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SURGICAL DISEASES
OF THE
STOMACH AND INTESTINES
—
JESSETT

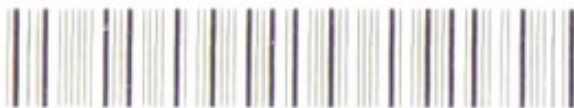
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SURGICAL DISEASES AND INJURIES

OF THE

STOMACH AND INTESTINES.

BY

Frederic
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SURGEON TO THE CANCER HOSPITAL.



LONDON :
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1892.

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PREFACE.

THE attention which the researches of Professor Senn of Milwaukee have attracted to intestinal surgery, induced me to make some investigations in the same field. These experiments were carried out at the Brown Institute, with the assistance of Professor Victor Horsley, in the year 1889, and again last year I instituted further investigations at the laboratories of the Conjoint Board of the Royal Colleges of Physicians and Surgeons. The results both of the experimental work and of its application in operations in actual practice were briefly comprised in a short series of lectures delivered at the Cancer Hospital. It was suggested to me that the lectures might be published, but as there were no text-books dealing specially with intestinal surgery, I thought the best course would be to elaborate the lectures by introducing the researches and experiences of others who have made this branch of surgery their study, and in this way construct as far as possible a systematic exposition of the whole subject. Inasmuch as physicians or general practitioners are usually the first to see cases of intestinal disorder, I have endeavoured to point out the paramount importance of defining early the different forms of intestinal obstruction and the operations which may be adopted for relief. But as these lectures deal only with surgical diseases and

injuries of the stomach and intestines, I have only treated of the pathological and clinical symptoms so far as they are actually necessary for following the operations which are described. It is true that hernia might with perfect propriety have been introduced, but as it is so fully described in nearly all surgical treatises, I have only referred to it in so far as it occasions complete obstruction or gangrene of the intestine.

I have throughout made use of all the literature upon the subject which I have been able to obtain, and I am deeply indebted to my colleagues at the hospital for the advantage they have given me of studying cases under their care.

I am also under great obligations to Sir William MacCormac for the loan of a number of the blocks which illustrated his masterly monograph on Gunshot Wounds of the Stomach and Intestines. I have to thank Mr. Victor Horsley for his help and suggestions in some of my experimental work, and Dr. Morotti, of Milan, for valuable assistance in the experimental work I conducted last year. Also Mr. Stanmore Bishop, Mr. Paul, Mr. Rabagliati, and others, for the loan of blocks illustrating papers which they have written upon the subject. Dr. Almroth Wright has rendered valuable assistance by translating for me reports of foreign articles bearing upon the subject.

1, BUCKINGHAM PALACE MANSIONS,
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May, 1892.

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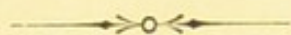
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SURGICAL DISEASES OF THE STOMACH.



LECTURE I.

Surgical Diseases of the Stomach—Carcinoma—Ulcer—Foreign Bodies—Contraction of Cicatrices—Pyloric Obstruction—Pressure of Tumours—Treatment—Operations—Pylorectomy—Combined Pylorectomy and Gastro-Enterostomy—Gastro-Enterostomy—Bernays' Operation—Gastrostomy—Jejunostomy—Gastrotomy—Pyloroplasty—Loreta's Operation.

THE rapid strides made of late years in abdominal surgery has led many surgeons to consider whether the operative treatment of the stomach and intestines cannot be so improved as to compare favourably with such operations as ovariectomy, hysterectomy, nephrectomy, and the like. It is to Professor Senn, of Milwaukee, that the populace and the profession are indebted for having introduced a system of intestinal surgery which, as it becomes more elaborated and better understood, must in the near future attain such perfection that the terrible mortality which has until recently attended all operations on the intestines will disappear; and we may reasonably look forward to the day when they will be performed with the same confidence and success as attends other operations on the abdomen.

On studying the admirable paper read by Professor Senn before the Congress of American Physicians and Surgeons at Washington, in the year 1888, I was so struck by the

extraordinary success which attended his experiments, that I determined in the early part of the year 1889 to prosecute a series of experiments in the same direction myself, which, by the courtesy and with the aid of Professor Victor Horsley, I was enabled to carry out at the Brown Institute.

The results were so successful, that I had no hesitation in publishing them in the columns of the *British Medical Journal* on July 27, 1889.

Many surgeons, especially in America, have since repeated and modified the operations, as performed by Senn and myself. During the last few months, in a further experimental research which I have been carrying out at the laboratory of the Royal College of Physicians and Surgeons, I have succeeded in establishing several important innovations, notably for the treatment of certain forms of intussusception and enterorrhaphy.

In the space of these lectures it will be impossible to more than allude briefly to the different forms of surgical trouble that the stomach is heir to. They may be summed up as carcinoma, sarcoma, ulcers, foreign bodies, fibrous contraction, contraction of cicatrices, and pressure of tumours.

CARCINOMA AND SARCOMA.

In dealing with malignant growths of the stomach, it will be necessary in the first place to point out to you the extreme uncertainty in their diagnosis in the early stages, and, having recognised the disease, the excessive difficulty in deciding upon the best mode of treating it.

It has been pointed out by Virchow and D'Espine, on the Continent, that deaths from carcinoma of the stomach occur in about 1 per cent. of the total deaths registered. Dr. Welch, of New York, however, in 444,564 deaths from all causes, found cancer of the stomach occurred in

1,548 cases, or 0·4 per cent. All forms of malignant disease are found to attack this organ, viz., medullary, scirrhus, colloid, adenoid or cylindrical-celled carcinoma, squamous epithelioma, and sarcoma; but of these, scirrhus and cylindrical-celled carcinoma are by far the most common.

MB.

The point, however, which is of the greatest interest to the surgeon is the seat at which the disease is most frequently met with; and here I would refer you to the tables of Drs. Habershon, Brinton, Welch, and Luton, which are now before you :

	HABER- SHON.	BRINTON.	WELCH.	LUTON.	TOTAL.
Pylorus ...	41	219	791	59	1,110
Lesser Curvature ...	11	38	148	—	197
Cardia ...	10	36	104	8	158
Anterior Wall ...	5	11	30	2	48
General ...	4	13	61	1	79
Central ...	4	4	—	—	8
Multiple ...	1	—	45	—	46
Greater Curvature ...	1	11	34	2	48
Cardia and Pylorus ..	1	—	—	—	1
Not stated ...	1	17	—	7	25
Posterior Surface ...	—	11	68	3	82
Fundus ...	—	—	19	—	19
	79	360	1,300	82	1,821

From the above table it will be noticed how very much more frequently the pylorus is attacked than any other part of the viscus; while the lesser curvature and cardiac orifice come next in the list as regards frequency of attack.

Sex.—Carcinoma of the stomach, like cancer of the lip and tongue, is more commonly met with in males than females. According to the authority of Drs. Brinton, Habershon, Wilson Fox and Welch, more than twice as many men are so affected than women; thus, in 223

cases collected by the first two named physicians, 151 were males and 72 females; in 1,303 cases collected by Dr. Wilson Fox, there were 680 males and 623 females; and in 2,214 cases reported by Dr. Welch, 1,233 men were affected, against 981 women. The Registrar-General, in his last report, confirms these statements, for, in referring to the increase of cancer in different organs, he states that the increase is comparatively slight in those organs which are most commonly the seat of malignant growths; but has been largest in the organs of digestion, and among men there has been a large increase in diseases of the digestive system.

Age.—The age at which this organ is most frequently attacked, as pointed out by the authorities already named, is much more frequent after middle life than before. Thus, as you will observe by the following table, of 74 cases collected by Habershon, 61 were over forty years of age, and the great majority between the ages of fifty and sixty.

	AGE.							
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total.
Habershon	1	2	10	17	24	18	2	74
Welch	2	55	271	499	620	428	140	2,015
Jessett	—	4	5	6	30	7	8	60

The statistics collected by Welch confirm this, as out of 2,015 cases, 1,687 were over forty years of age, and 1,119 between the ages of forty and sixty. In 60 cases that have been under my care during the last six years, 51 were over forty, and 36 between forty and sixty. The average age, then, may be put at about fifty-one years, when the largest number of cases are met with.

Heredity.—Family taint has been most distinctly recognised in this disease. The family of Napoleon is said to

be a striking exemplification of this: Napoleon, his father, and his sister Caroline are all reported to have fallen victims to gastric cancer. In a large number of cases under my care hereditary tendency has been distinctly traced.

Symptoms.—I will now pass on to the symptoms of the disease, first as they are found generally, and then discuss those which attend the disease when affecting different parts of the organ.

Carcinoma is usually ushered in by the ordinary signs of dyspepsia, the patient complaining of indigestion with, in some cases, severe attacks of gastrodynia, and frequently pyrosis. Even in this early stage the patient often presents a peculiar sallow appearance and loses flesh. As the disease progresses, vomiting becomes a prominent symptom; often the vomited matters are frothy and fermentous, and contain abundant sarcini ventriculi. The period at which this takes place varies according to the seat of the disease; frequently the food is ejected so quickly that it leads one to suppose the patient must be suffering from œsophageal cancer. The patient loses flesh rapidly, and, from the constant attacks of severe sharp lancinating pains, wears a most anxious and haggard expression. In some cases distressing flatulence and frequent eructation of often a very offensive character are present. Hæmatemesis may occur from time to time; but this is not so commonly met with as was generally supposed. From this point the disease usually progresses very rapidly, the symptoms becoming more and more severe, the vomiting more frequent—often of a coffee-ground consistency, the result of an admixture of blood with the contents of the stomach—the pain becomes more intense, and the patient speedily sinks. Towards the last stage the tumour, which may have been apparent before, decreases in size, and the

vomiting may for a short time be relieved, this being due to the sloughing and breaking down of the growth in the viscus.

These symptoms, however, often vary considerably. In many cases there is very little or no pain; I have observed this in a number of cases. Lebert describes it as being absent in 20 per cent., and in some cases—examples of which I have had at my hospital practice—the disease was not even suspected up to the time of death, when it was discovered at the post-mortem examination. In such cases general marasmus, or progressive anæmia and loss of flesh, or cachectic dropsy are prominent symptoms; such cases have been diagnosed as cases of pernicious anæmia, occasionally as Bright's disease, morbus cordis, or phthisis.

The above remarks do not refer to cases in which either orifice of the stomach is affected, but only when the disease affects the greater curvature of the stomach or the anterior or posterior wall.

From a surgical point of view it is of the greatest possible importance to differentiate between the symptoms as they present themselves when the stomach is affected in different parts, as the operation, which would be appropriate for the relief of carcinoma when affecting the pylorus, would be totally inappropriate for the same disease when present in the cardiac end of the viscus; and for equally obvious reasons, operations which may be the means of relieving patients suffering from the disease when affecting either orifice would be worse than useless if it were situated in the body of the viscus. I will, therefore, briefly endeavour to give the symptoms when different parts of the stomach are affected.

Cardiac Orifice.—When the cardiac orifice is the seat of disease, the patient complains quite early of some difficulty in swallowing; he tells you the food seems to go down as

far as the opening in the stomach and there stops, and often is returned unaltered in a very short time, if not immediately. Liquids are taken readily, although with pain and discomfort at the time of swallowing. Dysphagia is an important symptom. Tumours are felt in about 80 per cent. of the cases under the left costal cartilages, but are somewhat obscured by the presence of the left lobe of the liver.

As the disease progresses, these symptoms become more and more urgent, until at length the patient is unable to swallow even liquids without suffering excruciating agony. If liquid is taken in small quantities, he feels it after a time gradually trickling into the stomach.

Pylorus.—Carcinoma, when affecting the pylorus, is ushered in with very different symptoms. The patient can swallow his food readily, and complains of no pain for at least fifteen to twenty minutes after taking it, then the pain is always attributed to the epigastrium; and as the disease progresses, the food is vomited from time to time. On the growth increasing, and the obstruction to the passage of food becoming greater, the stomach commences to dilate from the accumulation of its contents and the gases evolved therefrom; this may increase to such an extent that it frequently extends, as I have often seen it, quite to the pubes; in the meanwhile a tumour develops and can usually be readily defined at the epigastrium; at first it is freely movable, but rapidly becomes more and more fixed. Succussion of the contents of the stomach can be readily demonstrated. It is rare in the early stages of this form of the disease to get any hæmatemesis.

Fundus.—When carcinoma attacks the fundus or the body of the stomach, there are often no symptoms whatever to guide one to a correct diagnosis unless a tumour

is detected. There is no obstruction to the passage of food into or out of the stomach, and often the patient complains of little or no pain—merely a discomfort which is ascribed to indigestion; but in this form of the disease hæmatemesis is most common, and the neighbouring organs, liver, large intestine, and pancreas, are often implicated quite early. The patient becomes more and more emaciated, and the appetite disappears. If the disease attacks the large curvature, the transverse colon frequently becomes implicated, and an opening between the two may be established, in which case the food passes directly from the stomach into the large intestine, and passes per anum undigested, the patient rapidly dying from inanition.

The principal diseases with which carcinoma of the stomach may be confounded are chronic gastritis, gastric ulcer, gastrodynia, and simple dilatation, and many tumours, as aneurism of the aorta or cœlic axis, hydatid or other tumours connected with the liver, spleen, or omentum, enlarged mesenteric glands, accumulations in the viscus itself, such as hair, etc.; disease of the pancreas, accumulation in the transverse colon, distended gall-bladder, and floating kidneys; and it is only by strict attention and careful and repeated examination, and bearing in mind the symptoms already laid down, that many of these diseases can be distinguished. I must not, however, delay longer over these, but pass directly on to the treatment of the disease when present.

Treatment.—The medicinal treatment resolves itself into purely palliative measures; and although such drugs as condurango, bismuth, arsenic, papain, and others have been credited with doing much in the early stages, in my hands they have one and all failed to do any permanent good, although temporary relief may be experienced.

When pain is extreme, the judicious administration of

morphia, belladonna, conium and the like has given relief.

In cases of dilatation, undoubtedly much comfort may be derived by keeping the stomach washed out once a day with a five per cent. solution of salicylate of soda, or weak boric acid solution, care being taken to wash the stomach out with tepid water afterwards, the patient being fed by stimulating and nutritive enemata. To relieve pyrosis, antacids, such as bismuth, may be of advantage. Creosote and carbolic acid in one-drop doses often exercise a marked effect, as also do naphthol and charcoal.

The surgical treatment of carcinoma of the stomach resolves itself into: (1) pylorotomy; (2) gastro-enterostomy; (3) combined pylorotomy and gastro-enterostomy; (4) gastrotomy; (5) jejunostomy; (6) Bernays' operation of opening the stomach and curetting the disease; (7) if the disease is localized to a small portion of the anterior wall, excision of the diseased part may be practised.

In dealing with the special forms of surgical treatment, I shall be guided to a great extent by the results of my experience, gained in experimental research, by operations which I have performed on the human subject, and by the experience of Senn, of Milwaukee; Abbé, Weir and Bull, of New York; Brokaw, of St. Louis; Robinson, of Toledo; and the German surgeons.

Pylorotomy.—In the treatment of carcinoma involving the pylorus the operation of pylorotomy demands our first attention, and it has been pointed out that one of the principal causes of the high mortality after this operation is the length of time taken in its performance. The object to be aimed at, then, is to adopt the method of operating which can be performed with the greatest rapidity combined with safety, and to get a good sur-

face of peritoneum of the divided stomach and duodenum into accurate apposition should it be decided to unite the divided ends. The mode hitherto practised is tedious and in many cases very difficult, and there are undoubtedly great improvements still to be made in this direction. When conducting my experiments on intestinal surgery,* the idea occurred to me, after removing the pylorus, to unite the divided ends of the stomach and duodenum by means of approximation discs; but in practice on dogs I found this most difficult to accomplish, owing to the short piece of duodenum which was surrounded by peritoneum that I had at my disposal, and the only instance in which I tried this method I failed. The same objection would, I am afraid, occur in the human subject.

I am pleased, however, to see that this operation has actually been put into practice by Dr. Rawdon, of Liverpool, and it was so successful that I should certainly perform it if a favourable case presented itself. Should, however, the portion of the duodenum remaining after the pylorus is removed, prove to be so short that there would be some difficulty and danger in introducing and fixing the bone-plate into it, I would abandon the attempt, and content myself with performing the combined operation of pylorotomy and gastro-enterostomy, which has been successfully performed by surgeons in this country and in America.

That the large mortality resulting from pylorotomy is to be traced, to a very great extent, to the length of time hitherto occupied in the performance of the operation, averaging as it did from $2\frac{1}{2}$ to $3\frac{1}{2}$ hours, I think there can be no doubt. In five cases reported by English surgeons all died—one 14 hours, another $3\frac{1}{2}$ hours, a third 4 hours, a fourth 17 hours, and the fifth $11\frac{1}{2}$ hours

* *Brit. Med. Journal*, July 27, 1889.

after the operation. There is no doubt that death resulted from shock and collapse produced by a prolonged operation upon a system already reduced to the lowest ebb by disease.

Mr. Mayo Robson, of Leeds, has performed pylorotomy by the method employed on the Continent on two occasions; once successfully, so far as the operation was concerned, the patient living for three months afterwards; once unsuccessfully, the patient dying on the fourth day from exhaustion.

Six other cases have been reported—one by Dr. Rawdon,* of Liverpool, in which, as previously stated, he united the divided ends of the stomach and duodenum by means of approximative discs, successfully; three by Dr. Bull,† of New York, by combined pylorotomy and gastro-enterostomy, one recovering; one by Mr. Greig Smith, of Bristol, unsuccessfully; and one by Dr. Lawson, of Hull, who was the first, I believe, to perform the combined operation in this country. To these may be added my own case, in which I removed the pylorus and at the same time restored the continuity of the gastro-intestinal canal by performing gastro-enterostomy successfully. It must not be forgotten, however, that in these cases the patients were seen tolerably early, the growths were not fixed, and so the patients had everything in their favour; and this brings me to the second cause of failure, viz., the fact that patients do not present themselves for surgical treatment until the disease has lasted so long that they are reduced to the lowest ebb, and it is only when they see death staring them in the face that they will submit to the risk of an operation.

It is then to the question as to when pylorotomy is justifiable that I would in the first place refer. In this

* *Brit. Med. Journal*, vol. i., 1890, p. 323.

† *Medical Record*, New York, Jan. 10, 1891, p. 38.

operation perhaps more than any other, the surgeon should choose his cases, for so long as the mortality remains where it is, the medical attendant cannot conscientiously advise patients to submit to so formidable an operation, and it is only by selecting those cases which are suitable, and in which the patient's strength is not already too far lost, and by adopting better modes of performing the operation, that we can hope to reduce this mortality.

First, then, as to selection of cases; and here it will be necessary to consider the anatomical condition of the parts in the healthy state. The first part of the duodenum is only two inches long and imperfectly surrounded by peritoneum, so much so, indeed, that in a large majority of cases you will find not more than two thirds of the length thus surrounded, leaving only an inch and a half of available intestine, and if from this you again deduct the portion which of necessity must be cut away, you will see what a very short piece of intestine is left to deal with. In disease, however, things appear in some cases to be somewhat altered, and you will find that as obstruction takes place at the pylorus, the stomach becomes dilated and always contains more or less of the food which has been taken. The greater the obstruction the more the stomach becomes distended. The weight of its contents in such cases appears to drag the stomach down, sometimes to the pubes, and the length of the first portion of the duodenum in this manner often becomes elongated; and here I would say that in any case where the tumour appeared movable, I should advise an early exploratory incision, with a view of ascertaining if the tumour is quite free from adhesions to neighbouring important parts, and if the glands are involved, which cannot be done without examining the parts by means of an opening into the abdomen.

Should it be found that the disease is limited to the pylorus and perhaps a portion of the stomach (carcinoma very rarely extends into the duodenum), and that it can readily be drawn out of the wound, then the surgeon may with every hope of success proceed to perform pylorotomy, and may fairly look forward to the operation being successful and the patient making a good recovery. But if there is any difficulty in drawing the tumour and a portion of the duodenum out of the wound, or undue tension is placed upon the stomach or intestine by so doing, I think the surgeon would be wise to adopt the milder operation of gastro-enterostomy, or the combined operation of pylorotomy and gastro-enterostomy presently to be described.

Gastro-Enterostomy.—With regard to the operation of gastro-enterostomy by means of approximation plates, as suggested by Senn, I can speak with more confidence. I have at present performed it five times, having previously operated on one patient by the old method. Five of these cases were suffering from pyloric cancer, and one from fibrous stricture of the pylorus. In none of the cases of carcinoma was it possible to remove the disease.

In the first case I performed the operation by Billroth's method; it occupied nearly three hours. The operation *per se* was successful, the patient, however, died eleven days later from exhaustion caused by constant vomiting, due to kinking of the jejunum. The post-mortem showed the adhesions between the stomach and jejunum to be perfect.

This case demonstrated to me the great difficulty and the length of time occupied in performing the operation in this manner, and I determined to give the method of union by approximation discs a trial.

The experience gained in my experimental research fully convinced me of the advantage of using approxima-

tion plates. The following two among other cases demonstrate how quickly and successfully they can be applied.

EXPERIMENT I.*—Successful. On June 11th, 1888. A rough-haired terrier, weight 15 lb., was placed fully under the influence of ether. The operation was completed in twenty minutes. The dog on the next day was apparently perfectly well, and was fed on milk for the first two or three days, after which he had his ordinary diet. There were no bad symptoms, and the abdominal wound was perfectly healed by the first intention by the end of the week.

July 2nd. Three weeks after the operation the dog was killed with chloroform.

Post-mortem.—Wound perfectly healed, omentum firmly adhered to peritoneal surface of the wound; no trace of peritonitis; jejunum seen to be firmly adherent to stomach on its anterior wall; omentum also adherent to the junction of the two viscera. No trace of the bone-plates was found. On removal of the stomach and upper part of intestine from the body, I applied a ligature round the pylorus; and on pouring water into the œsophageal ends of the stomach, it at once passed freely through the gastro-jejunal opening into the intestine. The jejunal end was then tied firmly, the viscus filled with spirit, and the whole immersed in spirits.

EXPERIMENT II.†—Successful. June 18th. A dog, weighing 26 lb., was placed fully under ether, and an incision made in the middle line of the abdomen between the ensiform cartilage and umbilicus. The transverse colon and omentum were drawn out through the wound and turned up; the transverse meso-colon was next torn through for the length of an inch and a half; the posterior wall of the stomach was then brought through the opening in the meso-colon and the abdominal wound; a piece of jejunum, somewhat low down, was also with-

* *Brit. Med. Journal*, July 27th, 1889.

† *Ibid.*

drawn through the wound, and the two viscera supported with carbolized cotton-wool pads. An opening was made into the stomach and jejunum, and decalcified bone-plates introduced and firmly tied. The parts were then dropped back into the cavity of the abdomen, the transverse colon replaced, and the toilet of the omentum attended to, and finally the abdominal wound was united in the usual way with chromicized catgut sutures. The operation lasted thirty minutes. The dog was quite brisk and well the following day. He was kept for three days on milk, after which he was fed on his usual food. The wound was perfectly healed on the 25th. He was killed with chloroform on July 16th, one month after the operation.

Post-mortem.—The omentum was as usual adherent to the abdominal wound, but not to the seat of juncture of the stomach and jejunum. The union between them, as you see, was perfect. There was no sign of peritonitis. No trace of the bone-plates was to be found. On removing the stomach and portion of gut below the pylorus, water passed freely through the artificial opening. The viscus was subsequently filled with spirit, and treated as the other.

From the result of these experiments, I determined to give the next patient that came under my notice suffering from pyloric obstruction the benefit of my experience thus gained. Of the five cases, which will be described later, in which I operated by this method, three were successful, one being alive and well now, twenty months after the operation; another, also alive and well, was operated on twelve months ago; a third died nine months after operation, and one case on which I performed this operation in combination with pylorotomy is also in good health, having been operated upon three months ago. My first case died from exhaustion, and the third from septic peritonitis.

Eleven other cases have been reported, one by Dr. Clarke,* of Huddersfield, who, by the way, was, I believe, the first surgeon in this country to perform the operation with approximation discs on the human subject, another by Mr. Stansfield,† of Birkenhead. Besides these, cases have been reported, one by Mr. Robson, of Leeds; one by Mr. Clarke; one by Mr. Paul, Liverpool; two by Mr. Beatson, of Glasgow; one by Mr. Brown,‡ Leeds; one by Mr. Larkin,§ Liverpool; one by Mr. Bennett,|| and one by Mr. Symonds. Other cases have since been recorded. Of these sixteen cases, eleven recovered, and the others, excepting one of my own, were successful so far as the operation was concerned; but both Mr. Paul's and my first case died from exhaustion, owing to the error of not feeding early enough, the union between the stomach and intestine being found to be perfect at the post-mortem examination.

From experiments I have made and observation of cases, I find the bone-plates become absorbed and digested in about four to five days, the time varying according to the thickness of the plate and the extent of decalcification. The peritoneal surfaces become firmly adherent in from two to three days.

Duodenostomy and Jejunostomy.—Besides the cases of gastro-enterostomy already described, I have operated on three other patients, in which the disease in the stomach was so extensive that it was impossible to even open it with any degree of safety; in these cases I performed in one duodenostomy, and in the other two jejunostomy. These cases cannot be alluded to with the same amount of satisfaction as

* *Brit. Med. Journal*, vol. ii., 1889, p. 1080.

† *Ibid.*, vol. i., 1890, p. 294.

‡ *Clinical Society Reports*, vol. xxiv., p. 176.

§ *Lancet*, vol. ii., 1891.

|| *Clinical Society Reports*, vol. xxiv., p. 247.

those operated on by gastro-enterostomy, although one man lived over nine months after being operated on, and was able to be fed by the artificial opening during that time. The case of duodenostomy died within three weeks of the operation, and it was found difficult to prevent the food returning by the artificial opening. Bile and gastric fluid were also constantly escaping. The third case did well for a time, but died three months after the operation. In the two cases of jejunostomy, I performed the operation in a novel method which will be described later on.

Gastrostomy.—In cases in which the cardiac end of the stomach is involved gastrostomy may be performed, and Professor Ewald (Berlin) suggests that the fistula should be established as near as possible to the pylorus, to enable the feeding tube to be passed through it into the duodenum. He quotes the following interesting case in support of his views :*

The patient was a woman, æt. fifty-three years, who was admitted to the Augusta Hospital, March 12, 1889. She was extremely emaciated, and palpation showed a tumour of the size of an apple in the right side ; this tumour was slightly movable. Patient vomited all food undigested, even milk. Examination with a bougie revealed an impermeable stricture at the cardiac end of the stomach, which was undoubtedly of a cancerous nature. The abdominal tumour was supposed to be metastatic, either pelvic in origin or a dislocated and carcinomatous kidney.

As the patient's condition became rapidly worse, and it was found impossible to nourish her by enemata, gastrostomy was suggested, and performed by Professor Küster. The patient was fed through a canula introduced through the wound, and only small quantities of food could be introduced at a time, owing to the contraction of the stomach, and from the fact that the canula is pushed against the posterior gastric wall. A tube was then introduced into the pylorus, and the food, peptonized milk, was poured directly into the intestine. Although as much as half a litre was retained in this way, the patient succumbed to progressive marasmus.

The autopsy showed that a portion of the right lobe of the liver projected as far as the horizontal ramus of the pubes, being constricted above, at which place was seated a cancerous nodule of the size of an apple. The stomach was very small, and its cardiac portion was occupied by a large carcinoma, which extended posteriorly over the lesser curvature and completely surrounded the œsophagus.

* *Deutsche Med. Woch.*, No. 23.

The author recommends, in cases in which the cancer involves the cardiac end of the stomach and the lower portion of the œsophagus, that after the performance of gastrostomy the food should be introduced directly into the intestine by means of a tube passed through the pylorus. Hence the fistula should be established as close as possible to the pylorus, for in these cases no gastric juice escapes, and nothing is gained by introducing the food directly into the stomach.

Dr. Lauenstein is opposed to the performance of gastrostomy in cases of extreme cancerous constriction of the cardiac end of the stomach; but I have now operated in several cases with marked benefit to the patient, and the case of Prof. Ewald just narrated fully confirms my view of the matter. Dr. Victor von Hacker, of Vienna, is opposed to Dr. Lauenstein's conclusions. Many advantages are obtained by the method of operating which I have introduced, which will be fully discussed later on.

Whilst recognising the importance, from scientific and diagnostic points of view, of distinguishing cancer of the lower part of the œsophagus from cancer of the cardiac orifice of the stomach, Von Hacker holds that such attempts at localization have no bearing on the choice of treatment. He gives brief notes of six cases, which show that gastrostomy performed as a palliative plan of treatment may be attended with results just as good in cancer of the cardiac orifice, even when a tumour can be felt in the epigastrium, as in cancer of the lower end of the œsophagus. In comparing these six cases with nine other cases in which he performed gastrostomy for cancer of the œsophagus, he can find no difference between the two series with regard to the feasibility of the operation. The fistula was as readily established in one set of cases as in the other, and an equal prolongation of life was attained. In studying the details of his fifteen cases, Von Hacker finds that the occurrence of more or less severe bronchitis has a most unfavourable influence on the results of the operation. Such a condition, it is pointed out, occurs for the most part in cases of cancer affecting the œsophagus. In none of the above-mentioned

cases was life much prolonged after gastrostomy. He believes, however, that the operation serves to render the latter days of the patient more tolerable, for the troubles which, with continuous fruitless efforts to take food, are caused by the uninterrupted retching of mucus and by frequent vomiting, are very distressing. It is acknowledged that no good result can be expected from gastrostomy in cases in which the new growth has involved a large portion of the stomach, especially the greater curvature, and has probably contracted extensive adhesions with the surrounding tissues. Under such circumstances one would be able, as a rule, to make out the presence of a large gastric tumour. In ordinary cases, however, of annular carcinoma of the cardiac orifice, the digestive function of the stomach is not much impaired, even when the new growth is of considerable size, and involves, to some extent, the lesser curvature. Under such conditions as these, gastrostomy may be performed with as good prospects of success as in cases of cancerous stenosis of the œsophagus. By Von Hacker's plan of operation, in which the fistulous opening is established in the middle of the rectus muscle, it is possible to bring the abdominal wall, which at this point is lax, into close contact with the small and retracted stomach, which would not be done so easily if the incision was made close to the costal margin.

Excision of Disease.—Finally, in cases where a carcinomatous patch of limited size can be recognised on the anterior surface of the stomach, I should advise that it should be excised, bringing the divided edges of the stomach together by a double row of Lembert or quilt sutures.

Palliative Treatment.—Should, however, the disease be so far advanced that none of these operations can be recommended, the comfort of the patient can be materially increased by washing the stomach out once or twice

a day with 5 per cent. solution of salicylate of soda or boracic acid, and giving no nourishment by the mouth excepting that which can be readily assimilated, *i.e.*, Brand's essence of beef, milk, or zyminized beef-tea, in small quantities; the patient at the same time being fed by the rectum with nutritive enemata and zyminized suppositories.

