix, 1889, p. 335	F., 58	10-12 cm.	Gély's suture	R.	On 22nd day abscesses formed, but cure complete after several months.
140 Gerster, A.	'Aseptic and Antiseptic Surgery,' 1888	F., 61	6 inches	Wedge of meso-colon removed	D.	Peritonitis
141 Surgeon-Major W. R. Browne	'Indian Medical Gazette,' March, 1890, p. 89	?	?	Lembert; fine catgut	R.	Radical cure. Bowels moved 48 hours after operation.
142 T. N. Fitzgerald (operation, 1879)	'Australian Med. Journal,' 1883, N. S., vol. v, p. 31	M., 55	?	Catgut	D.	Leakage at mesenteric border. Peritonitis

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
143	Do. (operation, 1882)	Loc. cit.	Inguinal	M., 56	?	Do.	Continuous catgut, "herring-bone"	D.	Collapse	Died 5 hours after operation.
144	J. A. Wyeth	'New York Med. Journ., March 19, 1887	Femoral	F., 56	2½ inches	Do.	Czerny's suture through mucous memb.; Lembert's, three rows	R.	—	Radical cure.
145	Luzenberg, C. A.	'Gross. System of Surgery,' 1882, vol. ii, p. 533	?	?	6 inches	?	—	R.	—	—
146	Rushton Parker	'Med. Times and Gaz.,' vol. i, 1882, p. 581	Right inguinal	M., 60	12 inches	Gangrenous portion excised	Catgut; interrupted and continuous	D.	Septicæmia	Death in 36 hours. Union found perfect.
147	Do.	'Liverpool Med.-Chir. Journ., Jan., 1886, p. 234	Umbilical	F., 52	6 inches	?	Catgut; Glover's stitch	D.	Collapse	Death in 12 hours.
148	Lücke	'Sonnenberg Deutsche Zeitsch. für Chirurgie,' 1873, vol. xii, p. 311	Femoral	F., 54	6 cm.	—	Randohr's invagination; double row sutures	D.	Peritonitis	Tendency to stricture at seat of invagination. Death same day.
149	G. Bouilly	'Revue de Chirurgie,' vol. iii, 1887, p. 362	Right inguinal	M., 47	50 cm.	Gangrenous portion excised	Lembert; fine catgut	D.	Acute peritonitis	Spreading gangrene. Secondary operation.
150	R. Gattai	'Lo Sperimentale,' Jan., 1882, p. 54	Right femoral	F., 67	1½ cm.	—	—	R.	—	—
151	Rochelt	'Wien. med. Presse,' No. 36, 1882	Right inguinal	M., 54	12 cm.	Gangrenous portion excised	Czerny-Lembert	D.	Collapse in 8 hours	—
152	G. Bouilly	'Revue de Chirurgie,' vol. iii, 1883, p. 362	Left femoral	F., 50	21 cm.	Corresponding piece excised	Lembert, silk	D.	Kinking of intestine above line of suture	27 hours after operation. Line of union found perfect.