OPERATIONS.

General Preparations.—It will be of interest here to describe and compare the different methods of performing the operations of gastro-enterostomy. The preliminary preparations for all these operations being practically the same, I will mention them first, and then describe in detail the precise steps of each operation separately.

The stomach in all cases in which the disease causes obstruction at the pyloric end of the viscus should be washed out once or twice a day with a 5 per cent. solution of salicylate of soda, or boracic acid, and warm water; no solid food whatever should be given by the mouth for at least a week before the operation, strained beef-tea, Brand's essence of beef, or Valentine's extract, with small doses of brandy and warm water, being the only nutriment given by this means. These should be administered in small quantities frequently repeated. The patient should be fed every two hours with nutritive enemata of zyminized beef-tea, with port wine or brandy, or eggs, repeated alternately with zyminized meat suppositories.

The method adopted for washing out the stomach is of great importance. A long soft rubber tube, with a large eye at the end, and measuring at least 5 feet in length, attached either to a Littré's bottle (Fig. 1), or furnished with a funnel (Fig. 2), is to be lubricated with glycerine, and gently introduced into the stomach.

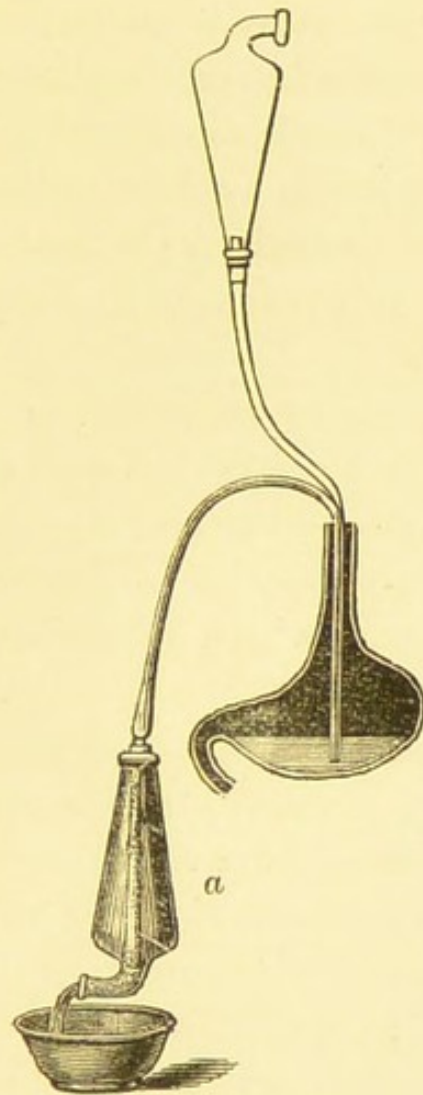


FIG. 1.—Showing stomach being washed out by means of Littré's apparatus ; *a*, the contents of stomach being syphoned off.

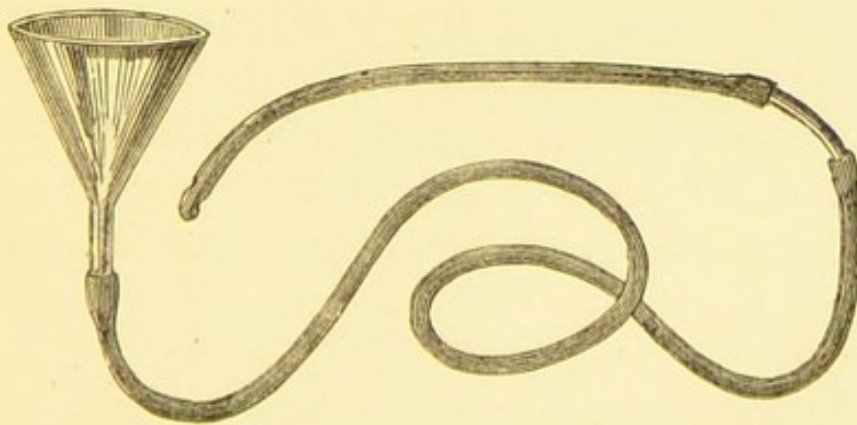


FIG. 2.—Funnel and long tube for washing out the stomach.

About one quart or three pints of which warm antiseptic fluid is then allowed slowly to run into the viscus through the tube. The Littré's bottle or funnel is then quickly lowered to a level considerably lower than the patient's stomach, when a syphon action is established, and the fluid impregnated with the contents of the stomach is readily run off into a receptacle placed to receive it (Fig. 1, *a*).

This proceeding may be repeated, in cases where the contents of the stomach are loaded with *sarcinæ*, until the water returns quite clear ; the last washing should always be of plain warm water, so as to drain off any remains of the salicylate of soda, which otherwise may give rise to unpleasant symptoms.

On the morning of the operation the stomach should be washed out in the manner just described, and nothing else given by the mouth before the operation. The rectum should be cleared by means of a warm-water enema the night before, and on the morning of the operation an enema of beef-tea ʒii. , and brandy ʒii. , be given, another being administered half an hour before the patient is placed upon the table. I have been in the habit of giving a hypodermic injection of from $\frac{1}{100}$ to $\frac{1}{80}$ of a grain of atropine before the anæsthetic is administered. In these operations I, on the whole, prefer chloroform, administered by means of Junker's apparatus, to ether ; but in some cases no doubt ether, or the A.E.C. mixture, is indicated. With chloroform, undoubtedly, the capillaries do not become so congested as when ether is given, a point of importance in abdominal operations.

PYLORECTOMY.

Rydyger was the first surgeon who actually removed the pylorus, but it was left to Billroth to bring the operation prominently before the profession, and the

plan he adopted is that which was practised until Senn introduced his method.

Billroth's Operation.—The abdomen being opened,

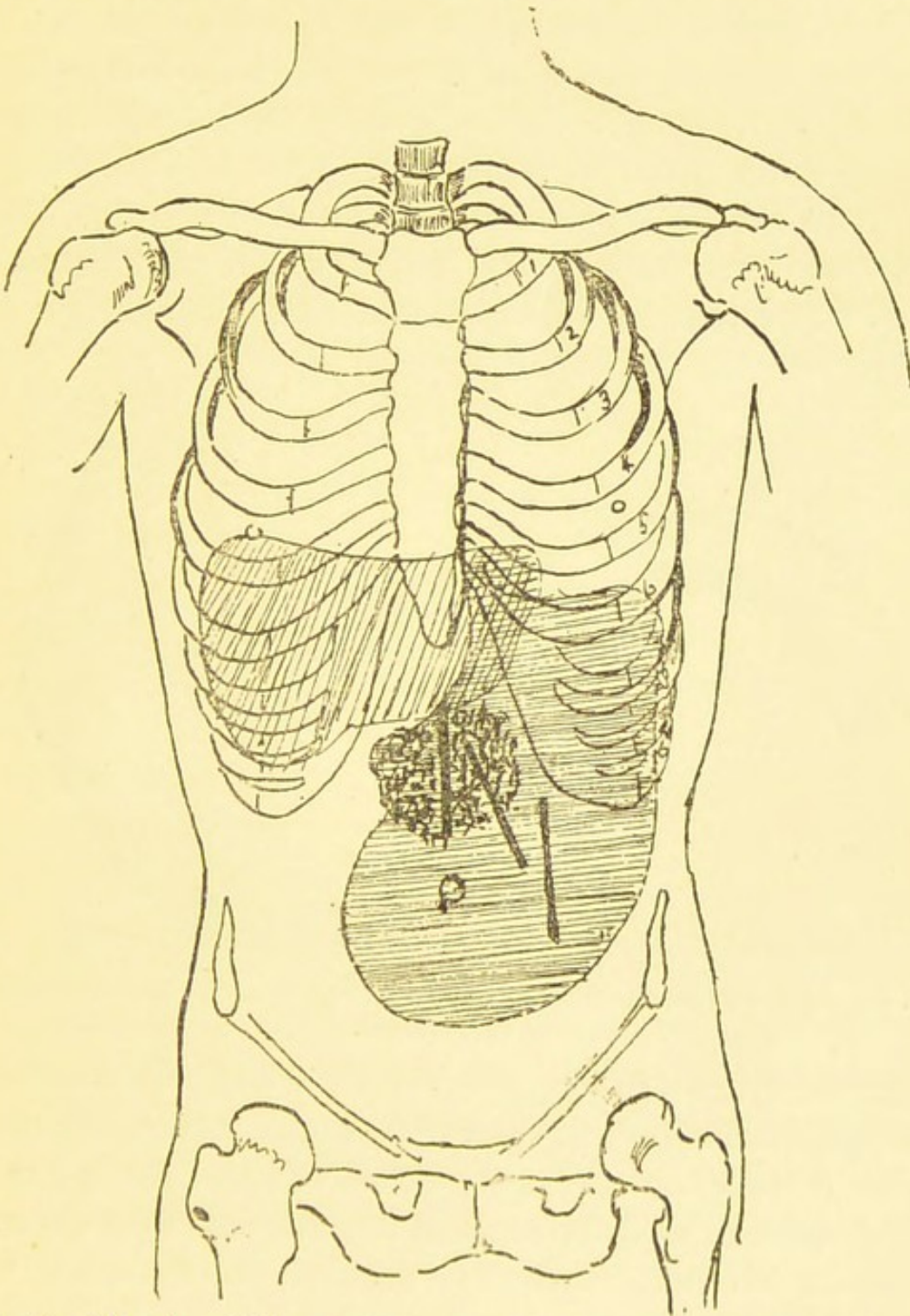


FIG. 3.—Showing different incisions adopted in pylorectomy and gastro-enterostomy.

either in the middle line between the ensiform cartilage and umbilicus, or transversely a couple of inches above the umbilicus, or obliquely parallel to the false ribs,

and about midway between them and the umbilicus (Fig. 3), the tumour, with as much of the duodenum and stomach as possible, is to be drawn out through the wound and packed round with sponges. The great omentum is to be separated from the pylorus and pyloric end of the stomach. This is done by taking up one small portion of the structure after another with a blunt aneurism needle armed with double fine Chinese silk; these are then fastened and the tissue divided between them. The same procedure is carried out next to the

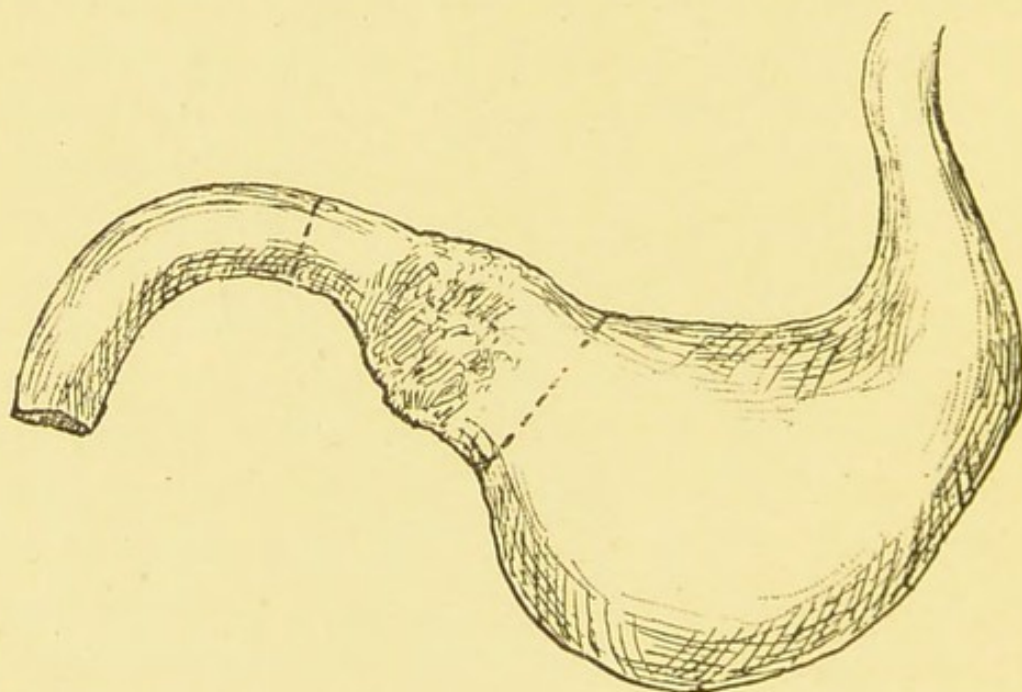


FIG. 4.—Showing carcinomatous growth at pylorus, and line of incisions for its removal.

lesser omentum, a considerable time being thus taken. The pylorus can now be easily lifted from its attachments. A clamp is applied across the whole width of the stomach well free from the disease, and another clamp is applied to the duodenum. An oblique section is now made to the outer side of the clamp on the stomach (Fig. 4), and all bleeding points carefully secured. A row of Lembert sutures is next applied as far as it is intended to fasten the two edges of the stomach, leaving a sufficiently large opening at the lower end for the attachment of the duo-

denum (Fig. 5). The duodenum is to be divided between the pylorus and the lower clamp and any bleeding point secured. The most difficult and tedious part of the operation now commences, and consists of attaching the divided duodenum to the open portion of the stomach. The posterior wall should be fastened first by a number of interrupted Lembert sutures passing through the serous and muscular coats only of the stomach and duodenum; a second series of sutures is then inserted, uniting the mucous membrane only. The anterior walls are to be next united in a similar manner, only reversing

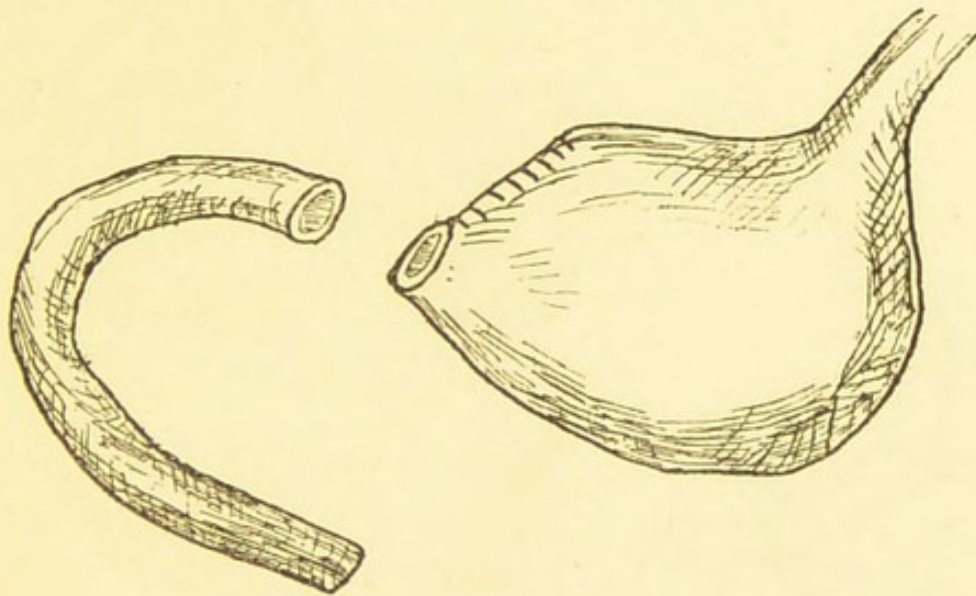


FIG. 5.—Stomach united obliquely from above, the duodenum to be united at lower angle.

the order of introducing the stitches, viz., uniting the mucous membrane first, and then the serous and muscular coats. This necessarily takes an excessively long time to do, and has to be most accurately carried out, the stitches that unite the upper part of the duodenum to the sutured portions of stomach requiring much care. The toilet of the peritoneum being carefully attended to, and the parts thoroughly dried and freed from blood-clots as far as possible, the edges of the abdominal parietes are brought together in the usual manner, and fixed with strong carbolized silk sutures.

In some cases it is desirable to suture the lower part of the divided end of the stomach, in which case the duodenum is fastened to the upper angle (Fig. 6). In others the divided stomach has been united at each end, the duodenum being fastened in the centre (Fig. 7).

The time occupied in performing the operation in this manner may be put down at an average of three hours. As will be seen by the drawings, the mode of dealing with the divided end of the stomach is varied by different

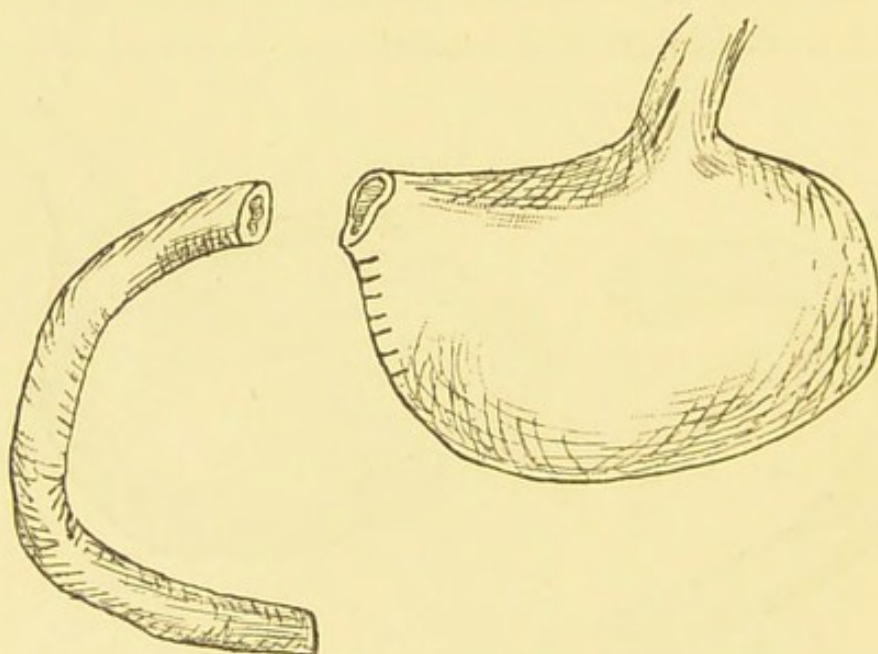


FIG. 6.—Stomach united obliquely from below, the duodenum to be united to the upper angle.

operators, but unquestionably the method of attaching the duodenum to the lower angle of the stomach is the one most generally adopted.

Dr. Rawdon's Operation.—The operation as applied by Dr. Rawdon, of Liverpool, is performed as follows :*

An incision is made in the mesial line between the ensiform cartilage and umbilicus. The diseased mass is drawn up through the wound and surrounded with sponges. The vessels coursing along the curvatures

* *Brit. Med. Journal*, vol. i., 1890, p. 323.

of the stomach are to be ligatured at a point where the section of that viscus would have to be made. The duodenal mesentery is now to be torn through with the fingers, and a piece of small-sized rubber tubing passed round the bowel and tied in a knot; this effectually prevents any escape of its contents. The mass being well drawn out through the abdominal wound and packed round with warm antiseptic sponges, the affected parts are readily excised, two or three vessels in the coat of the stomach requiring a ligature. The duo-

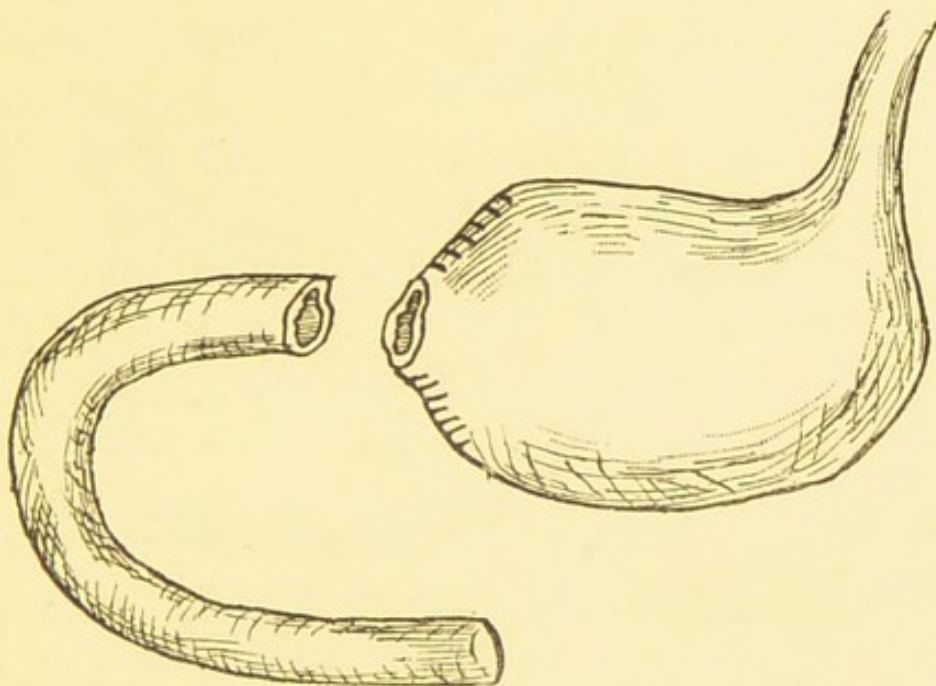


FIG. 7.—Stomach united above and below opening for fixing duodenum in centre.

denum is next cut through between the pylorus and rubber tubing.

The entire mass is now only attached by its omental connections; these are to be gathered into a pedicle, trans-fixed, and tied. The severed duodenum is now drawn well forward and the rubber tubing taken off. The incised edges of the stomach are next stitched with a continuous Chinese silk suture after the method of Lembert, the suturing commencing at the lesser curvature, and being discontinued one inch from the greater curvature,

thus leaving an opening sufficiently large to admit the introduction of one of the decalcified bone-plates. A Senn's plate with four threads of Chinese silk attached is then inserted into the opening and three out of the four silk threads attached passed through all the coats of the stomach, about one-sixth of an inch from its cut edges. A second plate is to be introduced into the duodenum and the four silk threads attached to the plate passed through the walls of the bowel a short distance from its cut margin (Fig. 8). The plates are then

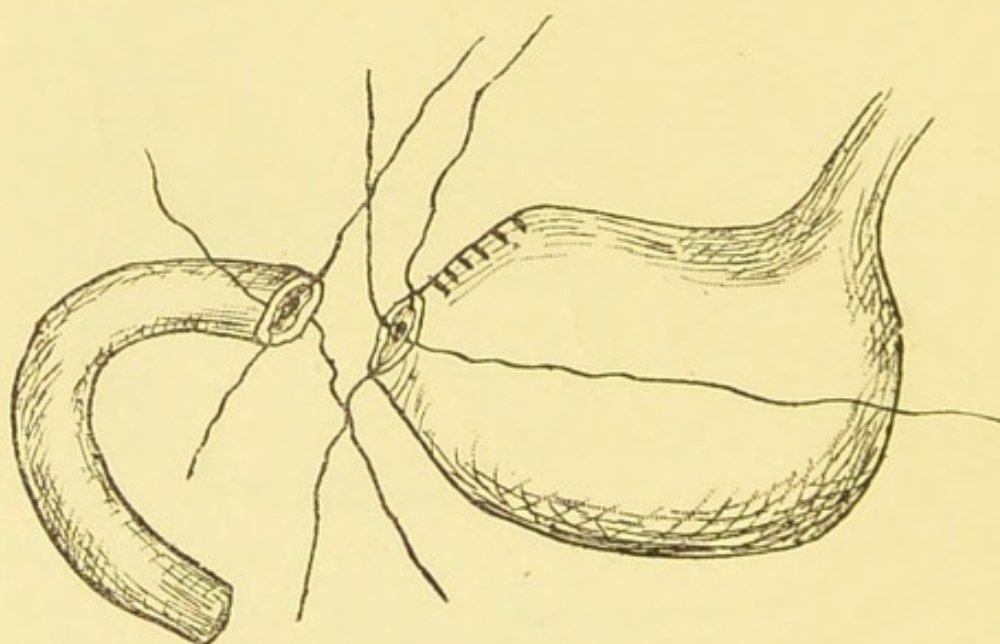


FIG. 8.—Pylorotomy. Stomach and duodenum united by decalcified bone-plates. *Rawdon's method*.

brought into apposition and held firmly together while each corresponding pair of threads is securely tied, the lowest being tied first. Thus the serous surfaces of the bowel are brought into immediate contact with that of the stomach.

The parts, after being carefully sponged, should be replaced within the abdomen, the wound closed in the usual way, and antiseptic dressing applied. Mr. Rawdon's patient was fed by nutritive enemata, and on the sixth day had pancreatized milk by the mouth.

COMBINED PYLORECTOMY AND GASTRO-ENTEROSTOMY.

When the portion of duodenum that remains after the pylorus is so short as to make it difficult to introduce the bone-plate, or the diseased portion which has been removed so large as to cause a considerable tension upon the divided ends of the stomach and duodenum on being approximated, no attempt should be made to restore the continuity of the gastro-intestinal canal by uniting the divided ends, but should close them and perform gastro-enterostomy. In fact, I think that in a large majority of cases it is safer to adopt this course, even when the divided ends can be brought easily together.

The operation I adopt for the removal of the pylorus is much the same as that carried out by Dr. Rawdon; but, as will be seen by the description of the operation in the following case, there are one or two important steps in the operation, as I have performed it, which differ materially from that practised by Dr. Rawdon, and I think it will be clearer if I describe each step in detail (p. 33).

The combined operation of pylorectomy and gastro-enterostomy was first performed by Billroth, of Vienna, in the year 1885. He, however, attached the loop of jejunum to the lower part of the divided end of the stomach by means of sutures; this method is a very much more complicated procedure than the one I have adopted. His patient died of peritonitis, the result of faulty suturing.

Dr. Bull, of New York, has reported three cases in which he performed the combined operation of pylorectomy with gastro-enterostomy.* His first case recovered; in this the jejunum was attached to the anterior wall of the stomach by means of Abbé's rings, and the great omentum was ligatured by means of a double row

* *New York Med. Record*, Jan. 10, 1891, p. 39.

of chain sutures; this proceeding alone occupied an hour. His second case died from faulty suturing, and his third also ended fatally owing to a surgical disaster, the operation itself being all that could have been desired. Tuholske has also practised the same method with an unfavourable result, his case dying of shock.*

Dr. Lowson, of Hull, performed this operation in July, 1890. His case unfortunately died. This is, I believe, the first case in which the operation was performed in this country. Mr. Greig Smith has also operated in one case, which died from the difficulty he experienced in getting his stitches to hold, owing to the rotten condition of the duodenal opening. His patient died in consequence of leakage from this part.

It will be obvious that many of these cases encountered extra risk from the time occupied in the operation; now, by adopting the plan of ligaturing the omentum by the method adopted by Dr. Rawdon and myself, much time is saved; indeed, Dr. Rawdon's case of pylorotomy is reported to have been performed in less than an hour, while the operation in the following case, which was performed by me, only occupied an hour and forty minutes. Full details of the different steps of the operation are described in the following notes.

CASE I.†—Combined pylorotomy and gastro-enterostomy for carcinoma of the pylorus; recovery.

The subject of the following notes, for which I am indebted to Mr. Cecil Beadles, my house-surgeon, was kindly sent me by Dr. Stonham, of Ventnor, who, after careful examination and in consultation with Dr. Coghill, believed her to be a favourable subject for operative interference, an opinion which was fully justified by sub-

* *Medical News*, vol. lv., p. 503.

† *Med. Press and Circular*, Nov. 18, 1891, p. 517.

sequent events. I showed the patient herself at the Clinical Society on October 23rd.

Ellen G——, aged thirty-eight, married, was admitted into the Cancer Hospital, Brompton, under my care, on July 25th, 1891. There was no history of cancer; her brother died of phthisis. She has had six children, the youngest twins; one living, aged nine months; could not nurse it, as she was too ill at the time. The patient says she had influenza badly a year ago last January, and had a return of it immediately. She had severe pains in her right leg and in her head, and also slight pain in the stomach. In March, 1890, she had vomiting, which has remained on and off since. In November, 1890, she was confined with twins, one of which was stillborn. Labour was difficult; was in bed for three weeks, and confined to her room for two months. She was very weak, used to vomit frequently, and kept very little down. After her confinement she had puerperal peritonitis; no history of hæmatemesis. Menstruation has not taken place since the birth of the child. She has suffered much from constipation. Three days after confinement, she says, Dr. Stonham, who was attending her, noticed a tumour in the right side of the abdomen; previously to this she had not observed it. During the last month this has grown rapidly. The patient has been confined to her bed during the three weeks prior to coming to the hospital, owing to pain and weakness; she has felt latterly much pain in the right side and back, and recently has suffered from frequent vomiting. Dr. Stonham arrived at the conclusion that she was suffering from pyloric obstruction, probably of a malignant character, and in consultation with Dr. Coghill advised her to submit to an operation. Dr. Stonham wrote me a short history of her case, and I, concurring with their opinion, advised her being taken into the hospital with a view of operation.

Present state.—The heart and lungs are healthy. The patient is emaciated, and has been losing flesh rapidly. The abdomen is distended and tympanitic. No ascites. The rectum was loaded with hardened fæces, which were removed by an enema of olive-oil and soapy water.

July 28th: Stomach-tube passed, and a quantity of sour-smelling fluid drawn off, the colour of beef-tea. The stomach, which was enormously dilated, extending to the pubes, was thoroughly washed out with warm water. Succussion splash readily produced. After the viscus was emptied the parietes were quite flat, and a tumour connected with the pylorus clearly made out. It appeared of a sausage shape, measuring apparently about 3 inches long by $2\frac{1}{2}$ inches wide. The tumour was freely movable, and situated on the right side of the middle line, extending from about 1 inch above the umbilicus downwards and to the right for about 3 inches.

The patient's condition was placed clearly before her (as, indeed, it had already been done by Dr. Stonham), and an operation recommended—firstly, with a view of performing gastro-enterostomy; and secondly, if found practicable, to remove the tumour. The patient, recognising the fact that she was daily becoming weaker, elected to undergo the operation. During the time she had been in the hospital she was fed by means of nutritive and stimulating enemata, only being allowed a little Brand's essence and water by the mouth. On July 30th the stomach was washed out with 3 pints of warm water, 1 pint containing 10 per cent. of salicylate of soda, which was drained off. The patient complained of a feeling of exhaustion afterwards. On the 31st she had some vomiting and diarrhœa; pulse 108. On August 2nd the diarrhœa had ceased, but she vomited during the day from time to time. On the 4th the patient was feeling better, and no vomiting occurred. She was now

being sustained entirely by beef-tea, port wine, and brandy enemata and zymized beef suppositories, given every four hours alternately. Preparatory to the operation the abdominal wall was ordered to be well washed twice a day, for two days, with a 10 per cent. solution of liquor potassæ and water; after which a pad soaked in 1 in 3,000 solution of perchloride of mercury was kept constantly applied. The night before the operation the stomach was washed out with a weak solution of salicylate of soda and water. In the morning she was given a beef-tea (3ij.) and brandy (3j.) enema, and half an hour before the operation an enema of beef-tea (3ij.) and brandy (3ij.) was administered. When the patient was on the table a hypodermic injection of $\frac{1}{80}$ gr. of atropine was given.*

Operation.—August 4th: Two hot-water cushions being placed on the table and covered with warm blankets, and the patient being placed thereon, Dr. English proceeded to administer ether, and Mr. Elam kindly assisted me in the operation. An incision 3 inches long was made in the middle line from the umbilicus upwards through the abdominal parietes, which were so very thin that the peritoneum was cut down upon directly, and no bleeding points required catching. The peritoneum was divided the whole length of the parietal incision, and caught in three places on each side with pressure forceps. The tumour in the pylorus was seized and readily brought out through the wound; it being found to be perfectly free from all surrounding organs, I determined to remove it. A cloth wrung out in warm carbolized water was packed round the growth, which was found to extend for about 4 or 5 inches on to the walls of the stomach. I next, with an aneurysm needle armed with No. 1 chromic gut, ligatured the vessels running along the larger and smaller curvature of the stomach, a little to the left of

* *Lancet*, Oct. 24, 1881, p. 921.

the point at which I proposed to make the section, and with a pair of broad ligament forceps I clamped that portion of stomach on the duodenal side of the proposed section. I then tore through with my finger the lesser omentum, and, Mr. Elam firmly holding the stomach (Fig. 10), I proceeded to cut it across between his fingers and the clamp forceps with scissors, catching up each bleeding point as it was divided with pressure forceps. The growth with the pylorus, being thus severed from the stomach, was covered with a cloth soaked in warm

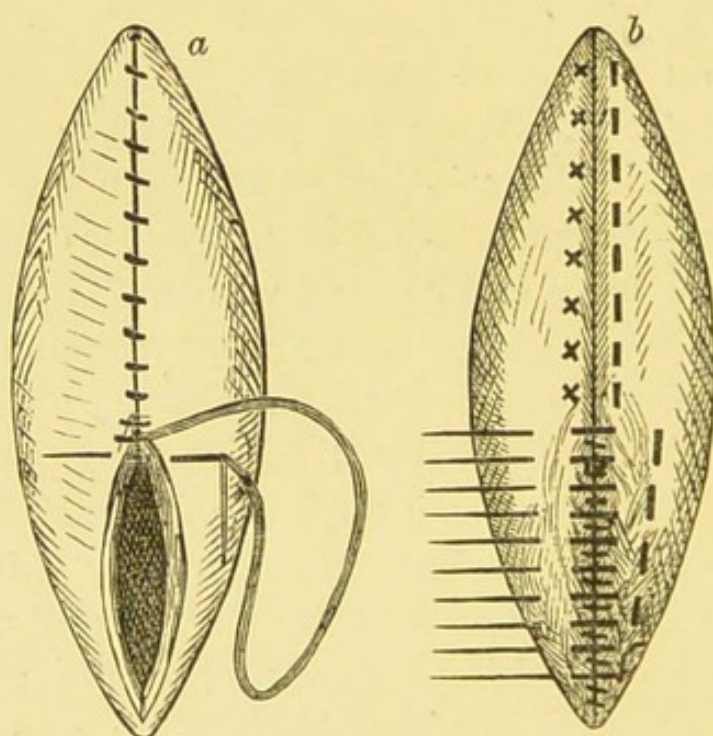


FIG. 9.—Showing (a) the first continuous suture, and (b) the quilt suture being applied.

carbolyzed water, and allowed to hang loosely out of the wound. The vessels in the divided edges of the stomach were now quickly ligatured with catgut, and as it was found that there was a quantity of fluid in the viscus, this was carefully syphoned off by means of a rubber stomach-tube, and washed out. The edges of the stomach were next united by means of a continuous chromicized catgut suture passing through all its coats (Fig. 9, a). A second line of quilt sutures of No. 1 chromicized gut were

now passed through the serous and muscular coats about an eighth of an inch from the edges (Fig. 9, *b*); the ends of each pair of these were secured by clamp forceps, to allow of their all being inserted before tying. Nine of these sutures were introduced in all; as each pair was tied, care was taken to thoroughly invert the cut edges of the stomach, so as to ensure

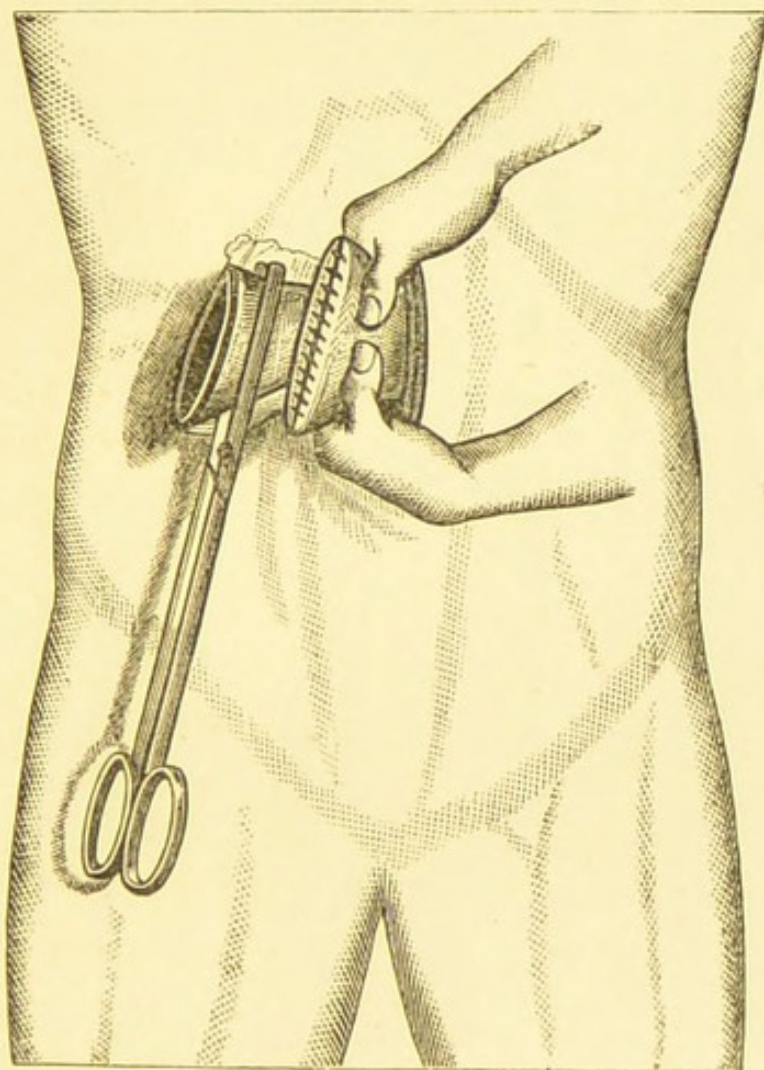


FIG. 10.—Showing the divided ends of stomach projecting from the wound, the proximal end of the stomach being held by assistant.

a good surface of peritoneum being approximated. When all the sutures were tied and the union appeared complete, I allowed the stomach to drop back into the abdomen. I next passed an indiarubber ligature lightly round the duodenum about 2 inches from the pylorus, and clamped that portion of the duodenum close to the

pyloric orifice with forceps (Fig. 11), and divided the gut between the forceps and the elastic ligature, leaving as much of the duodenum as I could with safety. The pylorus and growth were now free, excepting at their attachment to the great omentum. This I transfixed with No. 4 Chinese silk and ligatured in the same manner as an ovarian pedicle (Fig. 12), and removed the

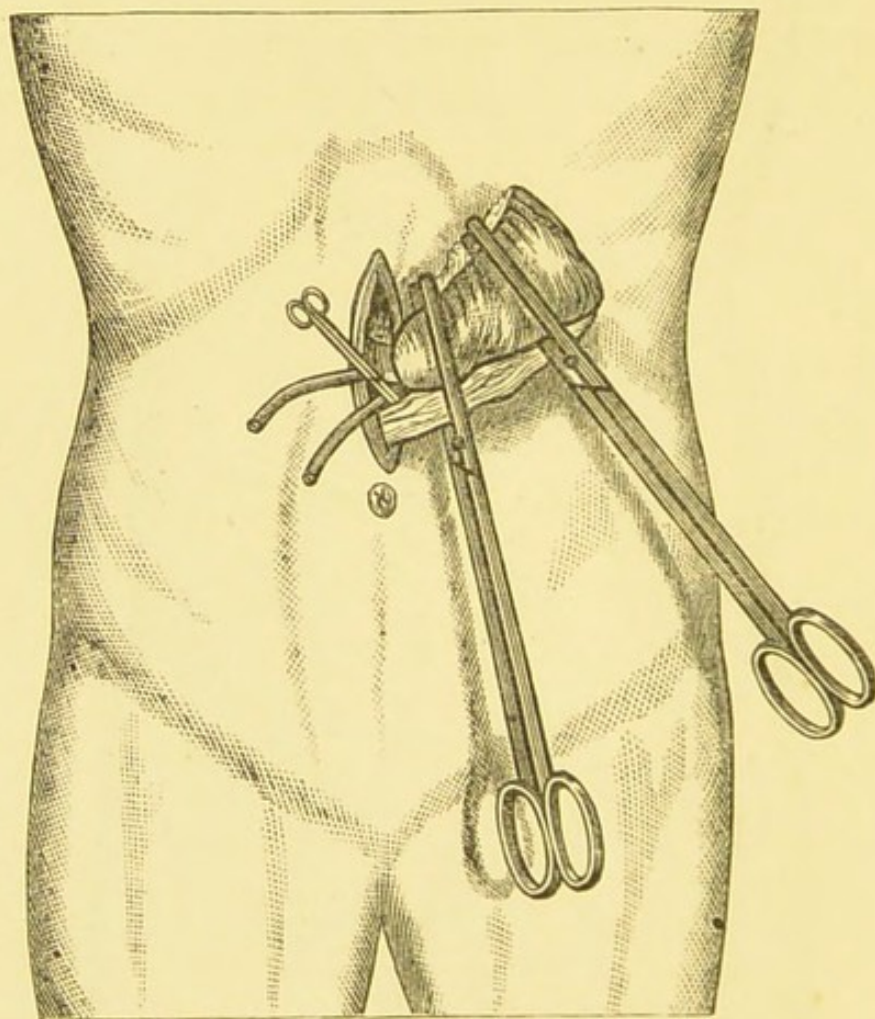


FIG. 11.—Showing the growth drawn out of the wound, and clamp forceps in place, also elastic ligature.

growth by cutting the omental attachment across with scissors. The divided end of the duodenum was then united by means of a continuous chromicized catgut suture passing through all its coats and a second row of quilt sutures of No. 1 chromicized gut, in the same manner as that described for the union of the divided

end of the stomach, and allowed to drop back. The rubber ligature was now removed from the duodenum, a sponge was introduced into the cavity, and the first part of the operation thus completed. I then proceeded to perform gastro-enterostomy. I first pushed the transverse colon and omentum over to the right and passed the index-finger of my right hand over it, and caught up

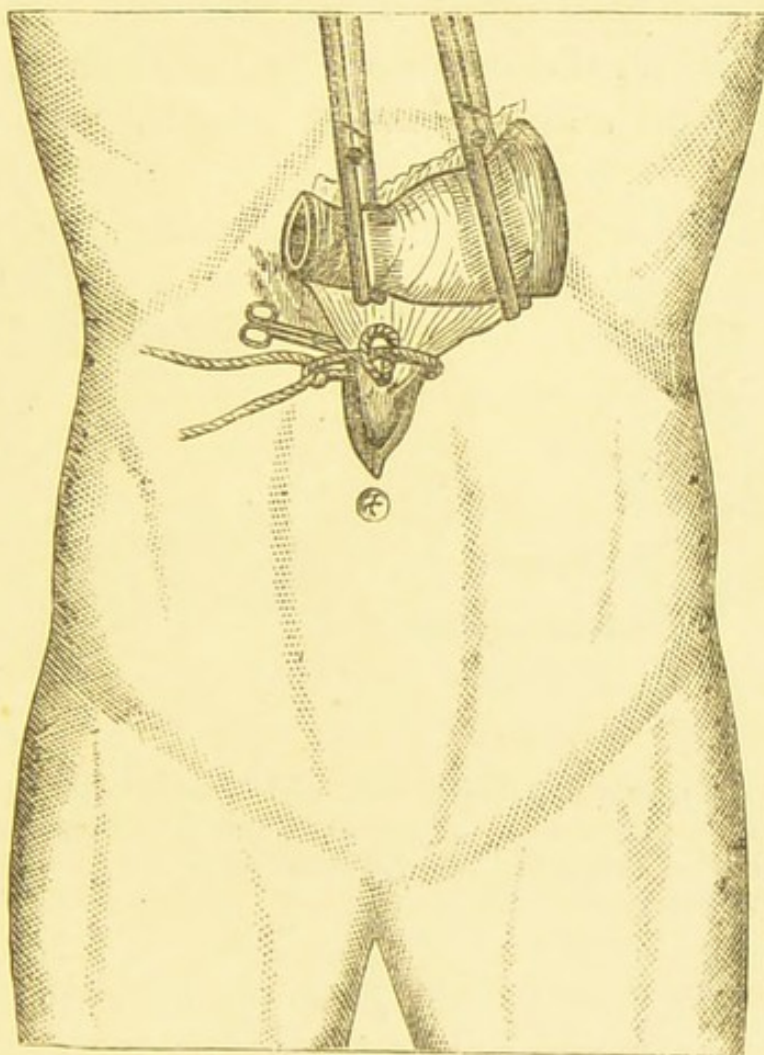


FIG. 12.—Showing pylorus and growth drawn out of the wound, and the ligature applied round the omental attachment.

a loop of the jejunum close to its origin, and drew it out through the wound. The stomach was again withdrawn, and an opening made into it about an inch and a half long, parallel to and about an inch from the greater curvature, and 2 inches from the divided end. A decalcified bone-plate, threaded with two lateral chromicized catgut

ligatures and two longitudinal No. 1 silk ligatures, was introduced. The lateral ligatures were passed through all its coats about an eighth of an inch from the divided edge. The ligatures were given to an assistant to hold, while I proceeded to introduce a similar bone-plate into the jejunum. Before doing this, the two indiarubber ligatures were passed round the intestine almost 4 inches apart, and fastened lightly to prevent the escape of the contents through the opening. A longitudinal incision, about an inch and a half in length, was made in

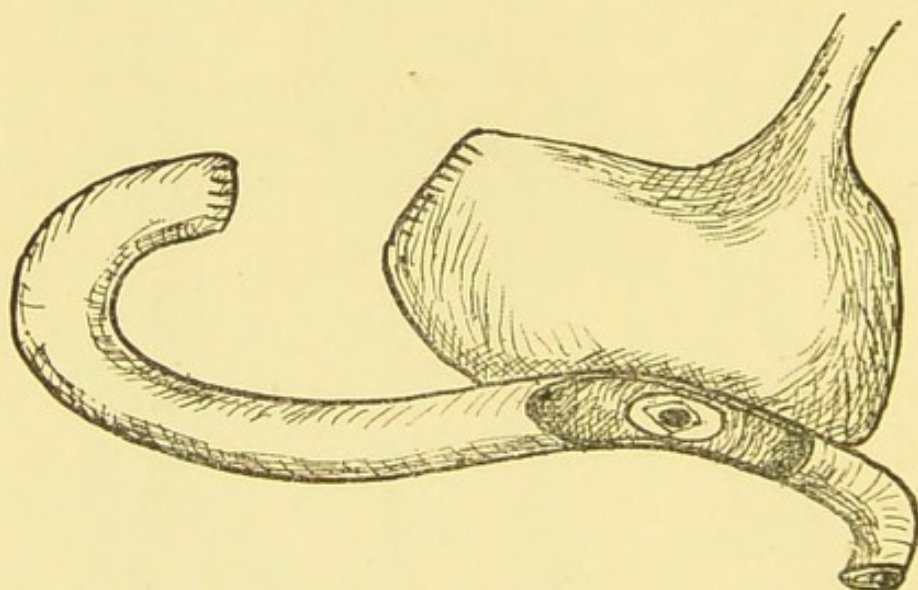


FIG. 13.—Combined pylorotomy and gastro-enterostomy. The divided ends of stomach and duodenum being closed, and a piece of intestine removed, showing the jejunum fastened to the stomach in front by bone-plates.

the convex surface of the jejunum between the indiarubber ligatures, and a bone-plate introduced, the lateral catgut sutures being passed through all the coats of the bowel. The two plates were now held in accurate apposition by Mr. Elam, while I tied the corresponding ligatures of the two plates. In tying the upper lateral ligature a considerable portion of mucous membrane prolapsed, and as great difficulty was met with in replacing it I cut it off with scissors, after which the upper edge was readily made to go into its proper position (Fig. 13). A

row of quilt sutures, five in all, was introduced along the upper edges and ends of the plate, and the parts, being thoroughly cleansed, were dropped back. The sponge which had been placed into the cavity left by the resection of the pylorus was removed, and, all being dry, the abdominal wound was closed with silkworm-gut sutures in the usual manner, the wound dressed with sublimate gauze, and a large pad of wool and a many-tailed bandage firmly applied. The patient was then returned to bed.

The patient bore the operation exceedingly well; the only time that her condition appeared to give anxiety was after the division of the stomach and while stitching up the duodenal opening. During the latter part of the operation, which lasted one hour and forty minutes, she rallied considerably. The portion of stomach and pylorus removed measured about 6 inches in length and 4 inches from above downwards at the gastric end. The specimen was shown at the Clinical Society with the patient. It contained a mass of growth, which was firm and not ulcerated, and which almost completely obstructed the orifice of the pylorus. There were no adhesions. The patient was ordered to have enemata of brandy (ʒij.) and beef-tea (ʒij.) every two hours, and zymized suppositories every two hours; if she expressed a wish for anything by the mouth she was to be allowed a tablespoonful of tepid water every hour. August 5th: Passed a good night; slept fairly well; no vomiting. The rectal feeding was now given every four hours; urine to be drawn off every six hours. To have two teaspoonfuls of peptonized milk and four teaspoonfuls of tepid water every hour by the mouth. 6th: Slept well. No vomiting; complains of very slight pain in abdomen; bowels opened. The milk-and-water by mouth to be increased to double the quantity. Enemata as before. 7th: Wound dressed. There has been no

tympanitis; no vomiting, or other bad symptom. At nine p.m. the patient complained of pain in the back and at the epigastrium. At twelve p.m. the pain had considerably increased. No tympanitis. Food by the mouth to be discontinued for awhile. 8th: Better; free from pain; no vomiting; bowels opened. One teaspoonful of peptonized milk to be taken every hour. At two p.m. she was ordered to take two teaspoonfuls of milk-and-water every hour, and one teaspoonful of Brand's essence every four hours. 9th: Patient decidedly stronger; pulse improved. Complains of a little soreness of the right iliac and left hypochondriac regions. 12th (a week after the operation): The patient slept well, and continues to improve daily. Allowed strong beef-tea, custard, and jelly by the mouth. She is now taking four ounces of beef-tea three times a day; three pints of milk, four eggs, and jelly and mutton broth in the twenty-four hours. All enemata discontinued; suppositories three times a day. 18th (a fortnight after the operation): Sutures removed from abdominal wound. Suppositories discontinued; diet as on the 12th. 20th: The silk ligature loops which held the plates, and with it a portion of the chromicized gut ligature, have been passed per rectum. Diet to consist of boiled fish, tripe, milk, strong beef-tea, mutton broth, jelly, and eggs. Sept. 17th: The patient has made uninterrupted progress, been out for drives, and takes her food well. Oct. 23rd: The patient was shown at the Clinical Society. Since the operation she has increased nearly 2 st. in weight, which on September 16th was 6 st. 4½ lb.; October 1st, 7 st. 4 lb.; October 21st, 7 st. 11 lb.

COMPARISON OF OPERATIONS.

Now let us for one minute compare these three methods of operating. In the first place, the operation as de-

scribed by the last two methods can be done in a third of the time of the Billroth method. The idea of catching up piece by piece of the omental attachments is tedious in the extreme, and considering the thinness of the omentum there can be no occasion for such excessive care, as it can easily be tied in two or three pieces, if not formed into one pedicle. Then, again, if the stomach has been well washed out, there can be no occasion for clamping this, as if the stomach is held well up, even if any of its contents should remain, it need not escape, and could be readily cleaned out by sponges, absorbent wool, or other agents, or by means of syphon.

Finally, the number of stitches used by Billroth's method is reduced from some fifty or sixty to certainly half that number, besides the four ligatures which unite the two plates.

Thus, then, it will be seen how infinitely simpler the method practised by Dr. Rawdon in his case and the combined operation as suggested by Weir and myself are to the method hitherto practised, and in the future I look forward to the time when the operation of pylorectomy will be performed with as great success as is now claimed for hysterectomy, nephrectomy, or any other operation about the abdomen.

It now remains to be considered, what is to be done supposing we find the pylorus adherent to neighbouring viscera, and it is deemed undesirable to attempt its removal. In such a contingency, the only operations open to us are gastro-enterostomy, and jejunostomy. The former operation is so simple and successful that it should always be practised in cases where the major operation is inadmissible, and the disease is limited to the pyloric end of the stomach.

GASTRO-ENTEROSTOMY.

I shall not detain you with comparing the operation, as suggested by Senn, with that which until now has been practised; suffice it to say they are both performed in identically the same manner up to the point when the union of the intestines and stomach takes place.

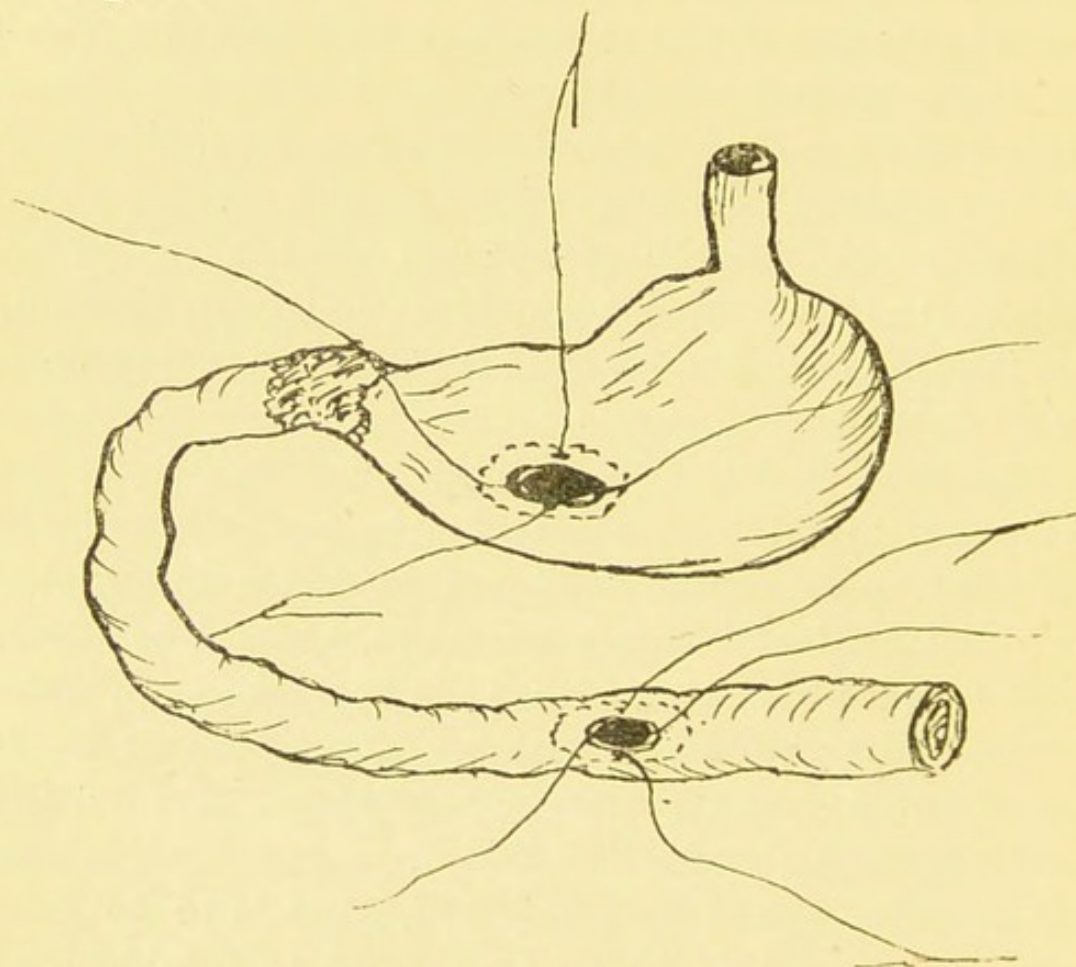


FIG. 14.—Gastro-enterostomy ; showing bone-plates in position.

The abdominal incision (Fig. 3) will have to be varied according to the situation of the growth and the amount of dilatation of the stomach. In my first two and fifth cases I made my opening in the middle line, between the ensiform cartilages and umbilicus; in my third and fourth I made it in the *linea semilunaris*. This latter incision has the advantage that it is directly over the origin of the jejunum, which is readily hooked up close to

its origin from the duodenum, while if the stomach is at all dilated, it lies immediately beneath the incision. On the other hand it is more difficult to apply the bone-plates here, as the stomach cannot be so easily drawn into the wound; whereas, if the incision is in the middle line, the stomach and loop of intestine can readily be brought out.

To find the Commencement of the Jejunum.

A portion of the stomach being withdrawn from the wound and held by an assistant, the surgeon next draws out a loop of the jejunum as near to its origin as practicable—and here let me warn you not to take up the portion of intestine which first presents itself, as, if you do, you may find you have seized a loop low down in the small intestine. In nearly every recorded case of this operation, as well as in text-books, you read that, the abdomen being opened, the surgeon is to push the omentum over to the *left*, and seize the small intestine. This is most erroneous and misleading, as the only reliable method of securing the portion of jejunum at its origin is to push the omentum over to the *right*, and pass the index-finger of the left hand down until it feels the top of the left kidney, and then following this to the vertebral column, a notch or fold will be felt in the peritoneum, which is the point at which the jejunum commences; seize this, and follow it downwards until you have sufficient loop to apply easily to the stomach.

MS.

Dr. E. Hahn, Berlin,* in demonstrating an operated case of gastro-enterostomy, stated that from numerous trials on the cadaver he had found the jejunum was very easily found in the following manner. After incision of the abdominal wall the omentum and colon are pushed up, when the index-finger and thumb of the right hand

* Report of 16th German Surgical Congress in *Centbl. f. Chir.*, 1887, No. 25.

determine the part of the pancreas lying on the vertebral column; he then seizes the loop of intestine which crosses from right to left just below the pancreas. If on pulling at this it does not follow, then it may be positively assumed that one has the first part of the jejunum.

Introduction of Approximation Plates.

The loop of intestine being drawn out of the abdominal wound, two indiarubber bands are next passed through the mesentery, about 4 inches apart, and the portion of intestine between emptied of its contents by gently squeezing it.

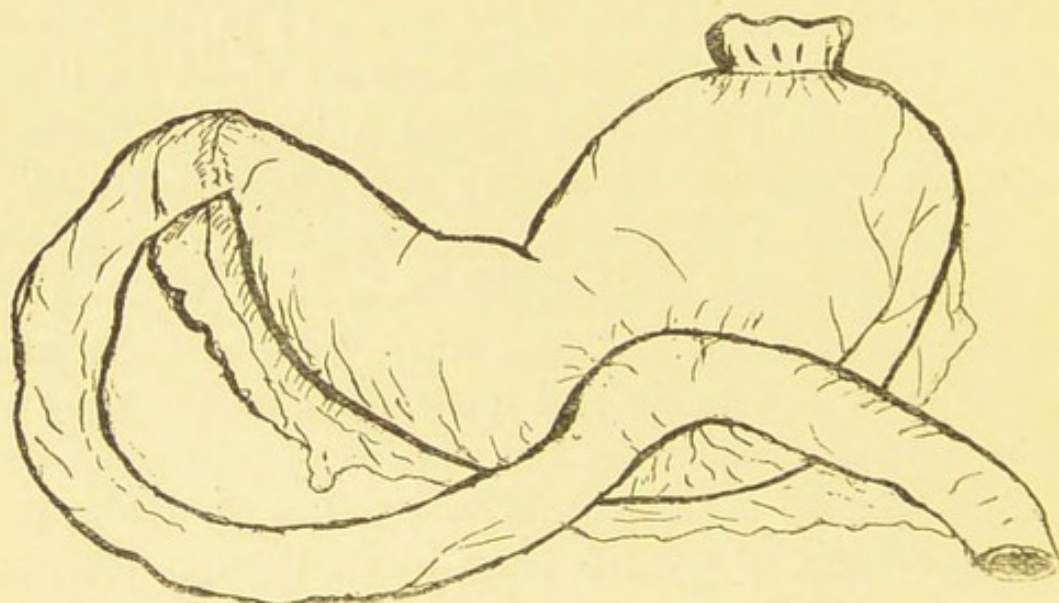


FIG. 15.—Gastro-enterostomy ; operation completed.

The bands are then lightly tied round the intestines and secured with pressure forceps, and an opening from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches long made on its convex surface (the mucous and serous membranes, if desired, may be united by a continuous catgut suture) and the bone-plate inserted; the lateral threads, which should be of chromicized catgut, are passed through all the coats of the intestines; the end threads are brought through the wound. These threads are now given to an assistant to hold, while a bone-plate is introduced in a similar manner into the stomach, the opening being made on its anterior surface of a similar length to

that in the bowel, and about $1\frac{1}{2}$ or 2 inches from the greater curvature (Fig. 14). The two openings with the bone-plates are next held in accurate apposition while the surgeon ties the corresponding threads of the opposing plates together, the lower lateral threads being tied first, then the end ones, and, finally, the upper lateral ligature (Fig. 15). A few Lembert or quilt sutures should be inserted round the ends and upper edge of the plates. The united parts are then dropped back into the abdomen, and, if possible, a portion of omentum brought up between it and the parietal wound. The parietal wound is then closed in the usual manner, and the patient returned to bed.

*Five Cases of Gastro-Enterostomy for Pyloric Carcinoma.
Under the care of the Author.*

CASE II.—W. V——, aged sixty-one, a Bath-chair man, was admitted into the Cancer Hospital, Brompton, on February 12th, 1890, suffering from carcinoma of the pylorus. Family history: brother died of abdominal cancer. Previous history: has always enjoyed good health. For many years was a steward on the 'Allan' line. During the summer of 1889 was employed as a waiter, and carried heavy trays up and down stairs, resting the edge of the tray against his abdomen. Present complaint: He first noticed the growth in the beginning of October, 1889. It seemed to be situated on the left side, and extended towards the right. Has suffered from vomiting every other day for the last two or three months; sometimes he has vomited twice or three times a day, the vomited matter being dark and frothy. Has lost flesh considerably, and during the last three weeks has lost 12 lb. in weight. State on admission: Stomach much dilated, extending downwards nearly to the pubes. Succussion splash readily obtained.