153	Von Lukowicz	'Archiv. für klin. Chir.,' Band 42, 1891, p. 491	Right inguinal	F., 54	5½ inches, duo-denum	Corresponding piece of mesent. excised	Lembert, two rows silk	R.	—	On 4th day spontaneous stool.
154	Von Baracz (operation Aug., 1886)	Loc. cit., pp. 493—522	Do.	M., 41	36 cm.	Resected cross-ways	First row, Czerny of mucosa; second row, Lembert	R.	—	Faecal fistula persisted. 6 months later secondary operation, with excision of 6 cm. more. Recovery. Digital dilation of efferent end of gut.
155	Kocher (operation Feb. 18, 1879)	'Deutsche Zeitschrift für Chirurgie,' Band 32, 1891, p. 101	Right femoral	F., 49	8 cm.	?	Twenty-five catgut	D.	Perforation of intestine below seat of suture	—
156	Do. (op. March 5, 1880)	Loc. cit., p. 103	Left inguinal	F., 49	42 cm.	—	Silk, Lembert	R.	—	—
157	Do. (May 19, 1880)	Loc. cit., p. 106	Right femoral	F., 61	11 cm.	—	Eight Lembert's silk; second row	D.	Peritonitis; pulmonary embolism	Death in 8 days. Littre's hernia.
158	Do. (July 6, 1880)	Loc. cit., p. 108	Right femoral	F., 31	21 cm.	—	Eight catgut Lembert, and a second row	D.	—	Gangrene after reposition en bloc.
159	Do. (Nov. 26, 1880)	Loc. cit., p. 110	Right inguinal	M., 34	12 cm.	—	Fifteen catgut	D.	Peritonitis; broncho-pneumonia	—
160	Do. (Feb. 10, 1881)	Loc. cit., p. 113	Do.	M., 27	25 cm.	Gangrenous portion excised	Twenty Lembert's	D.	Previous peritonitis	—
161	Do. (July 21, 1881)	Loc. cit., p. 115	Right femoral	M., 49	8 cm.	Involved portion excised	Twenty-five Lembert's	R.	—	Radical cure.
162	Do. (Dec. 15, 1881)	Loc. cit., p. 117	Do.	M., 42	7 cm.	Necrotic portion excised	Two rows of suture	R.	—	Littre's hernia.

No	Operator.	Where reported.	Disease.	Age and sex	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
163	Kocher (Jan. 26, 1882)	'Deutsche Zeitschrift für Chirurgie,' Band 32, 1891, p. 120	Do.	F., 60	25 cm.	—	—	D.	Peritonitis	Frequent and prolonged attempts at taxis before operation. No leakage.
164	Do. (Feb. 10, 1885)	Loc. cit., p. 122	Do.	M., 18	—	—	Two rows of suture	D.	Purulent peritonitis	—
165	Do.	'Correspondenzbl. für Schweiz-Aertze,' 1886	Inguinal	M., 57	1 m., 60 cm.	Separated close to attachment to ment to gut	Inner interrupted, outer continuous. Both silk	R.	—	Out of bed on 14th day; discharged on 18th day. No bad effects.
166	Do. (Apr. 22, 1886)	'Deutsche Zeitschrift für Chirurgie,' Band xxxii, 1891, p. 131	Right femoral	M., 65	—	Divided parallel to intestine	First row silk through whole thickness of intestine; second row serous and continuous Do.	D.	Partial gangrene of intestine; acute sepsis	Death 15 days after operation.
167	Do. (June 9, 1886)	Loc. cit., p. 138	Do.	M., 39	8 cm.	Do.	Do.	R.	—	Hernia returned in 1889. Littré's.
168	Do. (Oct. 22, 1887)	Loc. cit., p. 139	Left femoral	F., 46	21 cm.	Portion excised	Two rows continuous	R.	—	Radical cure.
169	Dr. Lardy, First Assist. (May 26, 1888)	Loc. cit., p. 144	Right femoral	M., 50	10 cm.	—	First row interrupted; second row continuous	R.	—	Well in 16 days. Littré's.
170	Kocher (June 17th, 1888)	Loc cit., p. 145	Do.	F., 34	4½ cm.	Divided parallel to intestine	Lembert's continuous	R.	—	Littré's.

171	Do. (July 10, 1886)	Loc. cit., p. 146	Right inguino- pro- peritoneal	M., 19½	3 cm.	—	First row through whole thickness of intestinal wall; second row continuous, Lembert	R.	—	Littre. No return of hernia in 12 months.
172	Do. (Aug. 11, 1886)	Loc. cit., p. 153	Left femoral	F., 77	20 cm.	—	First row inter- rupted; second row continuous	D.	—	Some leakage; 15 cm. of intestine in a semi- gangrenous condition. —
173	Do. (Sept. 19, 1886)	Loc. cit., p. 156	Left inguinal	F., 62	28 cm.	—	Do.	D.	—	—
174	Hagedorn (Jan., 1886)	'Deutsche Zeit- schrift für Chir- urgie,' Band xxxii, pp. 323—376	Right inguinal	M., 48	12 cm.	In all Hage- dorn's cases, he ligatures the mesentery parallel to the intestine, about 2 cm. from the gut, with silk or elastic ligatures. He begins to ligate at a point in mesentery cor- responding to middle of intestinal loop to be excised, and ends at a point 1 cm. before reaching the place where the intestine is to be divided. Mesentery is then divided along whole length of its attach- ment to the loop to be excised	Catgut—first row continuous through mucosa and muscularis; second row continuous, Lembert	R.	—	Small faecal fistula on 8th day, which soon closed. Firmly healed on 48th day.
175	Do. (May, 1890)	Loc. cit.	Right inguinal	M., 61	38 cm.	Do.	Do.	R.	—	No radical cure.
176	Do. (March, 1885)	Loc. cit.	Do.	M., 68	10 cm.	Do.	Do.	D.	Purulent peritonitis existing before operation	No leakage. Place of suture with- stood test by water.