A hard growth is felt in the epigastric region, extending downwards to the umbilicus, and to about an inch on each side. This mass is firmly fixed. A smaller mass, apparently separate from the larger growth, is to be felt just below, and to the right of the ensiform cartilage. The stomach was ordered to be washed out twice a day with a solution of salicylate of soda and water, twenty grains to the ounce. This had the effect of speedily reducing the size of the stomach and enabling more exact examination of the growth, which was found to be about the size of a cocoa-nut, measuring $5\frac{1}{2}$ inches across, 4 inches vertically on the right side, and $2\frac{1}{2}$ inches on the left. The tumour was nodular, and presented a deep notch just above the umbilicus and about the centre of the growth. The disease apparently extended along the anterior wall of the stomach. Tympanitic note over the whole growth, excepting to the extreme right. As the man was rapidly losing strength, and suffered much pain and distress from the constant vomiting, the operation of gastro-enterostomy was recommended as a palliative measure, it being recognised that it would be impossible to remove the disease.

The patient having consented, he was fed by nutritive enemata for the following three or four days, only being allowed essence of beef, milk, etc., by the mouth, and his stomach was washed out twice a day with the salicylate of soda solution. On February 23rd, the morning of the operation, at eight o'clock, he had ʒiv. of strained beef-tea and ʒj. of brandy. At ten o'clock he had his stomach washed out and an enema of beef-tea and brandy. At one o'clock his stomach was again washed out and another enema of ʒiiij. of strong beef-tea and ʒij. of brandy given. Just before the operation a hypodermic injection of $\frac{1}{100}$ grain of atropine was given. At two o'clock chloroform was administered by Dr.

English by Junker's inhaler, and with the assistance of Drs. Purcell, Dove, and O'Reilly, I performed the following operation. In consequence of the growth extending so far over to the left of the umbilicus, and being so fixed, I determined to make my incision in the left linea semilunaris; the incision extended from about $1\frac{1}{2}$ inches below the margin of the ribs downwards for about 3 inches. All bleeding points being secured, the peritoneum was opened and a coil of small intestines as near as possible to its commencement from the duodenum was drawn out of the wound. Two indiarubber bands about 4 inches apart were passed through the mesentery, and, the portion of bowel to be opened being carefully emptied, the ligatures were lightly fastened round the intestine. A portion of the stomach was now drawn into the wound with some little difficulty, owing to the fixity of the growth and the proximity of the œsophageal connections. The parts being packed round with sponges, an opening was made into the stomach about $1\frac{1}{2}$ inches in length, parallel to, and $1\frac{1}{2}$ inches from, the greater curvature. A decalcified bone-plate, armed with four silk threads, was passed into the stomach through the opening, and the two lateral threads, with needles attached, were passed through all the coats of the stomach about a third of an inch from its cut edge, the longitudinal threads passing through the opening. These threads were then given to Dr. Dove to take charge of, while an opening was made into the jejunum between the two elastic ligatures, and another bone plate, similarly armed with silk sutures, was passed into it, the lateral threads, having needles attached, being passed through all the coats of the intestine. All bleeding points being secured and ligatured with fine catgut, the two bone-plates were approximated and kept firmly in apposition by Dr. Dove, and the corresponding opposing threads were tied firmly, the two lower lateral

ligatures being tied first, then the end ones, and finally the upper lateral ligature. There was some difficulty, owing to the fixity of the stomach, in keeping the plates in strict apposition. It was deemed advisable, therefore, to put in about six Lembert sutures around the plates. The elastic ligatures were now removed, and the parts, having been thoroughly cleansed, were dropped back into the abdomen, the toilet of the peritoneum was attended to, and the parietal wound closed in the usual manner. The patient bore the operation well, and was returned to bed. He was ordered to have nothing excepting a little warm water to rinse his mouth out with. Enemata of zyminized beef-tea $\bar{z}$ ij., and brandy $\bar{z}$ j., were to be given every four hours, and the urine to be drawn, if necessary, every six hours. February 24th: Passed a good night. Temperature normal; pulse 84, good; respiration easy; tongue moist and clean; no pain; vomited about $\bar{z}$ x. of blood-stained fluid. Beef-tea and brandy enemata were continued every four hours. Complains slightly of thirst. To have nothing by mouth. 25th: Passed a fairly good night, with intervals of sleep of about two hours at a time. Temperature normal; pulse 80, rather weak; breathing regular and quiet; tongue moist; no pain or tenderness; abdomen soft and flaccid. Enemata to be continued as before, alternated every four hours with zyminized beef suppositories. 26th: Patient somewhat restless. Temperature normal; occasional hiccough; no tympanitis or abdominal tenderness. 27th: Restless night. Pulse feeble and the patient appears very weak. To have a teaspoonful of essence of beef every hour as well as beef-tea and brandy enemata. 28th: Patient gradually got weaker and died during the night, apparently from exhaustion. The abdomen was quite flaccid, and there was no pain or tenderness.

Necropsy.—March 2nd. Emaciation extreme. Abdomen: General old peritonitis over liver, spleen, and cardiac end of stomach; the posterior surface of many coils of intestine were adherent to the mass of glands covering the lumbar vertebræ. Liver: Nutmegy; large secondary deposit. Spleen adherent to diaphragm by old pleuritic bands. Abdominal lymphatics enlarged down to the sacrum. The stomach, intestines, and mass of lumbar lymphatic glands were removed *en masse*. The adhesions between the stomach and jejunum were perfect; the portion of intestine attached to the stomach was discoloured, but showed only very slight signs of recent peritonitis, which was quite localized to half an inch surrounding the puncture. One coil of intestine was adherent to the posterior surface of the wound in the abdominal wall. The stomach and intestines were dilated and distended with gas, and contained some brownish fluid. On opening the stomach, the bone plates were seen nearly digested, hanging by the silk sutures from the opening into the jejunum, which was quite patent and healthy. The portion of intestine which was joined to the stomach was found to be situated about 3 inches from the commencement of the jejunum.

CASE III.—A. C——, aged fifty-six, widow, was admitted into the Cancer Hospital, February 14, 1890, suffering from carcinoma of pylorus. Family history: None. Personal history: Has had four children, last child born twenty-two years ago. Menopause six years since. Patient always been delicate. Has suffered from indigestion for a considerable time; for many years she had an acute attack every summer, which confined her to bed for about a fortnight. The symptoms were pain in chest and back, vomiting, flatulence, and constipation. She dates her present illness back for six years, and says it commenced as one of her usual attacks of indigestion.

It lasted, however, longer, and was more severe. Her doctor told her the liver was congested, and a few months later she discovered a 'lump' in her abdomen. For eight or nine months the patient continued very ill, and was confined to her bed, suffering severe pain, and vomiting several times a day. There was no hæmatemesis. During this time she was frequently seen by the late Dr. Habershon, of Guy's Hospital, who told her the disease was incurable. Under treatment, after a while she began to improve, the tumour disappeared, the pain and vomiting ceased, and she got comparatively well. She remained free from all discomfort for the following five years; but in February, 1889, the old symptoms gradually returned, and the tumour reappeared. The pain was very severe, and was sometimes aggravated and sometimes relieved by taking food. There was occasional vomiting, but food was not returned, she bringing up a 'frothy, sour, watery fluid.' In May, 1889, she attended at the Cancer Hospital as an out-patient. She continued to get gradually worse until November, growing thinner, and suffering great pain, but able to get about. In November, however, she became considerably worse, and was almost constantly confined to her bed, the pain was most severe, and everything she ate was vomited, usually a few hours after eating. The tumour gradually increased in size. She was admitted into the hospital under the care of my friend and colleague, Dr. Purcell, through whose courtesy and kindness the patient was handed over to my care. State on admission: There is a tumour in the abdomen occupying nearly the whole epigastric region, situated apparently at the pylorus, and extending along the anterior part of the stomach. The tumour is movable, and also moves with respiration. The stomach is enormously dilated, extending as low as the pubes. Succus-

sion splash very distinct. Patient vomits once or twice a day a brownish fermenting fluid, filled with sarcinæ. She is very emaciated and weak. Urine healthy. I ordered her stomach to be washed out twice a day with a solution of salicylate of soda and water, and to take only zymimized milk, brandy, and essence of meat. She was also fed by nutritive enemata, port wine, beef-tea, and eggs three times a day. Under this treatment the patient gained strength and the stomach rapidly decreased in size, and vomiting ceased. The tumour was found to be so large that pylorotomy was not to be thought of; but, in consultation with my colleagues, it was decided to recommend gastro-enterostomy, as being likely to prolong life and to allow of the patient taking food by the mouth, and discontinuing the disagreeable process of having her stomach washed out. As the preparation for the operation, and the operation itself, were carried out in identically the same manner as described in Case I., I need not repeat the details here. I will only point out that in this case I used chromicized catgut ligatures for the bone plates instead of silk for the lateral ligatures. The abdominal incision was made in this case in the left linea semilunaris, as in Case I. The patient bore the operation well, and passed a good night. She was ordered to have zymimized beef-tea and port wine enemata every six hours, and the urine to be drawn off every six hours. She was fed by the mouth on the second day after the operation with a tablespoonful of zymimized milk every hour; this was increased gradually day by day, and on the fourth day she was taking 4 tablespoonfuls of zymimized milk every hour, or $\text{℥} \text{xlviij.}$ in the twenty-four hours. The patient was perfectly free from pain, had no nausea, and was rapidly improving. On the fifth day ℥ij. of zymimized beef-tea and calf's-foot jelly were added to the diet. There was not the slightest pain or tenderness

in the abdomen, which was perfectly flaccid and soft. The bowels acted regularly, and on the ninth day from the operation she was transferred to the general ward, and allowed to take boiled fish, beef-tea, port wine, jelly, eggs, etc. The enemata were now quite discontinued. At the end of a month the patient had considerably gained flesh, and was free from all pain, and able to take her nourishment well. The tumour was now to be felt drawn up considerably higher between the ensiform cartilage and umbilicus. July 3rd: The patient, who had increased much in flesh and was perfectly free from pain and able to take ordinary diet, left the hospital on July 27th. The growth had not increased in size, and there was no pain or tenderness on pressure.*

CASE IV.—Ed. E—, aged fifty-seven, admitted into the cancer hospital July, 1890. Pyloric obstruction, with great dilatation of the stomach. No family history of cancer. Extreme pain and sickness two or three hours after food.

July 26: The patient having been prepared in a similar manner to the two previous cases, I performed gastro-enterostomy with decalcified bone-plates. In this case I tore through the transverse meso-colon, and fastened the jejunum to the posterior wall of the stomach.

This patient died three days afterwards from acute septic peritonitis. At the post-mortem examination, firm union was found to have taken place between the stomach, meso-colon and intestines at the seat of operation, and there was not the slightest leakage. The cause of the peritonitis it is difficult to explain, as around and behind the seat of operation there was little more than might have been expected; whereas, the small intestines and great omentum at the lower part of the abdomen were covered with lymph.

* This patient is alive and able to eat anything and do her ordinary work now, December, 1891, twenty-one months after the operation.

Cases V. and VI. were operated on in a similar manner to Case II., and both made good recoveries. One died nine months after the operation from secondary deposits in the liver; the other is still alive and in fairly good health (twelve months after the operation), being able to take ordinary diet, and attend to her daily duties.

BERNAYS' OPERATION, CURETTING GASTRIC CANCER.

Dr. George W. Cale,* of St. Louis, gives a description of Bernays' operation, which has been brought forward as a substitute in suitable cases for gastro-enterostomy or pylorotomy. Bernays' operation is not curative but palliative, and is therefore not recommended in cases where a pylorotomy might be radically curative. The details of the operation are as follows: Laparotomy is performed in the median line, extending about 5 inches (12.5 centimetres) downward from the ensiform cartilage; through this incision the stomach is drawn out, and a pair of bullet forceps applied to the anterior surface about 2 inches (5.0 centimetres) from the pylorus; another pair of forceps is applied $2\frac{1}{2}$ inches (6.25 centimetres) nearer the fundus (on the anterior surface). An incision $1\frac{1}{2}$ inches (3.75 centimetres) in length is made, extending between the forceps on the long axis of the stomach. A Volkmann sharp spoon is inserted through the opening in the stomach, and the cancerous mass is scraped out. Hæmorrhage is very slight. The stomach is irrigated with pure warm water to remove small loose pieces of the growth left behind by the curette. The stomach is closed by the Czerny-Lembert silk sutures, *i.e.*, a row of deep sutures, including the serous and muscular coats, bringing the cut surfaces together, and over these the Lembert sutures, which of course in-

N. B.

* *International Journal of Surgery*, Feb., 1890, p. 27.

cluded only the serous and muscular coats. The fixation forceps are next removed, and the stomach is replaced in the abdominal cavity. The abdominal wound is closed with nine deep and several superficial silk sutures. The usual dressing of sublimate gauze and guttapercha tissue is held in place by a broad bandage. Liquid diet is permitted at once. Abdominal sutures are removed on sixth day. A gastric fistula may be established, if desirable, to allow of subsequent curetting, as was done by Bernays in the original operation, performed three years ago.

I may say I have no experience of this operation, neither does it commend itself to me in any way, as, judging by the analogy of similar operations for carcinoma of the uterus, very little good can be anticipated; on the contrary, I am not at all sure that the disease may not increase very much more quickly.

AFTER-TREATMENT.

With regard to the after-treatment of gastro-enterostomy and pylorotomy cases, the patient must be kept absolutely at rest for the first twelve hours, nothing being allowed by the mouth, excepting spoonfuls of warm water if thirst is very great. The urine should be drawn off every six hours. The patient should have nutritive enemata of peptonized beef-tea (3ij.), and brandy (3j.), given every four or six hours. No opium should be administered by mouth; but if the patient is restless a hypodermic injection of $\frac{1}{8}$ th grain of morphia with $\frac{1}{100}$ th grain of atropine may be administered.

After twelve hours small quantities of zymized milk and warm water may be allowed by the mouth, not more than a tablespoonful at a time every hour. Ice may be sucked if wished for. At the end of twenty-four hours the quantity of zymized milk and water may be increased to twice the quantity every hour, and if

this is borne well it may be still further increased ; when Brand's or Valentin's essence of beef and jelly may be given, the surgeon feeling his way. So long as there is no nausea or vomiting all will go well, and by degrees fish or finely-minced meat may be given.

The patient should not be allowed out of bed for a fortnight or three weeks at the earliest.

GASTROSTOMY.

If the disease is limited to the cardiac end of the stomach, gastrostomy may be practised ; this operation I perform in identically the same manner as that described later on for jejunostomy, substituting the anterior wall of the stomach for the jejunum.

The old method of performing this operation I have quite discarded, as it takes much longer to accomplish, is not nearly so safe, and the risk of passing the tube between the stomach and parietes into the peritoneal cavity, when feeding, is avoided by the method I have introduced. This accident has happened more than once, and cases of such are on record.

In many cases it is a good plan, when opening the stomach, to pass a long winged rubber catheter through the parietal fistula into the viscus, and endeavour to pass it through the pylorus into the duodenum, allowing it to remain fixed *in situ*, so that the patient can be fed without removal of the tube.

In performing gastrostomy, the parietal incision has been varied by different surgeons. In cases in which the patient is very emaciated, and the liver not enlarged, I consider the best situation to make the incision is in the median line between the xiphoid cartilage and the umbilicus. It need not be more than 2 inches in length, and the stomach is readily withdrawn to the requisite extent.

The next best position is that recommended by Tillaux

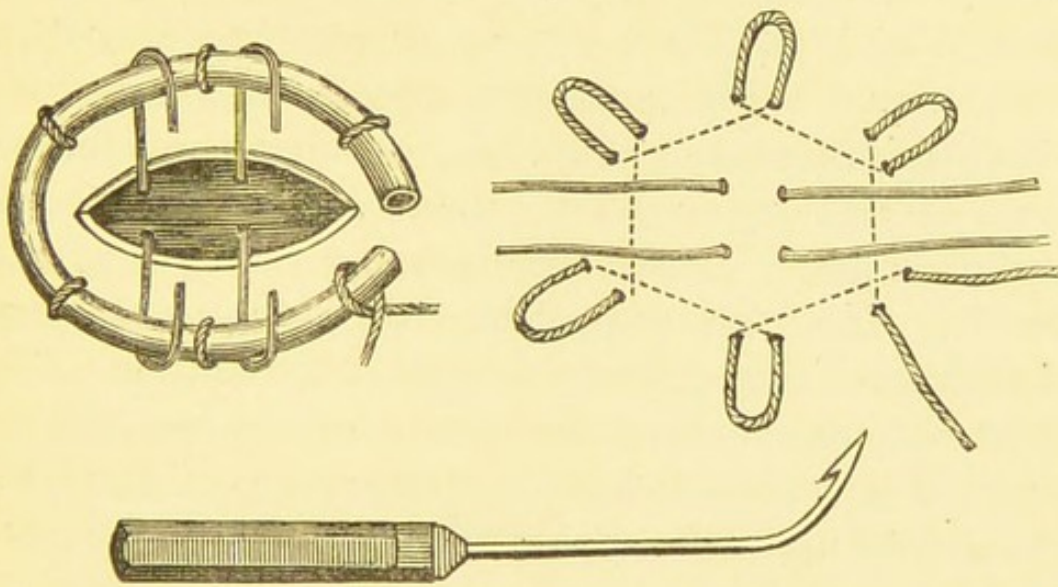
(Fig. 3), who directs that an incision should be made parallel to the left costal cartilages, taking the tip of the ninth rib as an anatomical landmark ; it should be from 2 to 3 inches in length, its centre being opposite the tip of the ninth rib.

On making the opening through the parietes, all bleeding points should be secured by means of pressure forceps before the peritoneum is incised ; this is then caught up with ordinary catch forceps and snipped through with scissors. The finger can now be passed into the peritoneal cavity, and serves as a director to pass the scissors along when dividing the peritoneum, which should be done to the full length of the wound. The divided peritoneum should be caught up with a couple of pairs of pressure forceps on each side and drawn well out of the wound ; this has the advantage of preventing the leakage of any blood into the cavity. The usual plan now adopted is to stitch the peritoneum to the skin carefully round the whole extent of the opening. This procedure I have discarded, as it is quite unnecessary, and, moreover, I consider the union of the parietes is weakened by preventing a good surface of muscular tissue uniting above and below the point where the stomach is withdrawn.

The index and middle finger are next introduced into the wound and the anterior wall of the stomach withdrawn, selecting that portion of the viscus at which there appears to be the least traction.

The method of fixing the stomach to the parietes is quickly and securely accomplished by the method I have recently adopted in the performance of this operation and jejunostomy. Four chromic gut threads, each about 18 inches long and armed with a needle at each end, are passed beneath the peritoneal and muscular coats of the stomach in the form of a parallelogram (Fig. 18, p. 62).

The needles are then passed through the abdominal parietes from within outwards, about a quarter of an inch from the cut edges of the wound, and then through a bone plate, in the centre of which is an oval opening. The corresponding threads are next firmly tied over the plate; a portion of the stomach is then drawn through the opening in the plate, by means of pressure forceps, and fixed by passing a hare-lip pin through it (Fig. 19, p. 62). The stomach may be opened the next day, or when the surgeon selects, and a winged rubber catheter



FIGS. 16 and 17.

passed into the viscus, and the patient fed through it. On making the opening into the stomach it is well to secure the cut edges of mucous membrane to the sutures across the plate by means of a couple of stitches. By this method there is very little leakage, and it is impossible to miss the opening into the stomach.

The following plan, described by Greig Smith (Fig. 16), is also good: by it the stomach wall is kept in accurate apposition with the parietal peritoneum in a continuous circle, and not at interrupted points.

Firstly — following Bryant's suggestion — insert two loops of silver wire near the spot where the opening is to be made. By these the stomach is manipulated during the process of suturing, and they serve to fix it when the opening is made. Then, with a round needle, threaded with thick soft silk about a foot long, pass a continuous suture, in a circle of about 2 inches in diameter, under the peritoneal and muscular coat of the stomach. At every third quarter of an inch in the circle the needle is taken out and reinserted, so that six or eight free loops, about $1\frac{1}{2}$ inches in length, are left protruding on the serous surface (Fig. 17). Then, at a corresponding situation in the abdominal walls, a handled needle, with a recurved hook instead of an eye (Fig. 17), is pushed through, and catches up the loops one after the other. As each loop is drawn through, a piece of indiarubber tubing is slipped under it. The loops are pulled with moderate tightness over the rubber tubing from each end of the incision. The ends of the silver sutures are now to be hooked under the tubing; this serves to keep the exposed portion of the stomach well up in the gaping wound. A suture at each end of the wound may be necessary.

Finally, an opening as small as practicable is made in the stomach, and a tube inserted. I find an ordinary winged catheter answers every purpose.

The patient should be fed with small quantities of fluid food, commencing with peptonized milk. I think it always wise to keep the catheter in the wound until a fistulous opening is established.

To prevent the irritation of the skin which so often arises from the escape of the gastric fluid, I, after a trial of numerous applications, have found nothing better than boracic ointment made with vaseline, and plenty of absorbent wool, which can be frequently changed.

Mr. Mansell Moullin, in a recent case, adopted the following plan to prevent the escape of fluid :

An attempt was made to prevent the skin being irritated by dusting bicarbonate of soda freely over the surface, but it did not seem to have any effect. The escape of the fluid was prevented by pressure; in the intervals between the meals the tube was withdrawn altogether, and the opening plugged with oiled lint, over which was placed a sponge or a thick pad of absorbent cotton moistened with bicarbonate of soda. Later, when the patient had regained his strength and was able to feed himself, he found it more convenient to keep the tube in permanently, fastening it with a clip, and packing it thoroughly all round. In time the edges of the wound became quite hard; and although there did not seem to be any power of contraction, it is probable that during the fits of coughing a certain amount of pressure was exerted by the rectus. The method of feeding was soon learnt by the patient, and he became quite expert. For a time he was induced to masticate the food in his mouth and eject it into a funnel down a tube attached to the stomach, but this had to be abandoned.

Professor Hahn's Operation.—Professor Hahn, of Berlin, in June, 1887, first performed Gastrostomy by a novel method through the eighth intercostal space. Since that time he has performed eight operations by this method, and, comparing the results alongside of similar operations performed after Fenger's method, expresses himself as decidedly in favour of the former. His method is as follows: An incision is made parallel with the lower edge of the last lower rib and the abdominal cavity opening. A second incision is made in the eighth intercostal space, close to the juncture of the eighth and ninth intercostal cartilages through skin and muscular tissues in a direction obliquely from above downwards and outwards. The parietal peritoneum at this point is punctured by a pair of curved dressing

forceps, or incised, and the opening is enlarged by spreading the forceps. The thumb and index-finger of the left hand are introduced into the first made abdominal incision, and the stomach sought for at a point corresponding as nearly as possible to the fundus. This is grasped by the dressing forceps and drawn through the eighth intercostal space until the stomach wall overlies the surrounding integuments for the space of 1 cm. After covering the wound first with antiseptic gauze, the stomach, in case the opening is to be made at a subsequent sitting, is sutured by means of its serous covering only to the edges of the wound. In case it is to be opened at once, the serous and muscular and mucous coats are together attached to the opening in the intercostal space. The abdominal wound is then sutured. After numerous trials on the cadaver, Hahn found that there was no danger of wounding the diaphragm if care was taken to always select the space between the cartilage of the eighth and ninth ribs, inasmuch as the former has no attachments to the cartilages of the seventh rib towards the median line, being attached in such a manner as to leave the eighth intercostal space uncovered and free for operation.

The advantages Hahn claims for this operation are :

1. A small and contracted stomach can, with greater ease, be drawn forward and attached at this point.
2. The attachment seems to be more reliable than when made to the edges of the abdominal wound. The contents of the stomach, on account of the better closure of the opening, do not come into contact with the wound to the same extent as in the older methods.
3. The feeding of the patient can be better accomplished ; the closure of the space by the approximation of the ribs acts as a pinch-cock, thus preventing fluids from finding their way out alongside of the feeding tube.
4. No obturator or other means of closing the opening

later on is necessary. A gradual dilatation of the fistula, owing to the resistance offered by the costal cartilages of the rib, cannot occur.

The operation certainly commends itself to me, and in cases of carcinoma of the œsophagus, in which the stomach was free from disease, I should unhesitatingly give it a trial.

Should the disease be so extensive that neither pylor-ectomy nor gastro-enterostomy can be performed, the surgeon has yet another course open to him, viz., to perform jejunostomy.

DUODENOSTOMY AND JEJUNOSTOMY.

As I have said, I have practised this operation on three occasions, two of which were successful. In my last two cases I performed the operation by a somewhat novel method, a method which I invariably adopt now in performing gastrostomy. All surgeons who have performed the latter operation in the ordinary way are aware of the great difficulty there often is in feeding patients afterwards, and the excessive discomfort caused by the constant escape of the gastric fluid; whereas in jejunostomy, performed in the manner I now adopt, there is no such difficulty in feeding, and the gastric fluid, bile, and pancreatic secretions pass into the intestines *per vias naturales*, and the leakage is practically absent.

The operation I propose is performed in this way: An opening being made in the middle line between the ensiform cartilage and umbilicus, a portion of the jejunum can readily be hooked up by the index-finger. It is easily found by passing the finger over the transverse colon to the left, and dipping it down just over the left kidney, when the jejunum will be felt at its origin from the duodenum, and followed up until a sufficient loop is

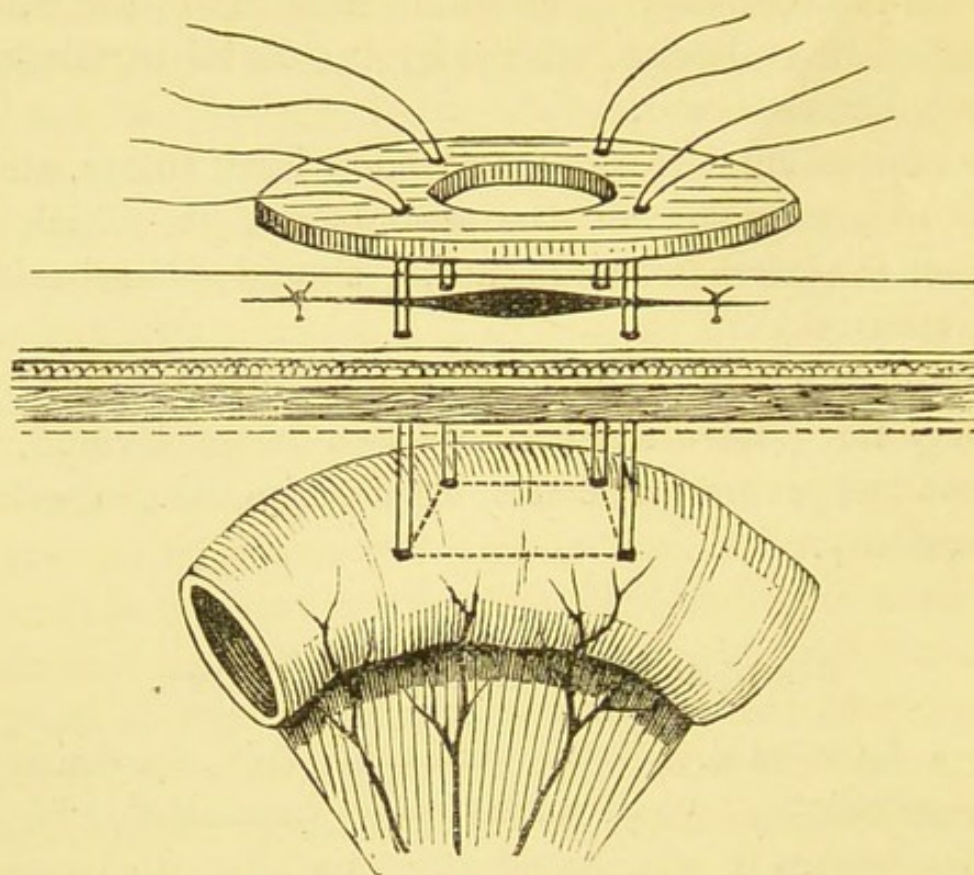


FIG. 18.—Showing the method of performing gastrostomy and jejunostomy with bone-plate on abdomen.

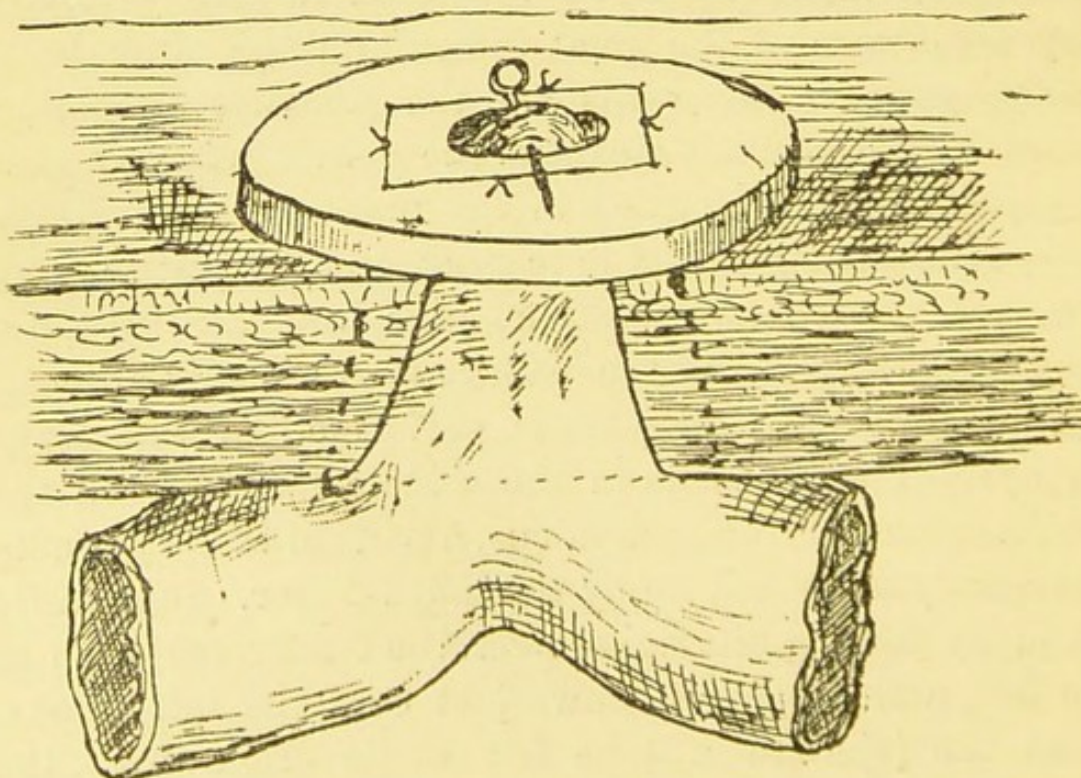


FIG. 19.—Showing same operation completed.

obtained to be easily drawn through the abdominal wound. I then pass a long straight needle armed with silkworm or chromic gut beneath the serous and muscular coats of the intestines in a longitudinal direction for from 1 to 2 inches, first on one side of the convex surface, then on the other; these two sutures run parallel to each other, and are about an inch apart. I next pass two more sutures armed with needles across from the points where the longitudinal threads escape. I thus have a parallelogram enclosed between my four sutures; each of these is now passed through the abdominal parietes about half an inch on each side of its cut edge, and then through a decalcified bone-plate with an opening in the centre, as shown in Figs. 18 and 19. The threads are next held in clamp forceps while the parietal wound is closed in the ordinary way. The threads are then tied firmly over the bone-plates, first the lateral threads and then the end threads, as shown in this drawing (Fig. 19); and finally, a portion of the intestine is drawn up through the opening in the bone-plate and trans-fixed with a hare-lip pin which rests on the bone-plate (Fig. 19). The abdominal wound is closed by a couple of silkworm gut sutures at each end. The wound is dressed in the ordinary way, and on the fifth day, or earlier if necessary, a small opening is made with a tenotomy knife, and a winged gum-elastic catheter introduced, and the patient fed by means of this.

The advantages of this operation are, a very large surface of peritoneum is brought into contact between the intestines and parietes. The tension is extended over a considerable surface. There is no possibility of missing the intestine when opening it, and the operation can be performed in far less time than by stitching the serous membrane of the intestine or stomach to the parietal peritoneum, as practised by the usual method.

Two Cases of Jejunostomy by the Method described with Bone-plate on Abdominal Parietes. Under the care of the Author.

CASE VII. — E. C——, ætat. forty-five, labourer, admitted into Cancer Hospital, June 10th, 1890, suffering from carcinoma of the cardiac end of œsophagus, extending over anterior walls of stomach. No family history of cancer. Had suffered from pain in epigastrium for two years, which had gradually increased; and during the last six months had been in the greatest agony after taking food, which has been followed by vomiting during the last three or four months.

As gastro-enterostomy was contra-indicated, owing to the position of the disease, I advised that the jejunum should be opened, and fixed to the abdominal parietes, and that he should be fed through the fistulous opening thus formed.

On June 13th, the patient being placed under the influence of an anæsthetic, I proceeded to make an incision in the middle line between the ensiform cartilage and umbilicus. A loop of jejunum was hooked up and brought out of the wound. Four chromicized catgut sutures were introduced through the serous and muscular coats of the intestine in the form of a parallelogram, as described in the text, and then passed through the abdominal parietes and a decalcified bone-plate, and fixed by tying the ligatures over the plate. A small piece of the intestine being drawn through the opening in the centre of plate, and transfixed by a hare-lip pin (Fig. 19), a couple of sutures were passed through the abdominal walls on each side of the parietal incision and tied. The wound was dressed in the ordinary way, and the patient returned to bed.

On the following day I cut through the coat of the

intestine over the pin which transfixed it, caught up the two edges of mucous membrane and sutured them to the threads on the plate, then passed an ordinary winged catheter into the intestine through the wound, and administered 2 oz. of beef-tea and 1 oz. of brandy.

This patient made an uninterrupted recovery, and in the course of a few weeks was able to feed himself by means of a funnel which was fitted to the tube in the jejunum.

He died nine months after from extension of the disease. The specimen which I was fortunate enough to obtain shows what a capital result followed the operation performed by this method.

CASE VIII.—J. C——, ætat. fifty-nine, admitted into Cancer Hospital, August 2nd, with carcinoma of the lower end of the œsophagus, extending along the anterior wall of the stomach. The man had been suffering great pain and difficulty in swallowing for eight months. Jejunostomy was recommended; and on August 5th the operation was performed in precisely the same manner as in Case VII. The feeding was readily managed by means of the winged rubber catheter. The patient, however, gradually became weaker, and died September 19th, seven weeks after the operation. The wound had perfectly healed, and the specimen which I have leaves nothing to be desired.

GASTRIC ULCER.

Gastric ulcer can scarcely be classed as a surgical disease of the stomach until such time as it becomes a perforating ulcer. These ulcers are usually present on the lesser curvature, and adhesions are frequently formed with the pancreas and left lobe of the liver. The ulcers that are most liable to perforate the walls of the stomach

are situated on the anterior surface, but on account of their comparative infrequency, perforation occurs oftener in other situations. In 220 cases, Brinton states the posterior wall is affected in about 40 per cent. Rokitansky states that the ulcer is almost always situated near the lesser curvature.

Surgically this is of very great importance, as intra-peritoneal abscesses may, and occasionally are, the result of perforation of a gastric ulcer into the lesser peritoneal cavity; or when adhesions have taken place between the ulcer and the adjacent surfaces of the pancreas or the liver, abscess may result, the pus usually collecting beneath the diaphragm forming the *abscessus sub-phrenicus* of Leyden and others. This may burst into the pleural cavity, or the lung, or even the pericardium, many examples being recorded of such lesion. Mr. John W. Taylor has recorded two such cases,* and has collected brief notes of twenty-one others, all of which terminated fatally, and also ten in which the patients are reported to have recovered from perforation due to gastric ulcer. Two of these cases came under his own notice. In one of them he performed laparotomy, letting out a large quantity of purulent fluid, and washing out the abdominal cavity and draining. The patient recovered from the operation, and some weeks afterwards, during some violent paroxysm of coughing, a considerable quantity of extremely foetid pus was expectorated. Mr. Taylor opened the chest five weeks after the first operation, and evacuated a large quantity of fetid pus, and drained the thorax. The patient improved considerably. She died shortly after from acute obstruction, which only had an indirect connection with her original illness.

In the study of the treatment by surgical methods of

* *Birmingham Medical Record*, April, 1888.

perforation from gastric ulcer, Mr. Taylor says: 'It will be doubtless the work of some years to make and collect sufficient material to warrant absolute conclusions regarding practice.' In any case, however, the aid of the surgeon will not be called for unless perforation and subsequent peritonitis has occurred, and in such a case I consider the surgeon should not hesitate to open the abdomen and wash it thoroughly out, and if possible find the point of perforation; and if he is fortunate enough to find it, it should be at once excised, and the cut surfaces brought together and united by a row of chromicized cat-gut sutures, passing through the serous muscular and submucosa coats of the stomach. The form of suture best adapted for this is first a continuous suture of fine No. 0 chromic gut, and a second row of quilt sutures to approximate the serous coats. Should the perforation be small it will be often sufficient to draw together the peritoneal surfaces, and secure them by means of a single row of Lembert or quilt sutures.

With these remarks I would refer you to Mr. Taylor's paper, and will simply add the conclusions he has arrived at as to treatment in his own words:

'First: As soon as the peritonitis of perforation is declared, the abdomen should be opened and the peritoneum thoroughly washed out and made clean. The "washing-out" is in my opinion the essential part of the operation, and the method of doing this is of importance.

'By syphon or douche a continuous stream of warm water is obtained. The rubber-tubing of the syphon or douche terminates in a tube of glass or metal, closed at its extremity, but possessing two large lateral perforations, the edges of which are perfectly smooth. By its means a double current of warm water is carried to every part of the abdomen and pelvis in succession. The intestines are gently shaken in the water-stream,

and the washing is continued until the returning fluid is perfectly clear. An ordinary ewer full of warm water contains the amount usually necessary for the "washing-out;" sometimes more may be required.

' Beyond this, in the first instance, it will not be wise to go except in very unusual cases, and this for two reasons. (1) The collapse is usually so marked and profound that a prolonged operation is directly contraindicated; and (2) the perforation, as we have seen, being usually about the posterior wall or lesser curvature, could often be directly dealt with only after opening the stomach. There is no external sign, not even the aspect of the perforation, which is any guide to the exact situation or extent of the ulcer as regards the mucous membrane, and a possible incision through the floor of a deeply-excavated ulcer would be a bad commencement for the operative repair of a perforation. In the specimen shown by Dr. Wilson and myself any manipulation outside the stomach must have inevitably disturbed the beneficent relations of the liver, and perhaps of the pancreas, while any attempt at treatment from within the stomach would have been worse or no less distinctly harmful, considering the loss of tissue and the structures which formed the floor of the ulceration. But in a limited number of cases the perforation may be in a part of the anterior wall untouched by the left lobe of the liver and unprotected by adhesions. In these cases particles of semi-digested food or fluid, evidently from the stomach, will be more likely to be met with on opening the peritoneum, and the treatment should be different. I think there can be no doubt that in such cases (which, however, will be rare) the perforation should be found, if possible, and accurately closed by Lembert sutures when the section is made for the peritonitis.

' Secondly: The alimentation subsequent to the lapa-

rotomy for peritonitis should be rigidly rectal or extra gastric for a prolonged period, probably for three weeks if possible. A careful consideration of the daily record and temperature chart of the case specially before us—viewed in connection with the fact that at no time was there any absolute evidence that directly extravasated matter formed the nucleus of the abscess—points, I am afraid, to the conclusion that the abscess was the result of irritation occurring subsequent to the laparotomy, and that the allowance of food so early as the third or fourth day was mistaken and prejudicial. If so, we may hope that by more careful attention to this particular we may prevent the formation of this special form of abscess.

‘Thirdly : If after successful laparotomy for peritonitis due to perforation symptoms should arise similar to those which were found in the cases I have described, viz., abdominal pain on the left side, a hectic temperature, cough and rapid breathing, with delayed manifestation of any adequate cause for this condition, the existence of a sub-diaphragmatic abscess may be probably suspected. The case should be diligently watched for the first physical signs of its locality, and as early as possible the abscess should be opened ; the history of my case tending to show that this may sometimes be done with a high probability of complete success.

‘One subsidiary question remains : Where should the incision be made in the primary laparotomy ? I think in the usual situation between the umbilicus and the pubes. Until diagnosis has reached a perfection at present altogether beyond us, it is important in every case of acute peritonitis occurring in a woman, if the abdomen be opened, that the pelvic organs should be capable of satisfactory examination. Furthermore, all fluids tend to collect in the lower part of the abdomen and pelvis,

and I am strongly of opinion, if the case be managed wisely afterwards, that it is much more important to thoroughly clean out the peritoneal cavity and pelvis than to accurately sew up the point of perforation. This opinion does not rest solely on the case here reported, but on a somewhat extensive experience of abdominal work in which not a few analogous cases have occurred tending to confirm the correctness of the advice here given.

‘NOTE.—To prevent misunderstanding it may be wise to draw attention to the fact that so far as is possible the term “perforation” used in this paper has been confined solely to perforation into the general peritoneal cavity or perforation in which the peritoneum was specially involved. Consequently many remarkable and interesting cases in which (through complete adhesions) the peritoneal cavity has quite escaped the consequences of perforation, have not been alluded to. As examples of these we may notice ulcers of the stomach directly communicating with abscess of the liver, with abscess of the pancreas, and with the external surface by gastric fistulæ. The most remarkable case of this kind of perforation, viz., perforation without involving the peritoneal cavity, is Dr. Finny’s case of gastric ulcer which perforated the left ventricle of the heart—the patient died of syncope, the whole intestinal canal being full of blood (*Dub. Jl. of Med. Sc.*, v. 81, p. 268). Three other cases of this curious phenomenon are mentioned in the report of this case.’

FOREIGN BODIES.

Foreign bodies in the stomach are perhaps not so much a cause of absolute obstruction as they may be of very distressing symptoms, yet occasionally partial or even complete obstruction does result from such presence.

The diagnosis of these cases is often attended with considerable difficulty and uncertainty. They may be confounded with carcinoma of the viscus, tumours or cysts of the pancreas, or fæcal accumulation in the transverse colon.* In the case on which Mr. Knowsley-Thornton successfully operated, although he saw the patient three times before operating, he was fully convinced that the tumour was in the transverse colon. Professor Schönborn

* *Lancet*, 1886, vol. i., p. 57.

published a somewhat similar case, in which he had operated and successfully removed a foreign substance composed of hair. Numerous other cases have been reported by Bandamant,* Pollock,† George May, Russell, and others.

In cases of accumulation of hair, etc., although in some instances attaining very large size—as in Mr. Thornton's case, in which he removed a mass of hair from a girl's stomach by laparotomy, weighing 2 lb.—there were no symptoms whatever pointing to stomach mischief; yet in a somewhat similar case, reported by Dr. J. Berg, of Stockholm, a married woman, twenty-six years of age, suffered from anæmia and dyspeptic symptoms, accompanied by glairy vomiting, for three years. A tumour had begun to form two years before the patient came under observation, and had increased very quickly during the last six months. The tumour occupied the epigastric and left hypochondriac region between the middle and left nipple lines; it was as large as the hand, concave at its upper and convex at its lower margin; it was movable, but could not be moved downwards.

An exploratory laparotomy was performed, and the stomach opened by an incision parallel to the greater curvature. The tumour, which was too large to remove in its entirety, was cut and removed in fragments. It weighed 600 grammes, and was composed of hair tightly compressed. This patient, like Mr. Knowsley-Thornton's, made a perfect recovery.

Another form of foreign body which may occasion partial obstruction of the pylorus is stone or concretion in the stomach. These are not often found in the human stomach, although frequently so in ruminants. Concre-

* *Journal de Médecin*, vol. ii., p. 507, 1779.

† *Pathological Transactions*, 1851-52, p. 327.

tions are occasionally met with in the stomach and intestines in the oatmeal-eating districts, and have sometimes been named 'avenoliths.' Dr. Langier has reported a case of an enterolith in the human subject, the nucleus of which was formed by a piece of liquorice-root. True gastroliths are, however, occasionally found in the human stomach; thus, Schönborn was able to collect seven such cases, all of which appeared to have formed round the nucleus of hair. One of these weighed 2 kilogrammes. Quite recently a Dutch physician, Dr. Koozher, has described a case of true gastric concretion weighing 885 grammes, in which there was no nucleus. The patient was a middle-aged man; he occasionally vomited blood, and gradually became more and more emaciated. Its nature was not revealed until post-mortem examination revealed a stone measuring 18 by 8 cm., nearly filling the cavity of the stomach; there were two smaller stones situated at the pyloric extremity.

These, then, are the only forms of foreign body which are likely to cause obstruction to the passage of food from the stomach, and these, you will observe, are rarely met with, and usually in young people.

The diagnosis is often very difficult; thus the case of Mr. Knowsley-Thornton's had been variously diagnosed as fibrous tumour of the parietes, cancer of the omentum, and Mr. Thornton thought it a case of impaction of fæces in the transverse colon.

Numerous other foreign bodies often find their way into the stomach, *e.g.*, false teeth, nails, fruit-stones, knives, forks, spoons, and the like, have been often swallowed, in some cases by accident, in others purposely by insane or idiotic people.

Treatment.—The treatment of these cases practically resolves itself into palliative and operative treatment.

Palliative Treatment should be given a fair trial, if the

nature of the foreign body is known, and there is reasonable hope that it may pass the pylorus and through the alimentary canal, and eventually be evacuated per rectum.

Operative Treatment.—In most cases, however, I think it would be safer to open the abdomen and stomach and remove the substance.

GASTROTOMY.

This operation is performed by making an incision through the middle line of the abdomen between the ensiform cartilage and umbilicus. The length of the incision will naturally vary in different cases, according to the size of the foreign body to be removed. The peritoneum being divided, the surgeon should pass two fingers into the cavity and examine carefully if there are any adhesions; if not, the anterior wall of the stomach should be seized and drawn out of the wound, and an opening made into it in a transverse direction, *i.e.*, parallel to the greater curvature, sufficiently long to enable the surgeon to explore the interior of the viscus, and ascertain the nature and size of the body to be dealt with. All bleeding points should be caught by pressure forceps; in all cases the incision should be sufficiently large to allow of the substance being removed easily, without tearing the walls of the stomach.

In some instances the substances may be easily removed by the finger and thumb; in others, forceps of some convenient shape will be preferable, or it may be found necessary to break up the substances before removal.

The opening into the stomach must be closed most carefully by a double row of interrupted sutures. The

deep row should be made to pass through all the coats of the viscus, and be about a third or quarter of an inch apart; the superficial row also interrupted, and made to pass through the serous and muscular coats of the stomach. I prefer using chromicized catgut for suturing the stomach; in fact, for all abdominal work, excepting the ligaturing of large pedicles.

The parts, being now thoroughly cleansed, are to be dropped back into the cavity of the abdomen, and the parietal wound closed in the usual manner.

PYLORIC OBSTRUCTION DUE TO CONTRACTION OF CICCITRICES, OR FIBROUS THICKENING.

Total or partial obstruction of the pylorus may be caused by the cicatricial contraction of ulcers in its vicinity. This form of disease was very well illustrated in a case that was under my care some three or four years ago. A man aged forty-nine was admitted into the hospital suffering from pain in the epigastrium, and vomiting his food about twenty minutes to half an hour after taking it, until which time he suffered great pain. Nothing could be detected by manipulation, although I fancied I felt some thickening over the pylorus. As no medicinal remedies did any good, and the man was getting rapidly weaker, I, after consultation with my colleagues, suggested exploratory laparotomy. To this the poor fellow readily consented, and I opened his abdomen in the middle line between the ensiform cartilage and umbilicus.

The pylorus seemed perhaps slightly thickened, but not sufficiently so to suggest carcinoma, and I closed the parietal wound without opening the stomach. The man's symptoms improved somewhat after this operation, but in the course of three or four weeks he died.

At the post-mortem an old cicatricial scar was found

close to the pylorus, which contracted that orifice somewhat; but it was difficult to believe that such contraction was the cause of this man's suffering and distressing symptoms. Had I opened the stomach and dilated the pylorus by Loreta's method, it is possible that I might have relieved him of his symptoms.

The swallowing of corrosive substances or strong acids may cause cicatricial contraction of the pyloric outlet of the stomach, and be the cause of partial obstruction.

Stenosis of the pylorus, either partial or complete, may also be caused by fibrous infiltration and contraction of the pyloric ring, and it is this form of disease that has been so successfully operated on by many surgeons in this country and abroad by opening the stomach and dilating the pyloric opening, either by means of the finger or some form of dilator as suggested and practised by Loreta. In many cases, after this operation, there has been a return of the old symptoms of obstruction, and I think that it is better to adopt the operation of gastro-enterostomy, as although it does not get rid of the pyloric stenosis, yet by opening up a fresh channel for the passage of food into the intestines, the pylorus is relieved of further irritation, and even if actual stenosis should follow, it is of but little moment; indeed, by removing the cause of irritation often the fibrous thickening may become reduced and the opening restored.

Rockwitz has given in his collection of twenty-nine gastro-enterostomies, seven cases (to which he added one of Mikulicz's and one of Hahn's, or nine in all) where the operation was resorted to in non-malignant stenosis with but one death—that is to say, with but 11 per cent. mortality. These operations were done under the old method, requiring on an average from two to two and a half hours for their performance, and the insertion of some sixty to eighty sutures; but in the same operation, con-

ducted in a similar manner, for malignant disease, the mortality reached 42 per cent.; whereas, by adopting Senn's proposal of uniting the stomach to the jejunum by means of approximation plates, or some modification of its technique, even in carcinoma, the mortality can be reduced to about 10 per cent. as shown by the cases recorded.

PYLOROPLASTY.

This operation has been practised now several times with good results. Heinecke was the first surgeon to perform it in 1886; it has since been performed by Mikulicz, Bardleden, and others. The functional results are reported as being excellent in the successful cases.

The operation is performed thus: An incision 10 cm. long is made in the linea alba, above the umbilicus. The exploring finger is introduced, and if the pylorus is free from adhesion it is drawn forward as far as possible; an exploratory incision is then made in the stomach, and the finger introduced to examine the condition of the pylorus. This being found to be narrowed and stenosed, the incision is to be enlarged in the direction of the long axis of the stomach, up to the point of stricture, and then through this point into the duodenum. The strong, circular, valve-like cicatrix of the mucous membrane is then observed causing the stenosis. The wound is then closed in such a manner that the longitudinal incision becomes transverse, with this modification, that in the pyloric region the wound is closed in a transverse direction, while a small part of the incision going towards the cardia is united longitudinally, so that the wound has a T-shape, the vertical part corresponding to the seat of the stricture, and the transverse part going from thence in the direction of the long axis of the stomach to

the beginning of the first exploratory incision. Three rows of sutures are made. The abdominal incision is united in the usual manner and the patient returned to bed.

Loreta's Operation.—This operation has been performed many times both in this country and abroad with varying results. From cases collected by Drs. Bull and Barton it would appear that of twenty-five operations that have been collected there were ten deaths, or 40 per cent. of mortality. Loreta, in 1887 and 1888, resorted to this procedure seven times with two deaths. This mortality was very high, and even though brought down in the last twelve published cases to 25 per cent., it presents such a risk, that if another way of accomplishing the same object can be found it should be adopted. Such an operation has, I contend, been established by the introduction of gastro-enterostomy by means of approximation plates. The recontraction that may follow the operation of stretching, though much less than was suspected by analogy of strictures thus treated elsewhere, must not be lost sight of. Loreta encountered the recontraction on three occasions, in two of which a second operation was performed. However, as Dr. Weir has pointed out, it may be said on behalf of the stretching operation that one of the causes of death—to wit, hæmorrhage—and perhaps others, can be avoided not only by more gradually conducting the dilatations, but also by refraining from stretching the pylorus as far as Loreta directs, as it has become apparent that this has been carried to a too great degree, and that a separation of 2 inches attained by this surgeon will suffice instead of 3 inches as Loreta advises.

The operation is directed to be performed as follows: Loreta in the first instance made the incision into the abdominal wall a little to the right of the linea alba and

extended downwards and outwards for 6 inches; the lower angle was $1\frac{1}{4}$ inches from the ninth right costal cartilage.

Loreta now, however, makes the incision in the linea alba. The muscles and peritoneum are divided in the usual way, and the pylorus felt for, which will be found thickened and hard, and probably adherent to some of the surrounding parts. A portion of the stomach is next drawn out of the wound and surrounded with sponges wrung out in hot antiseptic solution, and a fold pinched up and divided with scissors midway between the two curvatures, about $1\frac{1}{4}$ inches from the pylorus. The opening thus made is extended $2\frac{1}{2}$ inches, and T-shaped clamp forceps used to arrest bleeding from the edges. The right index-finger is to be passed into the stomach towards the pylorus and pushed into the pyloric opening, while the left index-finger steadies it. Considerable force and great patience are required to overcome the powerful grip of the narrowed orifice. The right forefinger being forced through the stricture, the operator proceeds to pull the pylorus toward the abdominal wound and then insinuates his left forefinger, and then by great force endeavours to dilate the stricture. Loreta directs that it should be dilated to 3 inches, but, as I have pointed out, probably 2 inches is quite sufficient.

The wound in the stomach is next sewn up, the stomach dropped back into the cavity of the abdomen, and the abdominal incision closed.

Palliative Treatment.—In those cases of pyloric stenosis where operative interference is inadmissible, what is the best course of treatment to adopt?

As I have before mentioned, in all cases of pyloric obstruction the stomach becomes greatly dilated, some of the food being constantly left, and consequent fermentation takes place; this state of things can be con-

siderably improved by washing the stomach out once or twice a day with a solution of salicylate of soda or some other antiseptic fluid. For this purpose I have been in the habit of using a tube about 6 feet long with a funnel at the end (Fig. 2). Littré's irrigator is admirably adapted for this purpose (Fig. 1). The tube is introduced into the stomach, and a quantity (two or three pints) of plain warm water is thus poured into the viscus; the funnel is then inverted and brought down to a basin under the bed, by which action a syphon is formed which quickly empties the stomach of its contents. At first it is as well to introduce the antiseptic solution until the fluid returns fairly clear, and then wash out with plain water. Medicinally a pill of carbolic acid (gtt.j.), or a powder composed of salicylate of bismuth, soda carb. and magnes. carb. (āā gr. v.) may be given often with good effect.

The diet should be strictly limited to small quantities of Brand's essence of beef and a little brandy and water, and the patient's strength maintained by the administration of enemata of beef-tea, brandy, port wine, eggs, and zymized suppositories of meat.

Pressure from Tumours.—Lastly, we have to consider obstruction to the passage of food through the pylorus owing to the pressure of tumours which may exist in its vicinity. The most common situation of these tumours is in the pancreas, aneurism of the descending aorta or coeliac axis and hydatid cysts.

It is not our province here to enter into the symptoms and history of this form of obstruction, but I will merely say a few words as to treatment. In the first instance, the rational course would be to remove the source of pressure. In the case of cyst of the pancreas, or hydatid cyst, this can readily be done, often with perfect success. In the case of malignant or solid tumours, aneurism and the

like, of course this cannot be done, and then it must rest with the surgeon to decide if nothing further can be suggested to relieve the patient. The only operations that promise any marked relief are gastro-enterostomy and jejunostomy.

The surgeon, in dealing with these cases of carcinoma of the stomach, pyloric obstruction, etc., must bear in mind that a very grave responsibility devolves on him in advising what he considers the best course of treatment to pursue—a responsibility that I cannot too strongly emphasize, and which must not in any case be lightly undertaken, nor must a decision be arrived at hastily and without thoroughly placing before the patient and the friends the arguments for and against the plan of treatment he may decide upon recommending.

LECTURE II.

SURGICAL DISEASES AND INJURIES OF THE INTESTINES.

Surgical Diseases of Intestines—Obstruction of Duodenum and Small Intestines — Constriction by Bands and through Apertures — Volvulus—Intussusception—Stricture—Neoplasms—Compression by Tumours—Obstruction by Gall-stones and Foreign Bodies—Enteroliths — Fæcal Accumulation — Paresis of Bowel — Congenital Stenosis—Obstruction by Flexion and Adhesions—Obstruction following Hysterectomy—Diagnosis—Treatment.

IN my last lecture I described the surgical diseases of the stomach and their treatment; to-day I propose to discuss briefly the different forms of surgical diseases of the intestines and the operations suitable for their relief. In describing these it will be well to divide the canal into sections, viz. : the duodenum, jejunum and ileum, large intestine and rectum.

THE DUODENUM.

Obstructions of the duodenum are uncommon, and need not detain us long. They are chiefly due to cicatricial contraction, the result of ulceration, or erosions following the swallowing of acids. The pressure of an aneurism, hydatid cysts of the liver, or tumours, which are usually connected with the pancreas, may cause sufficient obstruction to produce very characteristic symptoms.

I have lately had under my care a man in whom a large carcinomatous growth sprang from the pancreas, causing almost complete obstruction by pressure upon the

duodenum ; he could only take liquid nourishment, and he was deeply jaundiced from compression of the bile duct.

Carcinoma of the duodenum is rarely met with as a primary disease, although it occasionally is found as a secondary growth, extending from one of the neighbouring organs, usually the pancreas. I had only a short time ago such a case under my care in a man aged forty-five, who had a large tumour in his abdomen, occupying a position in the umbilical region. The growth was slightly movable and nodulated. The man was deeply jaundiced, and vomited much of his food shortly after taking it. He could not digest any solids. There was a tympanitic note over the growth, and between it and the liver. The diagnosis was tumour in the lesser peritoneum, probably connected with the head of the pancreas, which was pressing upon the duodenum and bile-duct. In due course the man died, and the post-mortem revealed that the diagnosis was correct; but the growth had extended into the duodenum, which was infiltrated with the disease, including the orifice of the bile-duct. The gall-bladder was enormously distended. The mesenteric glands were extensively affected. No secondary deposits in liver or kidney.

Treatment.—As it is absolutely impossible, in the majority of cases, to remove the cause of obstruction when it is due to carcinoma occurring in this portion of the intestinal tract, the rational course of treatment is to divert the channel ; this can only be done by performing either jejunostomy, or gastro-enterostomy in the same manner as if the obstruction were situated at the pylorus. These operations will, however, be of no avail, if the pressure upon the duodenum is so great as to occlude the biliary and pancreatic ducts.

In the cases in which the pressure is caused by cysts of the pancreas or hydatids these may be emptied, and relief given in many cases.

THE JEJUNUM AND ILEUM.

The causes of obstruction in the small intestines are very numerous, and depend upon a variety of circumstances. For the purpose of this lecture it will be convenient to follow the plan adopted by Mr. Treves, and classify the different forms of obstruction according to a method based upon pathological anatomy as follows :

1. Constriction by bands or through apertures.
2. Volvulus.
3. Intussusception.
4. Stricture.
5. Obstruction by neoplasms.
6. Compression by tumour.
7. Obstruction by gall-stones and foreign bodies.
8. Obstruction by enteroliths.
9. Obstruction by fæcal accumulation.

To these may be added—

10. Paresis of intestine.
11. Congenital obstruction.
12. Obstruction due to flexion.
13. Obstruction following laparotomy.

CONSTRICTION BY BANDS OR THROUGH APERTURES.

Constriction of the intestines by bands, the result of old peritonitis, is without doubt one of the most common causes of obstruction. These bands are, in some instances, broad, and pass from coil to coil of the intestine ; or they may be long and narrow, being connected to the intestine at the one end, and the parietes or some of the abdominal viscera, *i.e.*, liver or uterus, at the other, forming the so-called peritoneal false ligaments. Then, again, bands are found extending from the uterus, ovary or broad ligament, which become attached to

the parietal peritoneum of the pelvis. Another form of constriction that is sometimes found is due to localized peritonitis, arising from an inflammatory condition of some one or more of the mesenteric glands, especially when these are the foci of tubercular deposit; bands of lymph are formed, and pass from gland to gland at different parts of the mesentery; or they may even form a

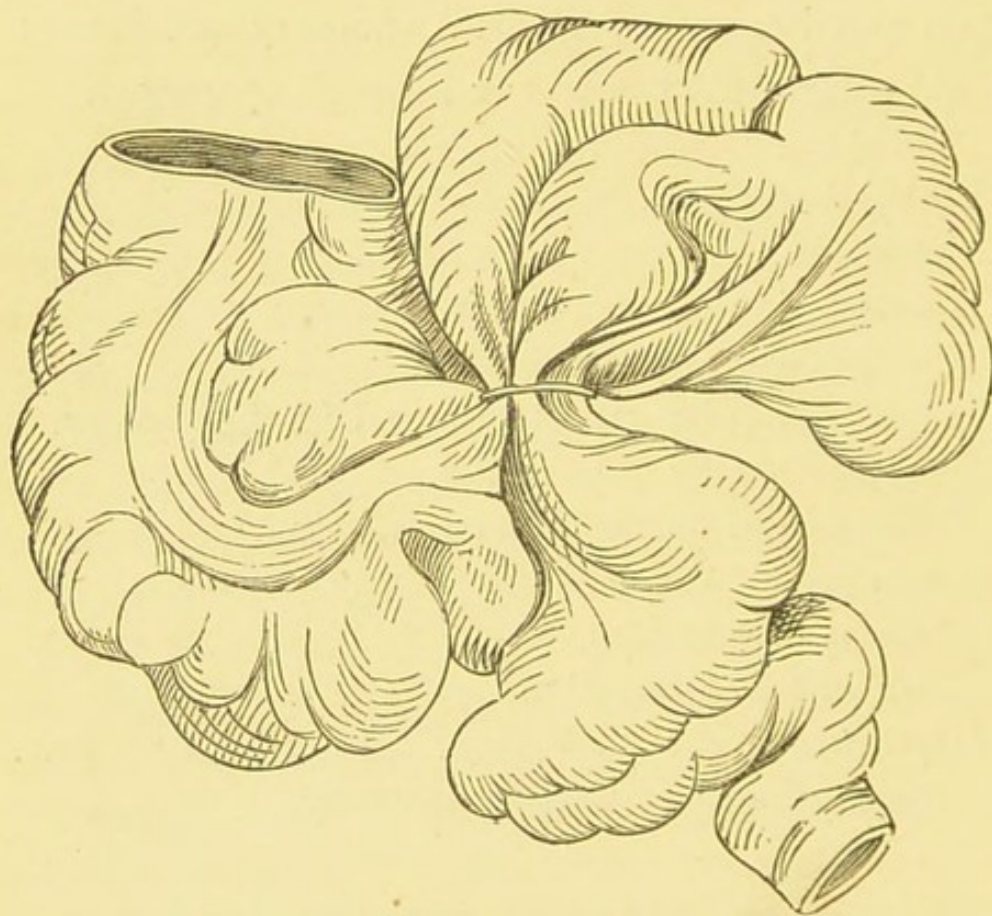


FIG. 20.—Showing intestine constricted by cord-like band (Anatomie pathologique du corps humain, par T. Cruveilhier, tome premier, livraison 7, pl. 5).

loop, passing from the gland on one side over the intestine, and become attached to the opposite side of the same gland.