No	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery	Suture material.	Result.	Cause of death.	Remarks.
177	Hagedorn (Dec., 1885)	Loc. cit.	Do.	M., 73	24 cm.	Do.	Do.	D. in 20 hours	Collapse	Extensive carcinoma, cardiac ventriculi, and of the peritoneum found. Serosa found glued firmly; withstood water test.
178	Do. (June, 1888)	Loc. cit.	Right femoral	M., 88	4 cm.	Do.	Do.	R.	—	—
179	Do. (Nov., 1884)	Loc. cit.	Do.	F., 84	9 cm.	Do.	Do.	R.	—	Radical cure.
180	Do. (Feb., 1886)	Loc. cit.	Do.	F., 53	20 cm.	Do.	Do.	R.	—	Do.
181	Do. (Dec., 1889)	Loc. cit.	Do.	F., 54	10 cm.	Do.	Do.	D. in 48 hours	—	Union firm. Withstood the water test.
182	Do. (Nov., 1889)	Loc. cit.	Do.	F., 55	11 cm.	Do.	Do.	D. in 36 hours	Fatty degeneration of heart. An inebriate	Do.
183	Do. (Oct., 1889)	Loc. cit.	Do.	F., 59	12 cm.	Do.	Do.	D. in 22 hours	—	Do.
184	Do. (Dec., 1885)	Loc. cit.	Do.	F., 66	17 cm.	Do.	Do.	D. in 12 hours	Pre-existing anasarca	Closure of wound in intestine was perfect, and withstood water test after 12 hours
185	Do. (Feb., 1889)	Loc. cit.	Left femoral	F., 48	7 cm.	Do.	Do.	R.	—	In 19 days.

186	Do. (Dec., 1884)	Loc. cit.	Do.	F., 67	13 cm.	Do.	Do.	R.	—	Patient had perfectly recovered, when she died of heart disease and pneumonia on 27th day.
187	Do. (April, 1888)	Loc. cit.	Do.	F., 38	12 cm.	Do.	Do.	D. in 9½ hours	Hæmorrhage from a vessel	—
188	Do. (July, 1888)	Loc. cit.	Umbilical	M., 88	8 cm.	Do.	Do.	D. in 10 mins.	Peritonitis and septicæmia	Patient moribund at time of operation. Hernia 14 days strangulated.
189	Do. (May, 1890)	Loc. cit.	Do.	F., 64	43 cm.	Do.	Do.	D. in 38 days	Acute purulent peritonitis, due to elastic ligature	Patient left perfectly well on 27th day. Peritonitis subsequently developed.
190	Cohn	'Berlin. klin. Wochensch.,' 1889, Nos. 20 and 21	Right crural, partial (Richter?)	F., 24	6 cm.	—	A row of sutures of mucosa, and a row of Lembert's sutures	D. in 18 hours	Septic peritonitis	Bowel was torn, and faces escaped into peritoneal cavity. Incision was prolonged up to the umbilicus, and abdomen washed out with thymol solution.
191	Do.	Loc. cit.	Right crural	F., 31	34 cm.	—	A row of sutures of mucosa, and a row of Lembert's. Bowel left in the sac	D. on 2nd day	Suppurative peritonitis. A leak at one spot	Faces came out between the sutures of gut on the first day.
192	Do.	Loc. cit.	Left inguinal	M., 57	6 cm.	—	A row of mucosa stitches, and a row of Lembert's	D. on 3rd day	Broncho-pneumonia	Sutures holding well; no peritonitis. Patient was a weakly man, suffering from chronic bronchitis.

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
193	Cohn	Loc. cit.	Left femoral	F., 59	20 cm.	—	Probably as in last case	R. after 5 weeks	—	An incision in linea alba was made for the suturing. Faecal fistula, which closed after a time spontaneously. Patient was the subject of bronchial catarrh, and had an acute attack soon after operation.
194	A. Casini	'Giorn. Internaz. della Scienza med.,' Napoli, 1889, p. 355	Left inguinal	F., 40	18 cm.	V-piece excised	Continuous fine-silk suture of all the tunics for three quarters of the circumference, and the circle at the mesenteric part completed by Apolito's suture. (2) A second row of Lembert's stitches	R.	—	
195	Dietrichsen	'Norsk. Mag. f. Lægevidensk.,' 1886, p. 487	Direct inguinal	M., 76	14 cm.	V-piece of mesentery removed	Wöelfler's method. Carbolicised sutures. A row of Lembert's stitches	R.	—	This operation was done under cocaine (6 per cent.). Gangrenous omentum was removed. Sac was gangrenous and gut ruptured. Astercoral fistula formed six days later, but it subsequently closed, and patient was well 3 months later.
196	Ström	Loc. cit., 1886, p. 573	Cruial	F., 40	12 cm.	V-piece excised, and edges stitched with catgut	"Czerny Lembert's double circle of iodoform silk stitches," but continuous, with here and there a knot	R.	—	There was a second constriction of gut, with doubtful vitality, and so when the sutured part was returned, it was decided to place "an iodoform silk sling round this doubtful part, through its mesentery, to fix it near the ring." This was removed at first dressing. No complications after operation.
197	Ferrajoli	'Giorn. Internaz. delle Sc. Med.,' Napoli, 1889,	Right cruial	F., 40	15 cm.	tinuous suture V-piece excised	"Apolito's method." Continuous sutures,	D. on 14th	Bronchitis and diarrhoea. A very small	Gangrenous omentum excised. Sac was sloughy at

p. 169					two, each taking half a circumference, and ending at mesenteric junction. Reinforced where necessary by fine catgut	day	localised abscess surrounded by adhesions near place of suture. A second larger abscess the size of a small apple, between layers of mesentery near suture-line. Perfect union of sutures. Chronic intestinal nephritis. Bronchitis and lung collapse	time of operation. Patient had long suffered from bronchitis.
198	Mickulicz	'Berlin klin. Wochenschrift,' 1892, Nos. 10—13	Right femoral	F., 36	32 cm.	Kocher's	R.	Tamponade of femoral canal with iodoform gauze.
199	Do.	Loc. cit.	Do.	M., 51	90 cm.	Do.	D. in 30 hours	Gut had perforated before operation.
200	Do.	Loc. cit.	Right inguinal (Richter)	M., 46	3 cm.	Do.	R.	Tamponade with iodoform gauze.
201	Do.	Loc. cit.	Right femoral	F., 45	15 cm.	Do.	R.	The sutured bowel, before being dropped back, was surrounded with iodoform gauze.
202	Do.	Loc. cit.	Do.	F., 56	25 cm.	Do.	R.	Patient had serous diarrhoea, after a right-sided pleurisy.
203	Do.	Loc. cit.	Left inguinal	M., 39	—	Do.	D. in 10 hours	Gangrenous part had ruptured, and gone back into abdomen. Incision was prolonged to umbilicus.