These bands, when long and cord-like, may assume a very complicated and twisted appearance, owing to the constant movements of the intestines.

Methods of Strangulation.—From the above remarks it

will be seen how easily a constriction of the intestines may take place. Supposing a broad band to extend across the iliac fossa, or from two points in the mesentery, it can readily be understood how easily a coil of intestine may slip under it, and become constricted and strangulated. Again, in the case of these long cord-like bands, strangulation may be caused by a portion of the intestine being caught in a noose and constricted (Fig. 20). It is not necessary to consider all the different ways in which the intestines may be constricted or strangulated by these bands.

One of the most common causes of snaring of the intestine is by means of Mickel's diverticulum. This may take place in precisely the same manner as I have just described, or a coil may be caught and constricted by a noose formed by looping of the diverticulum, it making perhaps one or two twists round a knuckle of the intestine.

Another method of strangulation is through slits or openings, which may exist in the omentum, mesentery, or broad ligament; many such have been reported, and specimens exist in nearly every museum.

The portion of intestine which is most frequently involved is the lower part of the ileum, the middle and upper part of which is involved in a fair percentage of cases; but the jejunum is very rarely the seat of constriction.

Males appear more prone to this form of constriction than females, in the proportion, according to Mr. Treves, of 180 males to 118 females. The age at which it is met with is generally between twenty and forty years.

Strangulations through apertures in the parietes, or hernia, form such special studies in themselves that the discussion of them will not be introduced into these lectures.

VOLVULUS.

Twists of a loop of intestine, either on its vertebral or mesenteric axis, or with another coil of intestine, are far from being uncommon. The cause of this condition of things can usually be traced to an unusually long mesentery; it is more commonly met with in young persons than in those above the age of twenty years, and is usually situated in the ileum or sigmoid flexure. Occa-

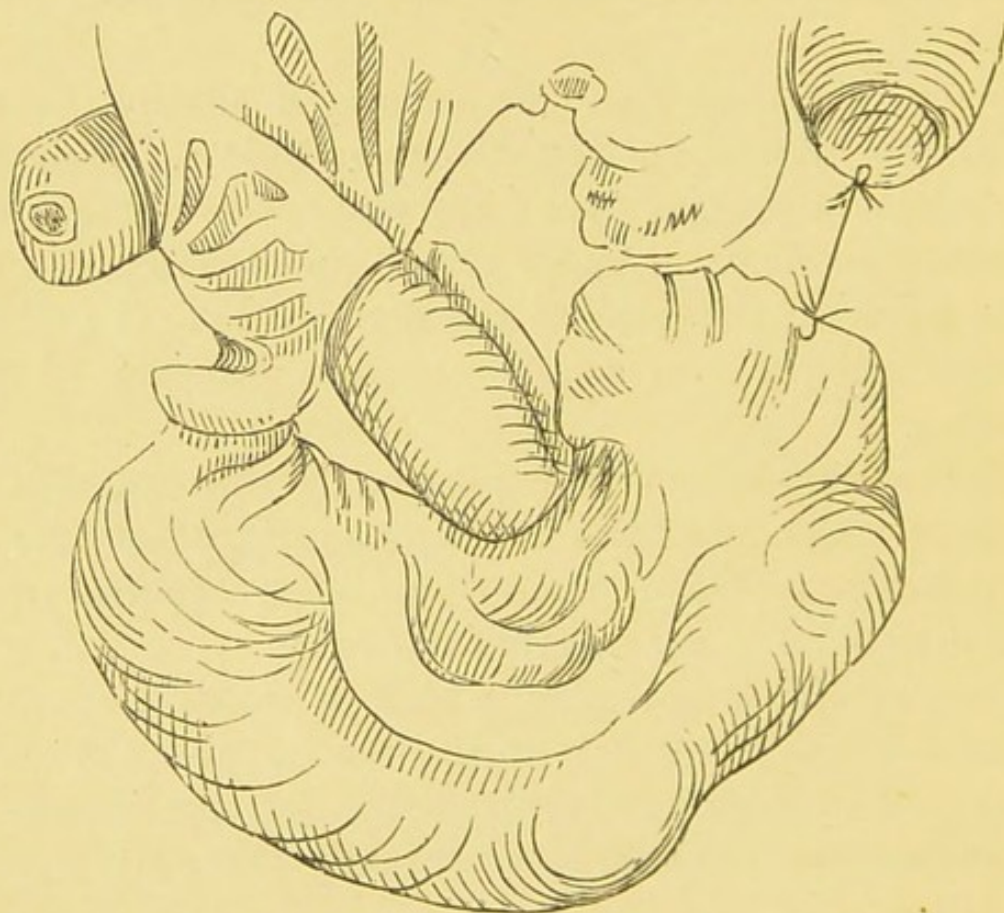


FIG. 21.—Volvulus of Ascending Colon (St. George's Hosp. Museum).

sionally it is met with in the colon, as shown in a very interesting specimen in St. George's Hospital Museum (Fig. 21).

INTUSSUSCEPTION.

The invagination of one portion of the intestine into

another immediately contiguous to it, or intussusception, is a very common form of intestinal obstruction in young people; Leichtenstern has collected 1,152 cases of intestinal obstruction, out of which he found that no less than 442 cases were due to intussusception.

Any part of the intestine is liable to this form of obstruction; but it is rarely met with in the upper part of the jejunum, and when present involves not more than a few inches of the gut. The most common seat of intussusception is, however, at the ileo-cæcal region; here the ileum may pass into the colon for a very considerable distance, or it may be arrested at the ileo-cæcal valve, and then increasing, the cæcum and colon become invaginated into themselves, carrying much of the ileum with them. In this manner the intussuscepted portion of the bowel may reach as far as the rectum.

The cause of intussusception has been explained in several ways, but it is, I believe, sufficiently proved now that the immediate cause is the irregular contraction of the muscular coats of the intestines. There is not sufficient evidence to show in what this irregularity consists.

STRICTURE OF THE INTESTINE.

Stricture or contraction of the lumen of the intestine is caused in nearly every instance by the cicatricial contraction of some ulcer, or from the presence of some neoplasm or malignant growth.

Cicatricial contraction dependent upon the healing of some ulcerated surface, or possibly gangrene of the mucous membrane, may vary much in extent, according to the size of the ulcerated surface.

The form of stricture which gives rise to the most severe symptoms is the annular stricture, while that form of cicatricial contraction which is continued along the

longitudinal axis of the intestine will cause but slight inconvenience. The middle and lower end of the ileum are the most common seats of this form of obstruction.

The small intestine is not, however, nearly so frequently attacked by stricture due to cicatricial contraction as the large. Thus Treves says that the proportion in which the large and small gut is involved is about six to one.

Stricture may also follow injuries and hernia, and also disease of the mesenteric glands.

CARCINOMA.

Stricture due to Carcinoma of the Intestine.—Formerly it was generally admitted that all forms of cancer were to be found in the intestines, viz.: scirrhous, medullary, colloid, and epithelial; it is now, however, recognised that the almost universal form of carcinoma found in this situation is the cylindrical-celled epithelioma—cylindroma. There is, however, another form of malignant disease, which is found in the intestines. This class commences as rounded nodules under the mucous membrane; usually multiple, they increase in size, and if there are more than one in close proximity they coalesce, and the mucous membrane over them ulcerates, and a deep excavated ulcer is the result. It sometimes remains as a large flattened tumour, which may extend nearly round the lumen of the intestine. The mesenteric glands are enlarged and often infiltrated with the disease, and nodules are frequently found in different parts of the peritoneum. These growths have been variously described, according to Treves, as colloid cancer, villous cancer, and medullary cancer.

Treves believes these growths to be examples of secondary deposits. He says some of them present all the aspects displayed by specimens of lympho-sarcoma.

Cylindroma may be met with as small nodules, flattened plaques, or as deposits which extend around the whole of the lumen of the gut.

The disease is rarely met with as a primary growth in the small intestines; when, however, it does exist, I believe it invariably commences in the cylindrical epithelium of the crypts of Lieberkühn, and extends downwards, much in the same manner as it does in the stomach.

The disease has a great tendency to spread around the circumference of the gut, forming an annular constriction, and stenosis of the intestine is the result; which may be due to two distinct causes, the one from projection of the disease into the intestinal tube itself, and the other from cicatricial contraction.

When the obstruction is caused by the projection of cancerous disease into the gut, the calibre of the tube may be restored by the breaking down and sloughing of the mass. If the disease extends, adhesive inflammation may take place between the diseased part and an adjacent coil of intestine, ulceration ensuing between the two portions, and an opening established, whereby the passage may be established between the portion of intestine above and another portion below the disease, through which fæces will pass.

Sarcoma is occasionally found in the intestines; thus in the Museum of the College of Surgeons there is a good example of lympho-sarcoma, presented by Dr. Goodhart, in which a considerable portion of the ileum is shown, with great enlargement of Peyer's patches from infiltration by lympho-sarcoma. These are exceedingly prominent, standing out quite free from the mucous membrane, with overhanging edges, and are fleshy in consistence; the rest of the mucous membrane and solitary glands are apparently healthy.

Dr. Bessel-Hagen also reports a case of a boy aged seven years who died of a tumour caused by an injury received in the abdomen. The post-mortem examination revealed a sarcomatous growth in the jejunum of the size of a fist. The growth microscopically proved to be a small round-celled sarcoma, and the disease sprang from the submucous-tissue.

The small intestines are much less frequently the seat of the disease than the large; and, indeed, the lower down the alimentary tract one proceeds, the more frequently is cancer present. Thus, out of forty-three cases of stricture of the intestine due to carcinoma, as shown by the post-mortem examination,

The small intestines were affected in	-	1
Cæcum and ascending colon	-	2
Hepatic flexure	-	3
Transverse colon	-	2
Splenic flexure	-	1
Descending colon	-	4
Sigmoid flexure	-	10
Rectum	-	20
		—
		43

TUMOURS.

Tumours may give rise to intestinal obstruction in a variety of ways, according to location, their anatomical relation and pathological character. A tumour outside the intestine may cause obstruction by direct pressure. A growth springing from the mucous or sub-mucous tissues prevents the passage of fæces, either by blocking the lumen of the gut or by causing invagination or flexion.

A cancerous growth produces obstruction, as we have seen, by causing a contraction of the gut, or by the accumulation of fæces or foreign bodies above the seat of

disease. If obstruction is caused by the pressure of a tumour, the cause should be removed if practicable.

ENTERO-LITHIASIS.

Biliary Calculi.—That form of obstruction caused by the impaction of gall-stones or enteroliths is far more frequently met with than was formerly thought to be the case.

Wising collected fifty-one cases of intestinal obstruction caused by the presence of biliary calculi, with the result that in only twenty-four of these could the anatomical condition of the gall-bladder be ascertained. In eighteen the post-mortem appearance showed that the calculus had entered the intestine from the gall-bladder by a process of ulceration, and in three only it appeared as though the calculus had passed through the common bile duct. In thirty-three cases the place of obstruction was twelve times in the jejunum and twenty-one in the ileum. In the twenty-one cases where the calculus was impacted in the ileum, the seat of obstruction in two was in the middle, in six in the upper half, and in twelve in the lower half, of that portion of intestine. Icterus was observed only in eight out of the fifty-one cases. The prognosis is always grave, as of the fifty-one cases referred to thirty-eight died; in fourteen cases out of twenty-five, death occurred between the sixth and eighth day; while in isolated cases death did not follow until from the ninth to the twenty-eighth day; and one patient died after two months, from ulcerative peritonitis. Taking all such cases, in at least 50 per cent. the calculi are found to be impacted in the lower portion of the ileum.

Tait and Treves are of opinion that gall-stones, causing intestinal obstruction, ulcerate directly into the bowel. If the stone become impacted high up in the jejunum, there may be a complete absence of tympanitis.

Intestinal Concretion.—Cloquet divides concretions found in the alimentary canal into two classes. The first includes enteroliths in man, and bezoars in animals, both being the result of calcareous deposits secreted by the lining membrane of the intestines. The second class comprises abnormal masses, such as foreign bodies, kernels of fruit, fruit-stones, biliary calculi, hardened fæces. He describes an enterolith which had a pin for its nucleus, deposits of phosphate of lime forming around it, and it had become arrested in the cæcum, when it caused the death of the patient. In another instance he found a pessary, which had perforated the bowel on one side, and the bladder on the other; and while the portion in the bowel was encrusted with phosphate of lime, that in the bladder was coated with uric acid.

Aberle reported a case in which there were thirty-two enteroliths, each of which was composed of concretions in concentric layers around a cherry-stone. The concretions had collected in the colon, and were successfully removed by rectal injection and cathartics.

Numerous other examples have been published by different authorities.

Dr. Heydenreich, of Nancy,* reports a case of intestinal obstruction in which Nélaton's operation was performed in the left groin with successful results, and the artificial anus was afterwards completely and permanently closed by a novel autoplasmic operation. It is held that the obstruction in this case was directly due to the blocking of the intestine by a large accumulation of round worms. The case, however, up to the time of the operation, was diagnosed and treated as one of intussusception; and neither in this supposed instance of occlusion by round worms, nor in three other cases, which are all that he could find in surgical literature, was the relation between the

* *Sem. Med.*, August 19th, 1891.

obstruction and the presence of round worms in the intestinal canal sufficiently close to permit one to reject positively the strong doubts that were expressed by Davaine on this point. The subject of the case reported in this paper was a child, aged eleven years, who came under the notice of the author on the ninth day of a severe attack of obstruction. The case having been diagnosed as one of intussusception, the idea of performing laparotomy was not entertained, as it was thought that the adhesions between the layers of intestine would be too firm to permit of the invaginated portion being drawn out. The small intestine was opened in the left groin on December 27th, and, two days later, a bulky mass, made up of seven round worms, presented itself at the artificial anus, and was extracted. The young patient quickly recovered from the attack of obstruction, and, as has already been stated, the artificial anus was subsequently closed. In this, and also in one of the three recorded cases, blood was passed from the anus during the period of obstruction.

Samer, Stepp and others have described concretion caused by a mass of ascarides, which in some cases yielded to the administration of anthelmintics.

Fæcal Accumulations.—This form of obstruction is almost universally met with in the colon, the favourite situation being the cæcum or the sigmoid flexure. I have had a number of such cases under my care.

In one, that of a lady, who sent for me late one night to see her, I found her prostrate, and apparently dying. She had constant vomiting, but had also slight diarrhœa. I examined her abdomen, and found a large tumour occupying the whole of the right hypochondriac and iliac region, extending forwards to the umbilicus, and much of the shape of the liver. I found she had been under the care of a distinguished London physician. He was

sent for, and in consultation with me expressed his opinion that the patient was suffering from cancer of the liver, and there was nothing to be done. She lived for another two days, when I suggested that another physician should see her. In consultation he corroborated the former physician's diagnosis, and I quite agreed, but suggested large enemata of sweet oil and hot water, as no harm could come of it, and, if the tumour were impacted fæces, it might be removed. This was done, with the happy result that the whole tumour came away, and the patient made a perfect recovery. Another case came to the out-patient department of the Cancer Hospital.

W. B——, æt. fifty, plasterer, admitted November 23rd, 1887. Noticed a lump in the left side some months. No injury. A hard tumour is to be felt in the left lumbar region, apparently fixed to the inner surface of the pelvis, extending up below the false ribs, and half-way to umbilicus in front. Dull on percussion over seat of tumour. Patient complains of having a dragging pain occasionally, and cannot stoop without pain. Per rectum nil. He had been an in-patient at one of the Metropolitan General Hospitals, and was discharged incurable, with malignant disease of pelvis (diagnosis confirmed by letter). The patient was treated with large enemata, and cascara with strychnine by mouth. December 21st: Marked diminution in size of tumour; patient complains of no pain now, and passes good motions. Can now sleep well, without pain. By the end of a month the tumour had completely disappeared, and three years later reported himself quite well.

I have had many similar cases, although, perhaps, few quite so pronounced as these two.

The following interesting case has been reported by Dr. Samuel Abbot :* The patient was a nervous, under-

* *Boston Medical and Surgical Journal*, January 29th.

sized single woman, aged 30. She had been constipated from infancy, owing to a congenital diaphragm which stretched across the lower part of the rectum. She took, when arrived at maturity, all sorts of laxatives. At length, characteristic diarrhœa set in, and for the first time she missed a monthly period. A large pyriform tumour filled the abdomen; it extended from the pubes nearly to the ensiform cartilage, and from one ileum to the other. The surface was somewhat irregular, as hard as wood, yet of somewhat unequal density on firm pressure, with slight depressions in different regions, suggesting spaces between folds of intestine. There was tenderness on pressure in the left iliac fossa. The tumour was very prominent between the epigastrium and umbilicus, so that the patient had for some time been unable to wear stays. The congenital diaphragm could be detected on digital exploration; the tip of the finger was passed through its opening and touched a mass of firm fæces. The malformation did not allow of the use of the scoop. Saline purgatives were given freely, producing watery motions, which succeeded in breaking down the mass by degrees. Within a few days frequent evacuations caused tenesmus, relieved by opiates. On the thirteenth day the discharges were very free and less watery than before. The abdomen was tympanitic, and no masses could be detected except in the left iliac fossa, which was now hardly tender. On the twenty-fifth day a formed motion passed. The catamenia reappeared, the appetite returned, and the patient once more became healthy, after ailing for years.

PARESIS OF INTESTINE.

There is another form of obstruction which is of a totally different character to any I have yet alluded to.

In fact, there is no obstruction in the proper sense of the term; there is no narrowing of the lumen of the gut or pressure of tumours; but there is complete suspension of all peristaltic action to propel the contents of the intestine onwards, the consequence being that there is a collection of fæces and gases in the paralyzed bowel, which is followed by great distension and distress. This state of things is often present in peritonitis after operation, or enteritis, or the paralysis may be the result of some reflex cause. Mr. Pitt has recorded two cases.

A gentleman was under my care a short time since suffering from this form of obstruction. He was a great gourmand, and had a most voracious appetite, bolting his food. Periodically he consulted me, suffering from complete inability to pass any motion; the rectum was empty, the abdomen enormously distended, and he suffered great agony. The cause in this case appeared to be purely reflex, and it was with the greatest difficulty that he was relieved.

These cases are most difficult to diagnose; there is always great distension and tympanitis, with complete constipation. Rarely any vomiting at first, but this succeeds as the case proceeds; it rarely becomes fæcal. The only treatment appears to be passing the long tube as high as possible into the rectum, and giving large warm-water enemata, allowing it to empty back through the tube; by this means after a while the flatus is withdrawn by the tube and relief follows. Galvanism and massage should also be used, and strict attention as to diet and mastication insisted upon.

CONGENITAL OBSTRUCTION.

Besides the causes of obstruction already mentioned, stenosis may be congenital. Mr. Legge in the 'Transac-

tions of the Pathological Society,' vol. xxi., p. 171, has reported a most interesting case, in which there was congenital stenosis of the ileo-cæcal opening, which led to dilatation of the ileum, and finally perforation into the ascending colon.

OBSTRUCTION DUE TO FLEXIONS AND ADHESIONS.

These forms of obstruction are far from being uncommon. Senn made many experiments on animals in this direction. Referring to his experiments on flexion of the intestine, he says :

'If the bowel at the point of flexion remains free, certain portions of its wall will yield to pressure from within of the fluid intestinal contents, and gradually the lumen of the bowel will become restored. . . .'

'If, on the other hand, the entire circumference of the bowel at the point of flexion has become fixed and immovable by inflammatory adhesions or other pathological products, a compensating dilatation becomes impossible, and flexion becomes a direct and serious cause of obstruction.'

A case illustrating this came under my notice a few months since. A woman aged thirty-six was admitted into St. George's Infirmary, suffering from acute obstruction. The symptoms all pointed to the obstruction being present in the small intestines. After a consultation with Dr. Webster, under whose care she was, and by whose courtesy I had the opportunity of seeing the case, it was decided to open the abdomen. The cæcum was found to be empty. Large coils of small intestines presented themselves in the wound, congested and greatly distended ; by carefully following them downwards an ovarian cyst was discovered on the left side, to which the intestine was firmly adherent, and flexed upon itself. It was deemed inadvisable to attempt to separate the adhesion, owing to the state

of the intestine ; I therefore short-circuited the canal by uniting the intestine above and below the seat of obstruction by means of decalcified bone-plates. This was quickly and securely done, and the patient returned to bed. She was so exhausted, however, by the previous vomiting that she never rallied. At the post-mortem examination I found a large ulcer existing in the intestines at the point of the adhesion, and the coats of the intestines, excepting the peritoneum, were entirely ulcerated through. Had this patient been operated on earlier I believe her life might have been saved.

In many cases of constriction gangrene of the intestine speedily takes place. By timely surgical interference and division of the constricting band, this calamity may be averted. The following case is a good illustration of this complication. Mr. Pollard asked me to see a man who had been suffering from symptoms of intestinal obstruction for some days. The man was, at the time of my seeing him, suffering from considerable prostration ; he had been vomiting constantly, and at the time of consultation the vomit was decidedly faecal in character. The abdomen was distended, but the patient did not complain of any great pain. Pressure on the right iliac and hypogastric region gave considerable pain. I advised an exploratory abdominal operation at once. This was agreed to. On opening the abdomen in the middle line, the distended intestine pushed itself out of the wound. On exploring the right iliac region, the obstruction was found to be caused by a large coil of intestine being tightly constricted by a strong band of lymph, the relations of which were difficult to define. The whole loop was completely gangrenous, and I decided that the only chance of saving the poor fellow's life was to remove this. I brought the loop well out of the wound, and then proceeded to ligature the mesentery in segments along the

gangrenous part. I next cut this away, holding the portion of intestine at the point of division well clear of the wound, and packing the wound with carbolized towels.

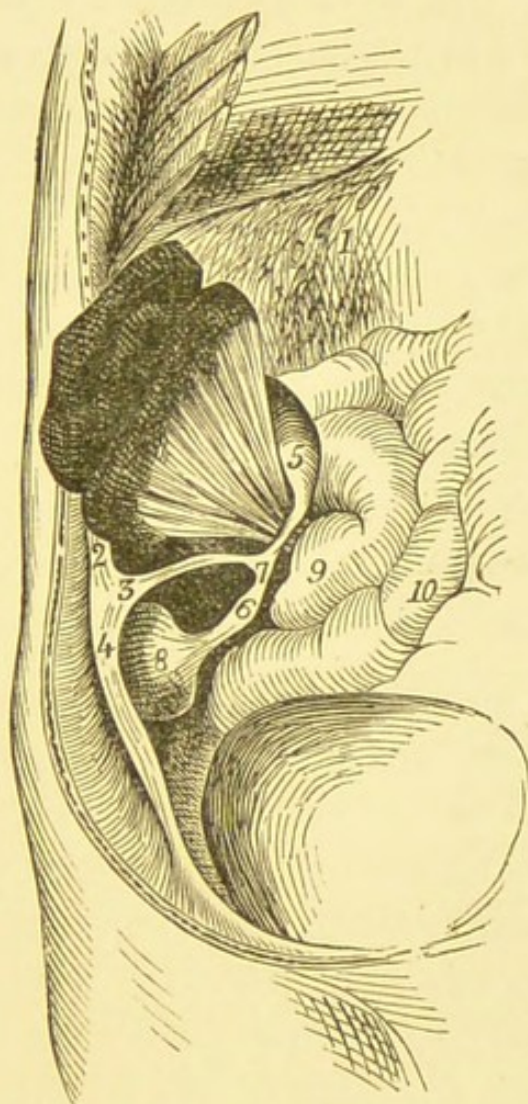


FIG. 22, illustrating Mr. Rabagliati's case.—The coils of intestine which lie over front have been turned to left, and the strangulated loops to left of large band have been turned to right. 1 is transverse colon covered with great omentum, which stretches and is continuous with first band 2. This divides into a short fork 3, and long 4. A coil of about two feet of intestine had its mesentery tightly strangled by band to which 3 passed, running from 5, part of the obstructed bowel to vermiform appendix 6, on tip of which were some hard nodules 7 (glands ?) ; 8 is caecum, 9 portion of bowel just passing through constriction. Finger passed beneath this in direction 10, 9, 7, went through hole through which loop had passed, and was tightly constricted by band 5 to 7.

On dividing the bowel, a large quantity of faeces escaped. I washed this thoroughly out, and then inverting and

closing the divided ends, proceeded to restore the continuity of the intestinal canal by means of approximation discs. The patient bore the operation fairly well, and was returned to bed, having nutritive stimulating enemata administered. He never rallied, however, and gradually sank twelve hours afterwards. The accompanying wood-cut, illustrating a case of Mr. Rabagliati (Fig. 22), so much resembles what I found in the case just recorded, that I cannot do better than adopt his illustration. The details of his case form a part of a most interesting and instructive paper entitled 'Some Representative Cases of Intestinal Obstruction.'*

INTESTINAL OBSTRUCTION FOLLOWING CÆLIOTOMY AND HYSTERECTOMY.

In a certain number of cases in which the abdominal viscera have been operated upon, intestinal obstruction has presented itself as a more or less distant complication, in some instances causing the death of the sufferer, and in others necessitating the reopening of the abdomen in order to ascertain and deal with the cause of the obstruction. I can recall two or three such cases in my own practice in which adhesion of the omentum lay down in the pelvis had occluded the lumen of the intestines, but others are reported which do not admit of this explanation. After laparotomy it not unfrequently happens that the patient, although recovering from the primary operation, has frequent attacks of pain with rise of temperature and abdominal tenderness. The symptoms occasionally have been relieved by free catharsis, but in other cases it has been found necessary to reopen the abdomen and break down the adhesions, thus exposing the patient to risks far greater than those of the original operation, for the

* *Med. Press and Circular*, Dec. 31, 1891, p. 678.

statistics of these secondary operations show a very unfavourable proportion of fatal results.

Dr. Maurice Collas* has collected a series of twenty-three cases of this nature. Of these, eighteen were operations for ovariectomy, and the remaining five followed other operations on the pelvic organs. Fifteen of the cases had their true nature revealed only at the post-mortem examination, whilst operations were performed in the remaining cases, and in four instances were completely successful. The symptoms of intestinal occlusion appeared most frequently within ten days after the operation; but they were delayed in one case as long as six years. In most instances the bowel was occluded by inflammatory adhesions or subsequent cicatricial contractions. In more than one instance volvulus occurred; but it seems doubtful how far this could be ascribed to the results of the previous operation. When the symptoms did come on, they were in all cases rapid in their onset, and it would appear that in such cases there is but little hope to be placed in any other treatment than cœliotomy.

The great point in preventing this untoward complication seems to be the closure of the peritoneal cavity at the time of the operation, and I would draw attention here to the importance of replacing the great omentum carefully over the intestines, so as to prevent them from becoming adherent to the parietal wound. In vaginal hysterectomy Dr. Coe suggests that the peritoneal cavity may be closed by suturing the peritoneum to the edge of the vaginal wound, and when this is impossible the stumps of the broad ligaments should be brought down and attached to the edge of the vaginal wound, thus placing the sloughing tissues outside the peritoneum, and leaving no raw surface in the pelvis to which a loop of intestine might

* *Thèse de Paris*, No. 267, 1891.

become adherent. Should adhesions, however, take place, he advises immediate intervention with as little disturbance as possible to the patient. Several cases are reported in which a fæcal fistula has been found opening into the vagina, after vaginal hysterectomy, or operation on the uterus, or for hæmatocele. As a large proportion of the fatal results after these secondary operations are due to septic complications, special precautions in this respect are necessary.

Similar cases have been from time to time recorded after ovariectomy, especially when there have been many adhesions.

OCCCLUSION CAUSED BY CONSTRICTING BANDS, OR VOLVULUS.

Diagnosis.—In diagnosing these different forms of obstruction, it is most important to differentiate between them, not only as regards the form of obstruction, but the locality, as the surgeon is often called in to cases which will not admit of delay, and he must decide at once as to the probable cause and situation of the obstruction. For instance, what could be more embarrassing than to perform colotomy in the left lumbar or iliac region, and to find the seat of obstruction to be situated higher up in the intestinal canal, and the surgeon has, to his mortification, to open the colon in the right loin, or perhaps the abdominal cavity, in order to find the seat of disease?

Then, again, it is necessary to decide whether the obstruction is caused by simple constriction, by a foreign body, by fæcal accumulation, or by carcinoma. It is also most important to be able approximately to decide if the obstruction is situated high up in the canal near to its origin, or at the lower part of the ileum or colon,

and again, should the obstruction be present in the large intestine, whether it is located in the rectum or sigmoid flexure, or higher up in the colon, and lastly, whether it is due to stenosis or to paresis of the intestines. It is to these points that I wish especially to draw your attention, and for this purpose I will at once pass to the discussion of the different symptoms of intestinal obstruction.

Clinically stenosis of the intestine must be divided into the acute and chronic forms; the latter gradually developing for months, or even years, before complete closure takes place.

Symptoms.—In the acute form of obstruction it may usually be taken as a rule that the higher the obstruction the more violent is the vomiting. There are, however, other symptoms that will enable us to localize with more or less certainty the seat of occlusion, and for this purpose we will divide the intestine into three portions.

1. When the obstruction occurs in the duodenum and jejunum;
2. When it exists in the lower part of the ileum; and
3. When the colon is occluded.

1. The first indication that presents itself when the occlusion is situated in the duodenum or upper portion of the jejunum is sudden and constant severe pain in the epigastrium, followed by the most violent vomiting and retching, which continues almost persistently until the obstruction is relieved or death releases the patient. The vomited matter is never fæculent. There is entire absence of tympanitis, the abdomen being flat and contracted; occasionally the stomach may be inflated, causing a fulness beneath the false ribs on the same side. As a result of the incessant vomiting the patient becomes collapsed very quickly, and death takes place speedily. The patient is troubled with intense thirst during the

course of the disease ; the bowels may act naturally and flatus pass.

There is usually tenderness over the epigastrium and a fulness may be distinguishable if the occlusion is caused by a twist upon the axis of the bowel. Should the obstruction be the result of pressure from a tumour, enlarged glands, or acute peritonitis, these will be readily discovered and the course of treatment indicated.

2. Occlusion when occurring in the lower part of the jejunum or ileum is accompanied by very different symptoms. Here, instead of contraction of the abdomen, meteorism exists in an extreme degree, causing great distress ; vomiting is persistent ; in the early stages the contents of the stomach are vomited ; this is followed by bilious vomiting, which speedily becomes fæculent. There is severe colicky pain, which is usually persistent, but may occur in paroxysms ; this is especially marked when stenosis is incomplete.

Pain is nearly always an early symptom ; it is often paroxysmal at first, but soon becomes constant. There is great tenderness over the abdomen ; in volvulus this is especially the case. In the earlier stages of volvulus vomiting is not so pronounced, but later on it is very severe.

The amount of collapse, although great in all kinds of obstruction, is not so pronounced in occlusion caused by volvulus as when the result of constriction by bands. Then, again, the suddenness of the attack has much to do with the amount of collapse ; in some cases the patient becomes profoundly collapsed at once and never rallies. The pulse is small and rapid, the tongue dry and furred, and commonly frequent disagreeable eructations are present.

The temperature is usually subnormal at first and may remain so until death ; even when peritonitis is present no appreciable rise of temperature takes place. The

respirations are increased in frequency, which is caused by the great distension of the abdomen.

There is complete absence of stool or flatus. In nearly, if not in every case, the disease commences quite suddenly, the patient being in perfect health up to the time of attack, when suddenly he is seized with a violent acute pain in the abdomen, followed by the above-named symptoms.

3. Occlusion of the colon or sigmoid flexure runs a much less acute course. The symptoms are ushered in by pain of a very severe character; the seat of obstruction can often be indicated by the patient; then follow slowly other symptoms. Vomiting may occur only once or twice at the beginning of the attack, or not until later, and it is rarely fæculent at first. I have met with cases where there has been no vomiting. Tympanitis, at first slight, after a few days becomes excessive; there is but little collapse; there is complete absence of motion or passage of flatus, and on examining the rectum it usually is found to be empty. There is diminution in the quantity of urine, which is high-coloured and loaded with lithates.

The portion of the large intestine which is most commonly occluded by bands or volvulus is the sigmoid flexure.

To sum up, then, in occlusion of the upper part of the small intestine the abdomen is flattened, fæculent vomiting is absent, the bowels may act for several days after the occlusion has occurred, vomiting and retching are constant, and pain is very great. In occlusion of the lower part of the small intestine the symptoms are equally distressing, but here there is meteorism and fæcal vomiting, while in occlusion of the large intestine there is distinct meteorism, total absence of the passage of fæces or flatus per rectum; vomiting in many cases very slight, but pain of a paroxysmal character is intense.

RB.

General Treatment.—In all cases of obstruction of the intestines, the general treatment should be directed—

1. To maintaining the strength of the patient ;
2. To arresting the peristaltic action of the bowels ;
3. To preventing vomiting and keeping the stomach as empty as possible.

It is obvious to feed a patient by the mouth who is suffering from obstruction in the intestines is worse than useless. In all cases in which obstruction is even suspected all food by the mouth should be at once stopped, and nutritive enemata of beef-tea, brandy, etc., administered.

The distressing thirst patients suffer so much from, can be much assuaged by enemata of warm water.

Food by the mouth must not be given under any circumstances ; but the surgeon must depend upon keeping the patient's strength up by nutritive stimulating enemata, accompanied where there is much tenesmus by opium. Before giving the enemata the rectum and colon should be washed out with warm water. In certain extreme forms of intussusception, in which it may not be possible to administer these enemata, I have found that zymized suppositories are of service ; the patient being given ice to suck or small quantities of warm water by the mouth.

The administration of opium in small and repeated doses, is, I consider, most important, as this drug has the property of arresting the peristaltic action of the intestines and in consequence possibly aiding spontaneous cure.

For the opposite reason aperients should not be given, as there can be no doubt that in many cases where these have been administered, irreparable harm has been done. The vomiting, which had been moderate, has become profuse and fæculent. Profound collapse has often followed the administration of an aperient.

In cases in which fæculent vomiting is present I have seen decided benefit, ease and comfort given by washing

the stomach out with some antiseptic solution; I usually use weak solution of salicylate of soda, and I certainly believe that if this practice was more constantly resorted to much benefit might be derived, as it diminishes the retching and produces in many cases a great sense of comfort. Peristalsis is also arrested by this means, and the distress arising therefrom alleviated.

Surgical Treatment.—The surgical treatment varies according to the different forms of obstruction. I will deal with them in the order adopted at the beginning of this lecture; but here, in the first place, let me enforce with all the stress conceivable, the importance of *opening the abdomen as early as possible after the surgeon is sure he has to deal with an obstruction due to a constriction*, with a view of discovering the seat and nature of the lesion, and performing such operation as is indicated for the relief of the occlusion. Remember that the success in these cases depends more upon *early interference* than in any other operation in surgery, and the result of timely surgical skill is pretty certain in many cases to be crowned with success.

As no surgeon would, if called in to a case of ordinary strangulated hernia, delay an operation until the patient was worn out by vomiting and pain with the view of releasing the hernia, so there should be no delay in case of obstruction in the bowel, which, although not visible to the eye or touch as hernia is, yet to the educated mind is equally as clear.

It is true that in years gone by the results of operations for intestinal obstruction were attended with disastrous results, and the surgeon rarely attempted to restore the continuity of the gut; but was contented with fixing the distended portion of the intestine above the seat of obstruction to the abdominal wound, and forming an artificial anus. This proceeding was, however, found

to be a most fatal one, and even when successful the patient's life was rendered a burden to himself, and many a man has been known to exclaim: 'Had I been aware this was the only result anticipated from the operation, I would rather have died.'

It is due to Professor Senn that intestinal surgery, from being one of the most fatal departments in surgery, may now be ranked among the most successful; and as time and experience progress, we may look for the most brilliant results, not to be eclipsed even by those of the ovariologist. Senn's method, which I had the honour of first bringing prominently before the profession in this country, proved so successful in the experimental research I made some two years ago with Mr. Victor Horsley that I have extended my investigations at the laboratory of the Royal College of Physicians and Surgeons, and have never ceased to impress the importance of these operations wherever an opportunity presented itself.

The adoption of approximation discs, either in the form of decalcified bone-plates by Abbé's catgut rings, or Brokaw's segmented rubber rings, for uniting two portions of the intestine and thus restoring its lumen, has proved so successful that we may at once put aside all that we have been taught respecting the tedious detail of the Czerny-Lembert suturing of the intestine.

In the future, I venture to think that the operation of enterostomy will not be known, excepting in cases which, from neglect, have been allowed to pass into such a collapsed condition that it would be impossible to do more than draw up a loop of intestine and drain it; the artificial anus will give place to jejunio-ileostomy, ileo-ileostomy, or ileo-colostomy. For these operations to be successful, as I have already insisted upon, no time should be wasted in the administration of drugs, or in

adopting Mr. Jonathan Hutchinson's plan of treatment, which he has described in the 'Record of Intestinal Obstruction with especial reference to Symptoms and Treatment,'* thus: 'The first point in abdominal taxis is the full use of an anæsthetic, so as to obliterate all muscular resistance. Next (the bowels and bladder being supposed to be empty) the surgeon will forcibly and repeatedly knead the abdomen, pressing its contents vigorously upward, downwards, and from side to side. The patient is now to be turned on his abdomen, and in this position to be held up by four strong men, and shaken backward and forward. This done, the trunk is to be held uppermost and shaking again practised directly upward and downward; whilst in this position copious enemata are to be given. The whole proceedings are to be carried out in a *bonâ fide* and energetic manner. It is not to be merely the name of taxis, but the reality, and patience and persistence are to be exercised. The inversion of the body and succussion in this position are on no account to be omitted, for they are possibly the most important of all. I do not think that I ever spend less than half, or three-quarters of an hour in the procedure.'

Mr. Hutchinson mentions no exceptions as far as the nature of the obstruction is concerned, so we may infer he advises this treatment in all cases. I must confess it is difficult to conceive in what manner these gymnastic exercises can effect reposition, and I cannot but think such energetic treatment might expose the patient to imminent risk of rupture of the intestine.

The rectal insufflation with hydrogen gas, however, in the case of volvulus, when seen quite early, may be cautiously tried. Should the gut be rotated around its vertebro-mesenteric axis less than one complete circle, reduction might be effected by thus

* 'Archives of Surgery,' vol. i.

dilating and elongating the bowel below the seat of obstruction, but this insufflation must be done most carefully and gently, as, should the loop of intestine be considerably weakened, rupture may result; so that I should not recommend this method of treatment unless operative measures were opposed by the patient and his relatives, or contra-indicated by the debilitated state of the patient.

Preparation.—Before commencing any operation for obstruction of the intestines, the patient should be carefully prepared, especially in those cases in which there has been fæculent vomiting. In all such cases I advise as a preliminary measure that the stomach should be washed out an hour before operating with a five per cent. solution of salicylate of soda, to be followed by plenty of warm water; by adopting this precaution the patient is put into a very much better position for after-treatment. There will be no vomiting, and the absorption of the deleterious gases and of such offensive matters as are in the stomach is avoided. The rectum should also be washed out with enemata. The patient should be fed entirely by the rectum, and have an enema of beef-tea and brandy administered before being placed on the table. Hot-water cushions should be placed on the table for the patient to lie on during the operation, and he should be packed in hot blankets.

The abdominal parietes should be washed with ten per cent. solution of liq. potassæ the day previous to, and the morning of the operation, and a pad soaked in a solution of perchloride of mercury (1 to 3,000) constantly applied for the forty-eight hours prior to the patient being placed upon the table.

I agree with Dr. A. V. L. Brokaw, of St. Louis, who says, 'The application of a strong solution of liquor potassæ will be found in many respects superior to

soap. I constantly carry a bottle of this solution in my emergency-case, from which extemporaneous solutions to cleanse the parts can be made as required.

‘The great advantage of the solution mentioned is that, when time is an object, more perfect cleansing can be obtained with less effort than by any other means with which I am acquainted. I have cleaned the field of major operations in few minutes with this solution, in emergency, when the parts were filthy beyond description, and secured union by first intention throughout. Surrounding the field of operation, I place sheets of unbleached muslin; these are one and a quarter yards in length, one yard wide, and are prepared by boiling in a three per cent. carbolic acid solution and dried by ironing while damp. Each extremity is wrapped in one of these sheets, and others are arranged above and below the line of proposed incision. One or more of these sheets are wrung out in some antiseptic solution and placed over the dry sheets at the time of operating, thus lessening the danger of chilling the patient. It is advisable to boil the instruments for fifteen or twenty minutes in a solution of carbonate of soda, one drachm to the quart, while the patient is being prepared for the operation. A convenient way to carry laparotomy instruments is in roll cases made of white ducking, ideal cleanliness being always maintained, as the roll with its contents may be sterilized at short notice by simply placing it in an oven—a good plan to follow out after cleansing the instruments, the dry heat insuring perfect drying of the same.

‘As to ligatures and sutures, well-prepared chromicized catgut is the ideal ligature. The objections to its use are outweighed by its many advantages, and the European surgeon who waged such an active, aggressive warfare against its use, because of some cases of infection following its employment, will soon, I believe, be driven

back into his trenches. True it was, from the great force of his arguments, catgut was abandoned by many of us, but the signs of to-day point to its even more general use. Catgut, as a rule, gives rise to but limited suppuration; in the vast majority of instances the army of leucocytes by their digestive action do away with the focus of irritation. This, however, is not so with silk; for it requires sixty to eighty days for its absorption, under the most favourable circumstances. Under less favourable circumstances it may never be satisfactorily disposed of. I have found a ligature used in tying off a hernial sac, over a year after the operation, unchanged in the tissue. Catgut prepared by boiling in alcohol or by the following method has served me with satisfaction: The raw catgut is carefully washed with strong alkali soap, or in a solution of liquor potassæ (1 to 40), thoroughly rinsed in clear water, placed in sulphuric ether for from one to four days, and lastly in mixtures of oil of juniper berries $\bar{3}j.$; alcohol $\bar{3}ij.$, or alcohol sublimate solution (1 to 1,000) $\bar{3}vj.$; glycerine $\bar{3}ij.$ Another method, equally as good as the above mentioned, is to place the raw catgut in sulphuric ether for three to six days, rinse in alcohol, and finally place in solution composed of alcohol $\bar{3}j.$, with juniper oil $\bar{3}ij.$ If desired, after removing the catgut from the ether, it may be placed in a sublimate alcohol solution, 1 to 1,000, before transferring to the final solution. My experience teaches me that too strong solutions of corrosive sublimate weaken the gut materially, also making it more brittle. After the gut is prepared, I cut it into sections, 24 to 28 inches long, winding it over two fingers into compact twisted rolls. Each strand is then sufficiently long for sutures, or may be subdivided into ligatures; these are then placed in small glass-stoppered bottles, partially filled with the sublimate or juniper solution sufficient to cover the gut.

Catgut, when carefully prepared, is, for the one reason previously given, a safe ligature for ordinary abdominal work, but not for ligature *en masse* (pedicles, etc.). When catgut is used for ligaturing, the danger of slipping of knots must be remembered. For ordinary vessels, tying off adhesions of the omenta or organized lymph-bands, it is safe to use. A well-tied surgeon's knot, or the square knot with an extra knot added, may be depended on.'

Choice of Anæsthetic.—In choosing an anæsthetic, one must be guided to a very great extent by the condition of the patient; if very collapsed, possibly it would be wiser to give ether, but in all ordinary cases I much prefer chloroform administered by Junker's apparatus. My reasons are that by this anæsthetic there is much less venous congestion, which is a very important matter; further, the breathing is quieter and more regular; there is not that jerking respiration which is so often present during the administration of ether, which is so liable to harass the operator. In those cases in which the whole operation is to be attempted the patient should be thoroughly anæsthetized, so as to ensure complete relaxation of the abdominal muscles.

Operative Treatment.—By studying the accompanying figures illustrating the different forms in which obstruction is caused by bands, or volvulus, each step in the operation will be readily followed. By referring to these figures I hope to be able more clearly to describe the steps of the various operations. Some of these figures I have adapted from Treves' excellent work on 'Intestinal Obstruction.'

In performing the necessary operation for the relief of intestinal obstruction, an incision sufficiently large to allow three fingers to be inserted should be made in the middle line between the umbilicus and pubes, and the exploring fingers should then be inserted. The cæcum should be

thoroughly examined in the first place. If this is found to be distended it will be a sure indication that the obstruction we are seeking is situated in the colon, sigmoid flexure or rectum; if empty and collapsed, then the obstruction must be looked for at the ileo-cæcal valve, or higher up in the small intestine.

If from this preliminary examination the probable situation of the volvulus or constriction is settled, no time should be lost, but the incision should be enlarged sufficiently to allow of the seat of twist or constriction being brought thoroughly into view. And here let me point out the value and importance of having an assistant or nurse told off entirely for supplying and changing soft cloths wrung out in warm carbolized water, for the purpose of covering the distended intestine which will inevitably escape from the abdomen; usually among the first coils that will escape, in the case of volvulus, on account of the greater degree of distension, will be the twisted portion of bowel.

In recent cases which are seen before adhesions have taken place there is no difficulty in untwisting the volvulus and replacing the intestines into the cavity of the abdomen.

When adhesions have taken place, and it is found difficult or impossible to untwist the volvulus, the loop should be at once opened and the contents allowed to escape.

It will usually be found that the distension is not due so much to faecal contents, as to the secretion of gas; and let me caution you against merely puncturing the distended loop, as the intestine is from the excessive distension thoroughly paralyzed, and an ordinary puncture, which in a healthy intestine would quickly contract, in an intestine paralyzed will remain patent and be the source of leakage. The loop, then, if it is found to be

in such condition that there would be danger in endeavouring to untwist it, should have a free incision an inch long made in it on its convex surface and in a

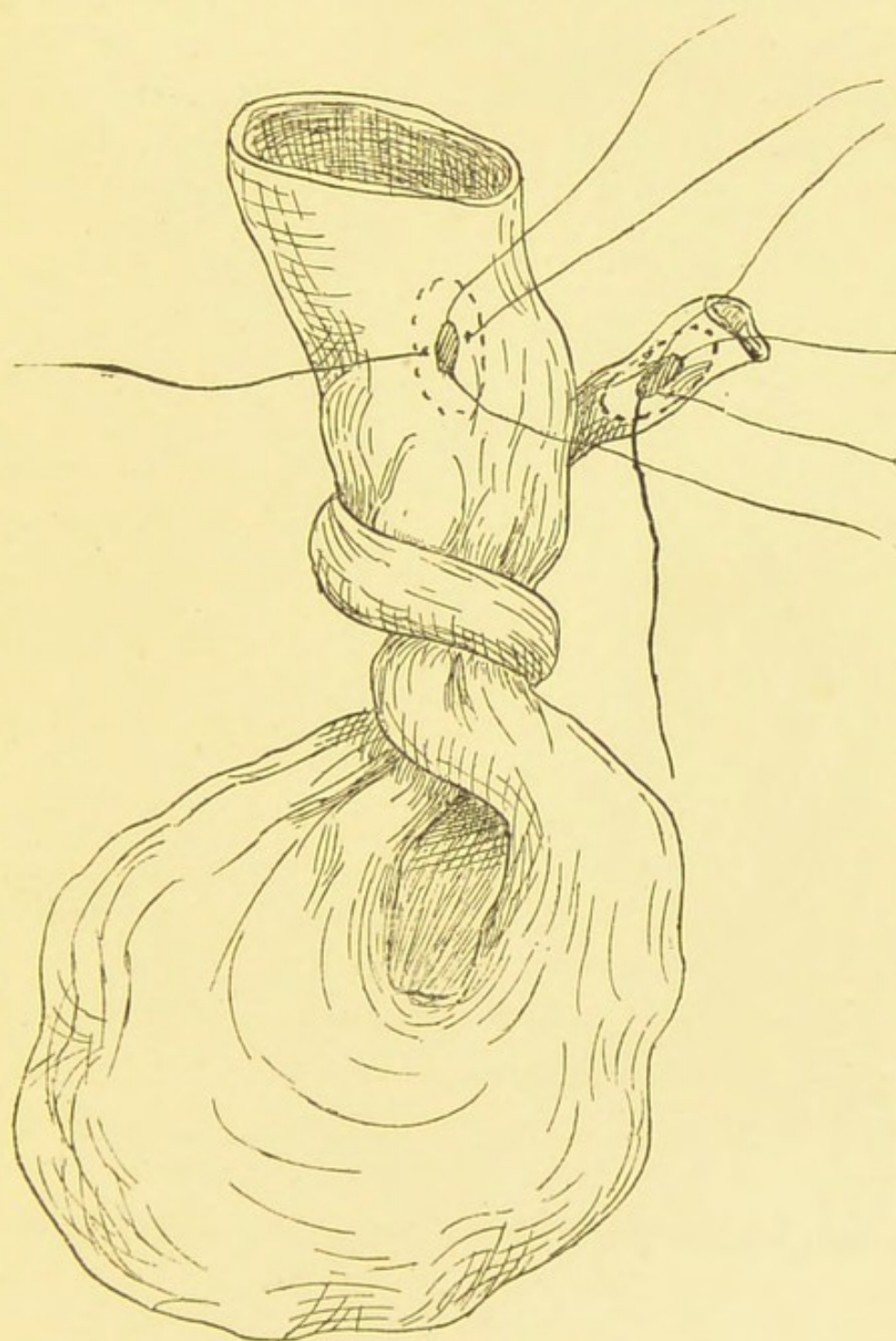


FIG. 23.—Volvulus : showing bone-plates in position.

longitudinal direction, care of course being taken that the patient is laid partially on his side and the opening held quite free from the incision into the peritoneal

cavity, which should be protected with cloths, etc. It will be found that through this opening not only will the con-

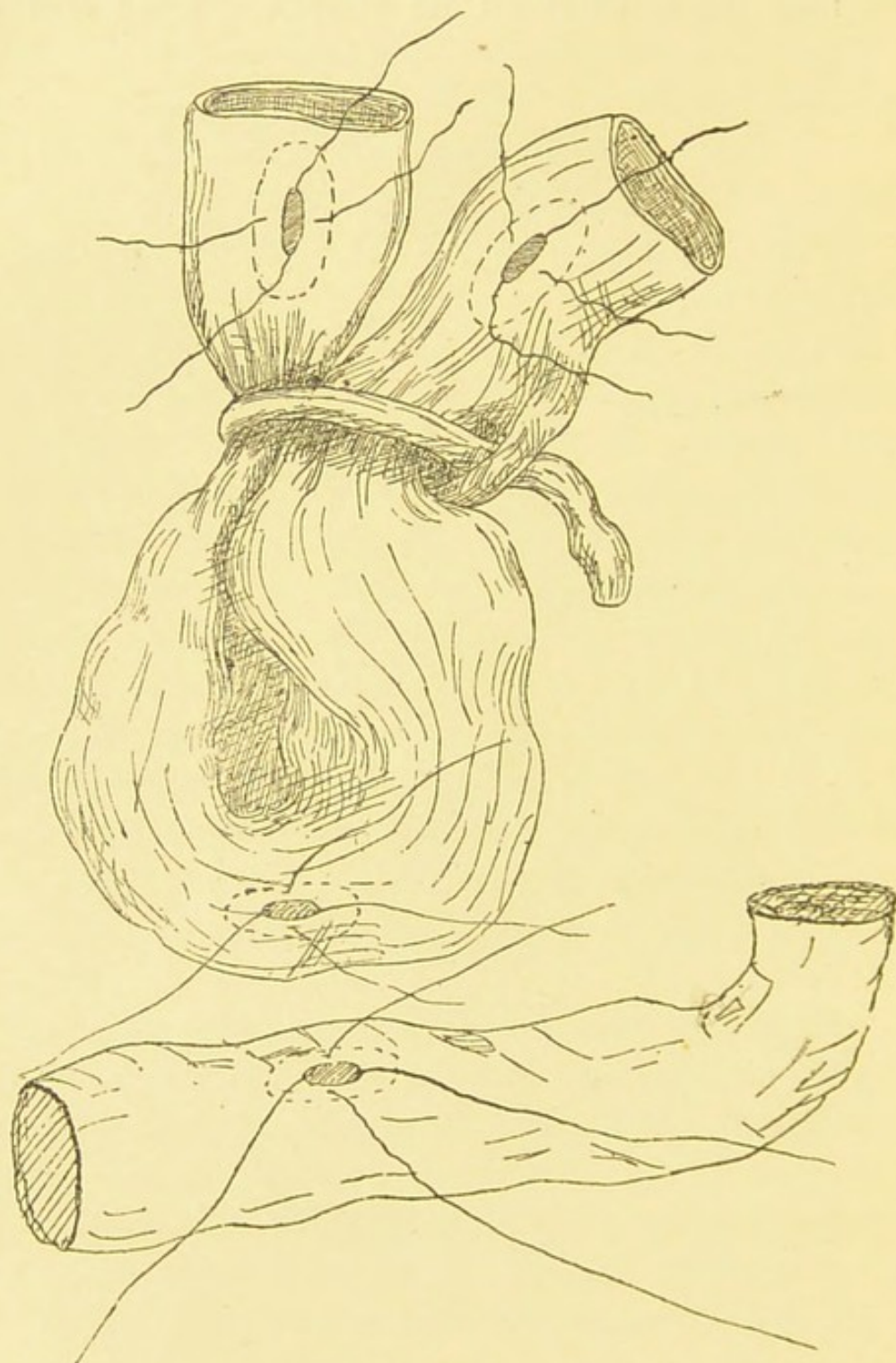


FIG. 24.—Strangulation of gut by diverticulum : showing position of plates connecting the constricted loop to adjacent portion of intestine.

stricted loop be relieved, but also a considerable portion of the intestine above it. This often will be easily

emptied by gently holding loop by loop up slightly higher than the opening, when its contents will run out by gravitation. When the bowel is pretty well emptied it will be wise to wash it out with warm salicylized water. Senn goes so far as to say that he believes it is absolutely necessary to incise the bowel in every instance

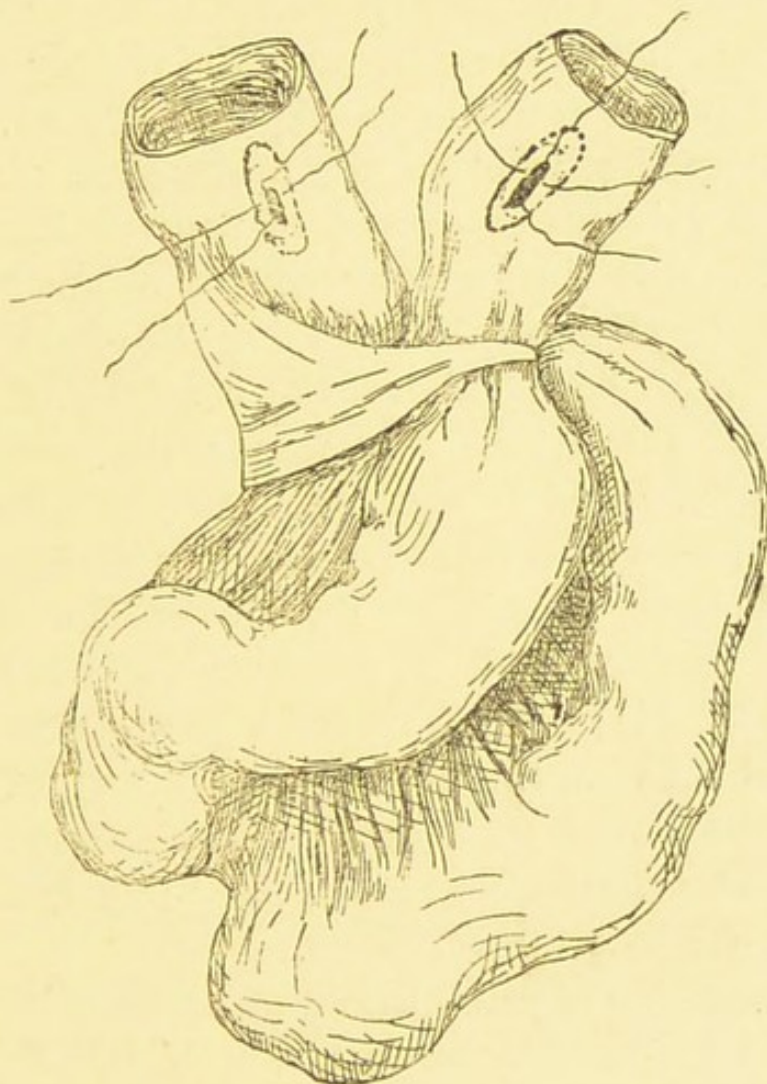


FIG. 25.—Constriction of gut by band : bone-plates in position.

when the abdomen is opened for the purpose of reducing a volvulus. Without going so far as this, there can be no doubt in the majority of cases when the volvulus occurs low down in the ileum or in the sigmoid flexure such a proceeding has much to recommend it ; moreover, as will be shown later on, such an opening can be utilized for the introduction of the approximation disc. This

evacuation of the bowel, moreover, facilitates the reposition of the intestines into the abdomen—often a difficult matter—favours the return of peristaltic action, and prevents fermentation after the operation.

When it is found to be impossible to untwist the volvulus, or reduce the constricted portion of bowel so as to restore its continuity without danger of tearing the intestine, and at the same time the vitality of the constricted loop is seen not to be impaired, the same plan of treatment applies, whether the obstruction is the result either of a volvulus or caused by constricting bands or diverticula. Intestinal anastomosis by means of approximation-plates (Fig. 23), should be established between the portion of bowel above the constriction and that below it, as shown; by this means the continuity of the intestinal canal is restored. At the same time it will be necessary to establish another anastomosis between the most prominent portion of the constricted loop and another coil of intestine in its immediate vicinity (Fig. 24); by this means a permanent fistula is established between the two, so that if any of the contents of the bowel pass by the first anastomosis into the loop of intestine, it will pass away into another portion of the bowel lower down.

This precaution of establishing an opening between the constricted loop and another coil of intestine I consider should be invariably practised as it has been pointed out by Dr. L. Hermann, that if a loop of intestine is detached from the remainder of the intestinal canal, and its ends closed, fæces, or a substance closely simulating fæces, will be secreted from the mucous surface. Dr. Almroth Wright drew my attention to this statement, and suggested that I, in my experimental work, should test the assertion.

For this purpose, with the kind assistance of Dr.

Almroth Wright, I operated on three dogs, detaching about eight inches of bowel from the continuity of the intestinal tract. This loop of intestine was washed out with antiseptic solution and dropped back into the cavity of the abdomen, after the divided ends had been inverted and securely closed. The continuity of the intestinal canal was restored by uniting the divided ends of the proximal and distal portion of the intestine by means of bone-tubes.

In the first experiment the loop of intestine in five days was found to be filled with a substance that could not be distinguished from ordinary fæces. In the second the dog died from leakage from the loop of intestine. In the third the dog was killed ten days after the operation, and the loop of intestine was found to be filled with a fluid which had all the characteristic smell of fæces.

In the case of constriction caused by bands or diverticula the same rules hold good, that is, if it is found that the constricted portions of intestine have become so adherent as for it to be dangerous or impossible to separate them, then intestinal anastomosis above the seat of constriction must be established (Figs. 24 and 25).

Dr. Almroth Wright has most kindly furnished me with the accompanying translation.*

‘Rings of gut are cut off from the rest of the intestine, and are thoroughly washed out with lukewarm water. Their ends are then carefully sewn up. The shortened gut is then joined so as to restore the continuity of the intestine.

‘Of nine dogs operated upon in this manner, two died on the fourth day of septic peritonitis. Four other dogs remained well up to the sixth day, and then also sickened with symptoms of peritonitis; some of these died, and

* L. Hermann. *Pflueger's Archiv f. d. ges. Phys.*, vol. xlv., p. 93, abstracted in the *Centralblatt f. Physiologie*.

others were killed. One dog survived the operation, and was killed a week later in the best of health and spirits. Two of the animals lived several weeks; one of these died later from perforation, the cause of which was a bone which had perforated the gut at the seat of suture.