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
204	Mickulicz	Loc. cit.	Right femoral	M., 58	20 cm. (nearly)	Do.	Do.	D. from shock 5½ hours later	No peritonitis. Atheroma of aorta. Old pleurisy. Lungs congested	Omentum resected. Pulse was good, and no shock of importance when patient was put back to bed. End was unexpected.
205	Do.	Loc. cit.	Left femoral	F., 15	11 cm.	Do.	Czerny-Lembert, silk	R.	—	There was perforation before operation. Patient had left-sided pleurisy a few days after operation.
206	Do.	Loc. cit.	Right femoral (Richter)	F., 26	7 cm.	Do.	Do.	R.	—	Puncture through abdominal wall relieved distension by gas of intestine above lesion after operation.
207	Do.	Loc. cit.	Right femoral	F., 50	88 cm.	Do.	Do.	D. in 24 hours	Diffuse peritonitis	Pre-existing perforation.
208	Do.	Loc. cit.	Left femoral	M., 37	33 cm.	Kocher's	Do.	D. on 4th d., with reappareance of obstruction signs	"Fibrinous" slight (local?) peritonitis; well marked meteorism. Sutures holding	D.
209	Do.	Loc. cit.	Do. ("Richter")	F., 57	10-12 cm.	Do.	Do.	R.	—	Slight symptoms of iodiform poisoning.

210	Do.	Loc. cit.	Right femoral	F., 35	25 cm.	Do.	Do.	D. on 7th day, with signs of peritonitis.	Two small perforations 2½ cm. above place of suture. Suppurative peritonitis. Sutures held	Patient apparently doing well for first 24 hours.
211	Do.	Loc. cit.	Do.	F., 61	30 cm.	Do.	Do.	R.	—	—
212	Do.	Loc. cit.	Do.	F., 48	12—15 cm.	Do.	Do.	D. 14 days after	Hæmoptysis Adhesions round healthy suture line. Pthiasis of both lungs Peritonitis	Had had phthisis for a year.
213	Do.	Loc. cit.	Do.	M., 50	33 cm.	Do.	Do.	D. in 24 hours	—	Pre-existing perforation.
214	Do. (?)	Loc. cit.	Right inguinal	F., 45	16 cm.	Kocher's	Czerny-Leubert, silk	R.	—	At first 10 cm. were removed, and suture done, but seeing asphyxial state of suture line, 6 cm. were further removed. Pre-existing perforation. An opening was made for washing out purulent contents of abdomen at time of operation.
215	Do. (?)	Loc. cit.	Right femoral	F., 37	30 cm.	Do.	Do.	D. in 24 hours	Purulent peritonitis. Sutures had given way in one place	On the 9th day a small faecal fistula was discovered, which remained open for 7 days, and healed, having discharged a silk suture.
216	Do. (?)	Loc. cit.	Left femoral	M., 38	30 cm.	Do.	Do.	R.	—	—

No.	Operator.	Where reported.	Disease.	Age and sex.	Length removed.	Mesentery.	Suture material.	Result.	Cause of death.	Remarks.
217	Mickulicz (?)	Loc. cit.	Left inguinal	M., 23	40 cm.	Do.	Do.	R.	—	Pre-existing perforation.
218	Do. (?)	Loc. cit.	Left femoral	F., 44	90 cm.	Do.	Do.	R.	—	—
219	Potozki	'Proceedings Russ. Soc. of Phys.,' 1889, p. 196	? Inguinal	M., 30	32 cm.	—	Single row of Lembert's suture of fine silk	R.	—	—
220	Carl Beck	'New Yorker med. Monatsch.,' 1892, p. 249	Right inguinal	M., 45	12.5 cm.	Not sutured, but only folded	Double row of Czerny's suture (iodoform silk)	R.	—	—
221	Do.	Loc. cit.	Umbilical	F., 57	? (But quite a small piece)	Do.	Double row of Czerny's iodoform silk, and fixing to neck of sac by two sutures	R.	—	Faecal fistula on 4th day. Secondary resection done 14 weeks later, and 9 cm. of gut removed; the same stitching done, and the same fixing at ring of sac. Discharge cured three weeks later.
222	Kendal Franks	Present communication	Do.	F., 30	23½ cm.	Wedge removed. Sutured with fine catgut, continuous	Gélv's, modified. Fine silk	R.	—	Ovarian tumour and ascites present; tumour removed 5 weeks later. Recovery.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. v, p. 82.)