‘In the animals which died from the peritonitis supervening on the sixth day, or which were killed in consequence of that peritonitis, the ring of isolated gut was filled with a jelly-like brown mass.*

‘In the animals which survived the operation for several weeks, the ring was found filled with a firm greenish-gray mass, which looked deceptively like fæces, especially like biliary stools. This mass could be pressed out in the form of sausages.

‘The mass contained numerous micro-organisms and a few white cells, but no other organic (“formed”?) contents. The reaction was slightly alkaline, and there were no bile constituents, but mucin, fat drops, fatty acid crystals, and in one case masses of calcium carbonate crystals. The mass gave the reaction with Millon’s reagent.

‘The origin of this remarkable mass can only be sought in a secretion from the intestinal wall, and a subsequent thickening of the secretion by the absorption of water.

‘It becomes very probable, therefore, that the fæces are not, as has been assumed, composed almost entirely of a residuum of food-stuffs and bile, but rather consist of a thickened intestinal secretion. One must reflect that a principal function of the small intestine might consist in producing a secretion, which, when thickened by water absorption, would clear out the intestine in its passage

(* *Translator’s note.*—This, I think, describes what was found in your first operation.)

downwards through the gut of all leavings of food-stuffs by enveloping them in a doughy mass.'

Hermann is Professor of Physiology at Königsberg, Prussia, and the editor of the best compendium of physiology. Heidenhain, at the International Congress of Physiologists, confirmed Hermann to some extent. He had seen a thickened secretion formed in Thiry's fistulas, *i.e.*, in pieces of gut sewn up into *cul de sacs*, the free opening of which was brought up and sewn to edges of wound.

EXPERIMENT I.—July 31st. With the assistance of Dr. Morotti and Dr. Wright, I performed the following operation on a large mongrel dog, with a view of testing the correctness of Dr. Hermann's statement as to the glands of the mucous membrane secreting a substance which had all the characteristics of fæces. A loop of intestine was withdrawn through the abdominal incision and divided in two places, about a foot apart. The continuity of the gastro-intestinal canal was restored by uniting the divided ends of the proximal and distal portion by means of my tubes. The remaining loop, which had now no connection with the intestinal channel, was washed out with solution of carbolic acid. The ends were inverted and securely fastened by a continuous suture passing through the serous and muscular coat; it was then dropped back into the abdominal cavity. The dog was killed five days afterwards. The union between the main length of intestine was perfect, and the detached loop of intestine was filled with dark-coloured matter of semi-fluid consistence, which Dr. Sims Woodhead and Dr. Wright examined, and pronounced to have all the characteristics of fæces.

EXPERIMENT II.—With the assistance of Dr. Wright, a retriever was treated in exactly similar manner to Experiment I. This dog died three days after the operation.

The union of the gastro-intestinal canal was perfect ; but the loop which was detached was distended with a dark grumous and gangrenous fluid, and a slight leakage was found to exist at one of the occluded ends, which caused peritonitis, from which the animal died. The contents of this loop had, like Experiment I., much the appearances of fæces.

EXPERIMENT III.—Dr. Wright has kindly furnished me with the following notes of the next experiment :

‘*Nov. 4th, 1891.*—Black retriever operated with the assistance of Dr. Wright, a loop of the ilium quite close to the ilio-cæcal valve being isolated. This loop was carefully washed out by means of a funnel and piece of indiarubber tube, and it was then invaginated and carefully sewn up at both ends and replaced. The continuity of the intestine was then restored, and the shortened intestine replaced in the abdominal cavity. No bad symptoms whatever manifested themselves after the operation.

‘*Nov. 18th, 1891.*—Dog to all appearances perfectly well, being very lively and cheerful. Killed by administration of chloroform.

‘*Post-mortem.*—Abdominal cavity.

‘The first thing which strikes the eye on opening the abdomen is the large distended isolated loop. There are some slight adhesions between it and the rest of the intestine, but these are easily broken down. The serous coat is pale and perfectly normal in appearance. The loop, when taken out, is found to measure 40 cm. (*i.e.*, *circ.* 16 inches) along its free convex margin, and its girth, which greatly exceeds that of any other portion of the small or large intestine, is found to measure 8 cm. (*i.e.*, 3 inches and a fraction).

‘The loop is distended, though perhaps not tensely distended. It is carefully washed externally under a

flowing tap, and is then cut open. When this is done, 207 cc. (*i.e.*, *circ.* 6 oz.) of a grayish-green thickish fluid of a stercoraceous odour escaped from the gut. The mucous membrane of the loop is, as far as can be judged, perfectly normal in character, but no microscopical specimens were put up.

‘NOTE.—The faecal matter from the loop is examined microscopically, and is seen to consist entirely of a mass of leucocytes, with a certain amount of detritus and a very few fatty acid crystals. The fluid naturally contains numerous micro-organisms. When the contents of the loop are thrown upon the filter, a clear yellowish-brown filtrate is obtained, which has a very alkaline reaction, and a copious evolution of carbonic acid is produced when a few drops of acetic acid are added to the filtrate. No precipitate is produced on neutralization. The fluid contains no mucin, no precipitate being formed in it on acidification with acetic or weak hydrochloric acid. On the other hand, the fluid contains very large quantities of the primary albumoses. As the contents of the loop were contaminated with putrefactive micro-organisms, no attempt was made to determine the presence or absence of digestive ferments, or to examine for indol and skatol as evidence of such action. The ethereal and alcoholic extracts of the residue which remained on the filter left a deposit of fat behind them when they were evaporated, but no crystals of either leucin or tyrosin were obtained.

‘P.S.—The presence of such an extraordinary mass of leucocytes in the intestinal secretion in this case cannot have been due to any inflammation, as the signs of this were strikingly absent. The presence of the leucocytes more probably stands in some relation to the fact that the loop, which was isolated, came from a portion of the

intestine which is characterized by the presence of numerous Peyers' patches.'

From these experiments it will be seen how absolutely essential it is to establish a communication between the constricted loop of intestine and the bowel below, to allow of the secretion draining away.

In treating cases in which the patient is extremely collapsed, no anæsthetic should be given. The treatment advocated by Mr. Greig-Smith may well be practised, viz.: To make a small incision not longer than one inch into the abdomen in the middle line below the umbilicus; seize the first loop of intestine which presents itself, and fasten this by four quilt sutures; these are fastened on each side to pieces of adhesive plaster, carried around the back, and fixed on the abdomen. Fixation in this way is more likely to secure steady apposition of the gut to the puncture than the hands of an assistant. The intestine, its outer coats being incised by a scalpel, is now gently pierced by a long needle—by preference, with an aspirating needle—with a long piece of tubing attached to it, to carry the fluids to a distance.

This operation should be done with the patient in bed, and wrapped up in hot blankets with hot-water bottles around. The surgeon then sits by the side of his patient, while the contents of the bowel are evacuated, at the same time having enemata of brandy given by the rectum.

If the patient can be tided over forty-eight hours, his life may probably be saved, and the continuity of the canal can be restored at a future date.

In a paper by R. V. Oettingen, upon 'Enterostomy and Laparotomy in Acute Intestinal Obstruction caused by Volvulus Strangulation and Flexion,' comparison is made between cases in which simple laparotomy is alone necessary and those in which the performance of enterostomy is in addition demanded. In

judging of that which enterostomy can accomplish, he includes the palliative effect of the operation; the life being preserved, but the occlusion persisting. On the other hand, he considers with due appreciation those cases in which, from an anatomical and pathological view, cœliotomy was successful, but in which the clinical was not taken into account.

In the whole literature of this subject, it is asserted that not a single case of volvulus is recorded in which a cure of the volvulus was obtained by the performance of an enterostomy; all so treated (five cases) were followed by death. The argument that in cases of volvulus, after the disappearance of the latter, the fact that it had existed cannot be subsequently demonstrated, is disputed by this writer. It is not to be supposed that enterostomy in every supposed case of volvulus has a curative, and in no single case a palliative, effect. The objection appears to be not quite a valid one if the uncertainty of the diagnosis of volvulus and the small number of published cases treated by enterostomy is considered. From a theoretical standpoint it would appear possible for a loop of intestine, twisted upon its mesenteric axis, to undergo reduction, upon emptying the loop of intestine leading to it by means of an artificial anus. By means of cœliotomy cure was obtained in six cases of volvulus. In six further cases the twist was found and removed, but the patients died from causes independent of the operation. In seven other cases death followed untwisting of the volvulus by means of cœliotomy, partly in consequence of already existing peritonitis, partly from perforation of the bowel consequent upon gangrene, partly from collapse directly after the operation. In these nineteen cases, at least a technical success was obtained in thirteen instances, although but six patients recovered. In opposition to this are seven additional cases in which no measure

of success followed the cœliotomy; in one case death occurred during the operation, in another case the obstruction was apparently removed, but the post-mortem showed that the volvulus was not entirely reduced. In three cases the obstruction presented the form of adhesions, and seemed to have been removed; but a volvulus remained, and caused death. In two cases the operation was abandoned before completion. Finally, in four still further cases, because of well-marked gangrene, the sphacelated portions were excised.

Among the cases of strangulation, Dr. Oettingen found seven described in literature, in which enterostomy was employed. Six of these ended fatally; in the seventh, however, the diagnosis was not assured, although recovery followed. In no case, however, did the operation have a purely palliative effect; either the strangulation was removed, as in the uncertain case just mentioned, or the patient perished. In opposition to this, it is stated that in twenty-three cases recovery followed cœliotomy. In two instances of otherwise successfully accomplished cœliotomy, death occurred from pneumonia. In seventeen cases the obstruction was removed, but death by peritonitis or collapse followed. In eight instances only was it found impossible to locate or remove the obstruction by means of cœliotomy.

The results of enterostomy in the cases of occlusion caused by flexion are far more favourable. In six cases, in which, from the history, a flexion of the bowel could be diagnosed, recovery followed, the obstruction being overcome. In three other cases a palliation of the condition only followed, and of these the obstruction was subsequently overcome by cœliotomy. Only one case is on record in which the operation of artificial anus caused death, and that a case of acute obstruction due to flexion. These favourable results are attributed to an easy performance

of enterostomy, and of the absence of considerable damage to the peritoneum. In fourteen cases of flexion cœliotomy was followed by recovery; six times, despite of a technical success, death followed. In four cases the obstruction could not be found; of these two died. In the two remaining cases an artificial anus was established, and subsequently the obstruction was removed, and the artificial anus closed.

Basing his opinion upon these favourable results, Dr. Oettingen declares, from the pathologico-anatomical stand-

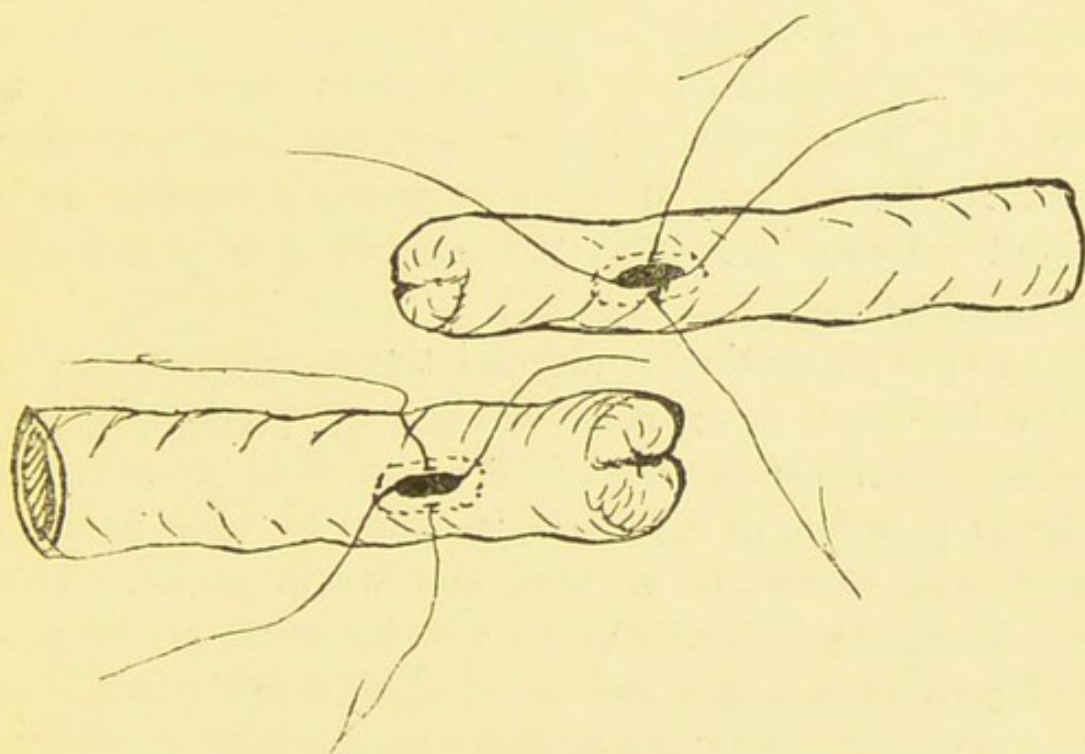


FIG. 26.—Ileo-ileostomy: showing bone plates in position and ends of intestine invaginated.

point, in cases of volvulus and strangulation, cœliotomy is decidedly indicated, while in flexion both methods of operation offer equally good results. He states 'cœliotomy is to be performed in all recent cases of intestinal obstruction where the necessary advantages offered by a well-equipped hospital are at hand; enterostomy or artificial anus when these advantages are not obtainable, and where the operative procedure is too long delayed, and when the general condition has consequently suffered,

so that in all probability the patient will not bear a coeliotomy.*

In case of gangrene of the constricted portion of intestine it may be necessary to perform enterectomy and remove the gangrenous portion; and here, again, the value of the approximation plates is demonstrated, as it has been hitherto a universal rule that in a case where a portion of the bowel has been removed an artificial anus has been established. It is true there are a few cases where surgeons have united the divided ends by a double row of Czerny-Lembert sutures, but the results were so disastrous that few surgeons would care to undertake the operation; moreover, the length of time taken in performing it upon a patient already in a state of collapse precludes the possibility of performing it in most cases.

When Senn's method is adopted, the gangrenous portion of the intestine being removed and all bleeding points secured, the intestine should be emptied of its contents as far as possible, and, indeed, it would be wise to wash it out with salicylate of soda and warm water. This being done, the divided ends of the intestine are invaginated into themselves and secured by a few stitches of either chromicized catgut or fine Chinese silk—I always use the former, and adopt either a continuous or quilt suture as being more readily applied. The two ends of the intestine are then applied *end on* (Fig. 26). This is important to remember, since if they were applied otherwise a distinct angle would be formed (Fig. 28). By applying the two portions *end on* the even passage of the contents is not interfered with. This operation can be readily accomplished in from thirty minutes to three-quarters of an hour, according to the amount of adhesion or injury to other intestines, the act of inserting the

* *Inaug. Dissert.*, Dorpat, 1888.

plates and forming the anastomoses occupying but a few minutes.

Senn recommends before the plates are fixed that the peritoneum should be scarified; he claims for this, that lymph is more quickly poured out, and firmer and quicker

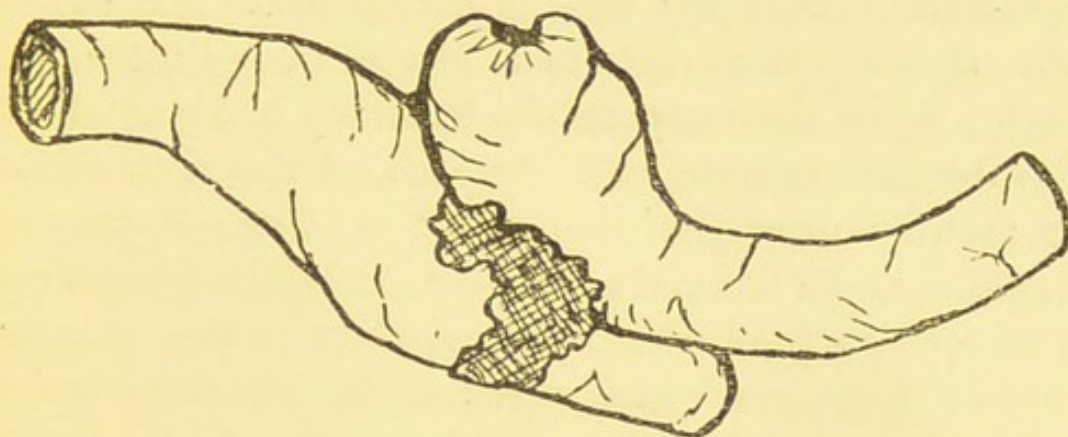


FIG. 27.—Ileo-ileostomy completed.

adhesion takes place. I have not hitherto adopted this course in the cases that have come under my notice, neither do I think it necessary.

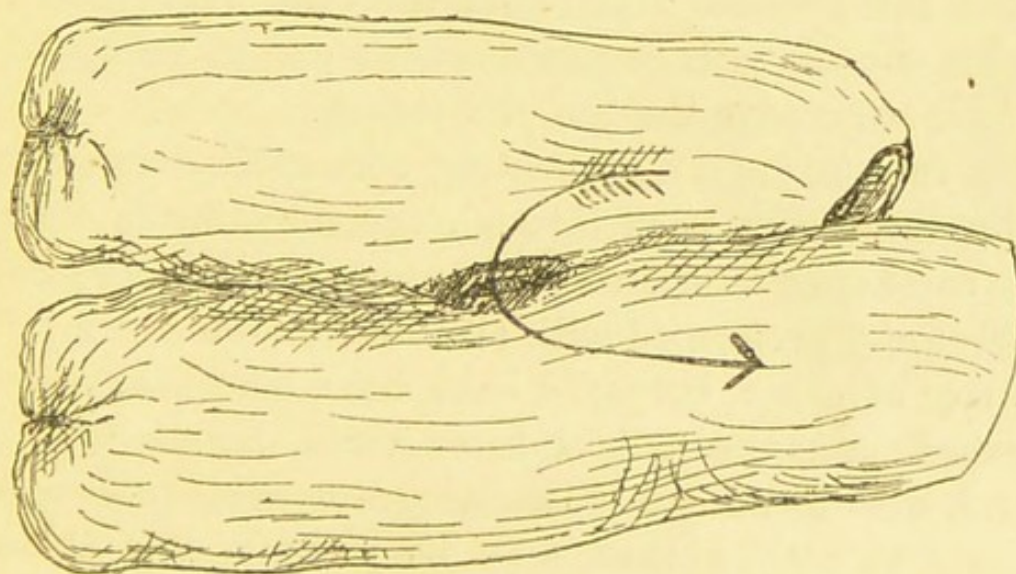


FIG. 28.—Ileo-ileostomy: improperly performed.

There is one point that may be adopted, and that is, after the incision has been made in the intestine, the mucous membrane may be stitched to the peritoneal surface by a continuous catgut suture, or if it protrudes

it may be cut away. This will prevent further prolapse of the mucous membrane through the wound, and also preclude the possibility of the wound closing, as happened in a case of gastro-enterostomy performed by Mr. Stansfield, of Birkenhead. His case was one of gastro-enterostomy for pyloric carcinoma. The patient made a good recovery and all went well for two months, when the temperature suddenly rose and all the old pains and symptoms recurred, and the patient died four months after the operation. At the post-mortem the gastric and intestinal peritoneum were firmly adherent, but on opening the stomach the only sign of the operation was the silk sutures, which were hanging where the wound had been; this was perfectly and firmly closed. It is, then, to prevent such a catastrophe as this that in certain cases it may be desirable to suture the mucous membrane to the serous before introducing the bone-plates, and use chromicized catgut suture for passing through the bowel. Should the mucous membrane protrude very much, it may be cut off with scissors, which can be safely done, and will often save the use of a suture.

The reason for my advocating chromicized catgut for the ligatures that pass through the intestine is that in three cases that have died at different periods after gastro-enterostomy performed with silk sutures—one of my own and two of other surgeons—the bone-plates have been absorbed and the silk sutures were dangling in the wound, thus forming a most dangerous nucleus for catching any substance that may be passing, and thereby causing obstruction. Chromicized catgut was used by me in all my experiments, and notwithstanding that the digestive powers of animals are far higher than those of man, they always lasted long enough to allow of firm adhesion taking place.

After evacuating the strangulated loop, should it be

found to be unnecessary to connect it with another coil of intestine as above referred to, the opening should be closed by a double row of Lembert sutures. But judging by experiments, I think it would be wiser in all cases to connect the loop with the intestine below.

In some cases where gangrene is limited to a small area it may be unnecessary to remove the whole loop of intestine. In such a case the serous membrane may be stretched over the gangrenous spot, which will then slough out and be discharged into the intestine, for it must be remembered that the circulation through the constricted portion of bowel will return so soon as the distension is relieved and the obstruction to the passage of the contents of the bowel is removed by the formation of intestinal anastomoses above and below the constriction.

Treatment of Constricting Bands.—In the early part of this lecture I pointed out that the chief causes of obstruction of the intestines were, on the one hand, constricting bands or diverticula, and on the other, volvulus the result possibly of an elongated mesentery.

It will be evident, then, when called upon to operate in any such cases, that it will be our duty not only to do our utmost to rescue our patient from his present perilous position, but likewise as far as possible to prevent the recurrence of the disaster in the future.

To accomplish this it will be necessary, in the case of obstruction caused by constricting bands, to remove them by simply passing a ligature around them at either end, and snipping them through with scissors—that is, of course, if they are not so firmly adherent to the loop of intestine as to prevent our doing so.

In the case of diverticula a little more caution is required, as these will in many cases be found to have an opening into the intestine, and if they were simply

ligatured there may be a fear of future trouble from leakage. In this instance, therefore, the diverticula should be cut across and removed, then the peritoneum over the divided stump should be stitched over by a Lembert suture, and if there is a sufficiently large opening the end should be invaginated and fixed in position by a couple of quilt sutures.

Elongated Mesentery.—In the case of volvulus, should the mesentery be found to be abnormally long after the reduction of the volvulus it should be shortened, and this is easily accomplished by folding it over on itself parallel with the bowel, as suggested by Senn, and fixing the apex to the root of the mesentery by a few sutures. By this simple manoeuvre all future fear of trouble from this cause may be avoided. Great care must be taken not to puncture the vessels or include them in the ligature.

Conclusions.—The conclusions that I have arrived at are as follows :

1. Obstructions of the intestines, the result of constricting bands or volvulus, are usually met with either in the small intestine or the sigmoid flexure.

2. The most common cause of bands are old peritonitis, local or general. Meckel's or other diverticula may be the cause of constrictions of the bowel by snaring or twisting.

3. The predisposing causes of volvulus consist in elongation of certain segments of the intestine, abnormal length of the mesentery, adhesions, or unequal peristaltic action.

4. The higher in the intestine the obstruction, the more severe usually are the symptoms.

5. All cases of obstruction should be treated by early abdominal section, and if possible reduction of the constricted portion of the intestine by dividing constricting bands or untwisting a volvulus; that is, if the gentle

insufflation of hydrogen gas per rectum fails to effect reduction.

6. In all cases where the intestine is very distended it should be freely incised and its contents evacuated.

7. In all cases in which the constriction is irreducible, lateral anastomoses by approximation discs should be practised so as to exclude permanently the seat of obstruction from active fæcal circulation. The most dependent portion of the constricted loop should be united to a portion of intestine in its vicinity.

8. In cases where gangrene has taken place in the loop of constricted intestine, it should be excised, and the portion of intestine above and below the seat of constriction should be united by lateral anastomoses by means of approximation plates, the divided ends being invaginated into themselves; or by performing enterorrhaphy by one of the operations presently to be described.

9. All bands and diverticula should be removed when practicable at the time of the operation; in the case of volvulus, if the mesentery is abnormally long it should be shortened.

10. That enterostomy, or the formation of an artificial anus, should never be performed unless it is found to be absolutely impracticable to re-establish the continuity of the intestinal canal by enterorrhaphy, or by means of lateral apposition, on account of the collapsed condition of the patient or other cause.

Intussusception.

The treatment of invaginations of the bowel is one of the greatest interest and importance, as in the first place these forms of obstruction are met with much more frequently than any other; and in the next, when occurring, if early relief is not given they are peculiarly fatal. Accord-

ing to Treves at least 30 per cent. of all cases of intestinal obstruction are due to this cause, exclusive of hernia and congenital malformation. He divides cases of intussusception into four classes, namely: the ultra-acute, which is very rare, and usually terminates fatally in twenty-four hours; then there is the acute, which lasts from two to seven days—these number about 47 per cent. of all cases of invagination; the subacute, lasting from seven to thirty days, number about 34 per cent.; and lastly the chronic, occurring in about 18 per cent. of the cases.

According to Leichtenstern, from observations he made in 579 cases in which the termination was known, the result was as follows:

Age.	Total Mortality.	Age.	Total Mortality.
1	88	21-40	63
2	82	41-50	63
2-10	72	51-60	71
11-20	63	over 60	77

Treatment.—The first and main object of treatment should be to place the whole gastro-intestinal canal in a condition approaching perfect physiological rest. Immediately after the occurrence of invagination, if the patient come under treatment at this early stage, the peristaltic action should be arrested as far as possible by emptying the stomach by an emetic or irrigation, by suspending the administration of food by the stomach, and by giving opiates in doses sufficient to procure rest for the bowel at and above the seat of obstruction. As soon as the existence of an invagination is suspected, the large intestine should be emptied of its contents by the administration of a copious enema. Should relief not be obtained by these means, and the surgeon is convinced that he has to deal with a case of intussusception, the patient should

be placed fully under the influence of an anæsthetic, and no time be lost in giving abdominal taxis a fair trial, aided by rectal insufflation of hydrogen gas or filtered air, as suggested by Senn, or the introduction of large volumes of warm water, by means of a long soft tube connected with an irrigator, or Littré bottle, filled with warm water (Fig. 29) held sufficiently high to allow of a gentle but continuous flow into the bowel. Plenty of time should be allowed for the water to permeate round the intussusception, as it is by the pressure of the water, and compression of the intussusception by it, that the greatest hopes can be entertained of a successful issue to our

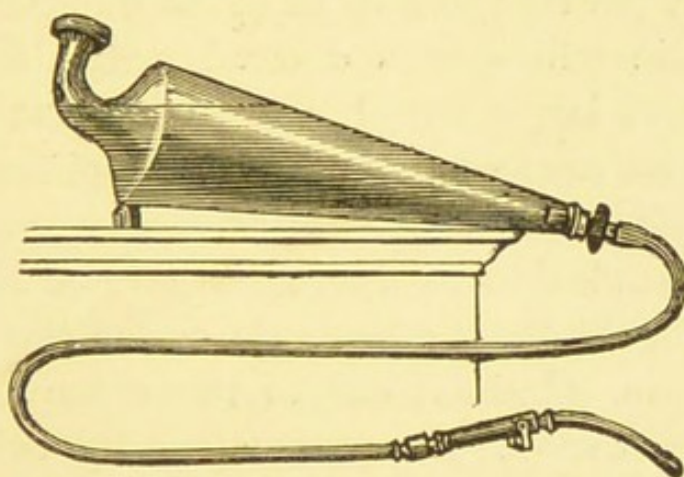


FIG. 29.

efforts. On no account should a syringe be used, as by it the water is injected spasmodically, and that constant gentle pressure which is so important to adopt is lost.

According to experiments conducted by Professor Senn, by rectal insufflation by hydrogen gas, properly administered, he found that it was easy to force the gas past the ileo-cæcal valve; and as distension of the intestine below the seat of obstruction may prove successful in correcting the mechanical difficulties due to other causes, it should be resorted to both as a diagnostic and therapeutic agent in the beginning of all cases of intestinal obstruction.

If the patient is seen before the second or third day, I believe steady perseverance in either of these methods would be attended with success. The chief obstacle to the return of the invagination is either adhesions at the neck of the intussusception, or throughout the whole of the invaginated peritoneal surfaces. By experiment I have found that such adhesions do not take place in a healthy animal under from three to four days, and sometimes even later. In several cases I experimented on dogs, invaginating a considerable piece of small intestine; and on examination in one case, a week after, I found no adhesion that could not readily be overcome by gentle traction and manipulation.

In cases in which it is deemed advisable to try insufflation, the large bowel should be first thoroughly emptied of its contents by means of copious enemata of sweet oil followed by soapy water.

Rectal insufflation of hydrogen gas, or the injection of water, should always be made under the influence of an anæsthetic, administered to the extent of complete muscular relaxation. The pressure on the rubber balloon should be uninterrupted, and should not exceed 2 lb. to the square inch.

Disinvagination is effected by two distinct forces. In the first place, the steady elastic pressure of the gas distends the bowel between the sheath and the returning cylinder, which makes traction upon the neck of the intussusception, while the column of gas or water by its pressure against the apex of the intussusception acts as a direct reducing force. I think it also acts in another way, that is, by its elastic pressure around the intussusceptum, it empties it of the venous congestion and serous infiltration, and so makes it smaller, and therefore more readily reducible.

The inflation must be made steadily, slowly, and

continuously, as by this method there is less risk of rupturing the bowel than if the inflation is made rapidly and with interruptions. The return of the gas or water is best prevented by an assistant pressing the margins of the anus against the rectal tube with a cloth. A small female gutta-percha nozzle makes the best rectal tube, as it can be readily introduced into the rectum, and extends well above the sphincter.

A sudden diminution of the pressure signifies either that the invagination is reduced, or that the intestine has ruptured. The former is distinguished by noticing the steady inflation of the small intestines at the lower end of the bowel, whereas if rupture of the intestine has occurred, the whole abdomen becomes uniformly distended by the escape of the gas into the peritoneal cavity. It is most important that the surgeon should recognise this, as otherwise he may leave his patient thinking the invagination was overcome, whereas the intestine below the seat of occlusion would have been ruptured, and fatal peritonitis ensue.

Enterostomy.—This operation may be performed in some of those acute cases in which the patient is almost pulseless and collapsed. The invagination is usually situated at the ileo-cæcal region, and the most convenient incision for opening the abdomen in such a case is in the right iliac region.

The incision should be not more than two inches in length, which will be sufficiently long to enable a loop of intestine to be withdrawn and the bowel emptied above the seat of obstruction; by thus removing the abdominal tension great comfort will be given. The pressure from above, which has been exerted on the invaginated part, will also be removed.

Cæliotomy.—The mortality following cases of intussusception is so great, as I have before shown, 70 per

cent., that any operation that may tend to reduce this should be encouraged. Mr. Ashurst has recorded thirteen cases in which the abdomen had been opened; in five of these recovery followed, and eight died.

The objects to be aimed at in opening the abdomen should be: (1) to reduce the invagination; (2) to form intestinal anastomosis; (3) resection of the intussusception.

In attempting to disinvaginate the intussusception, it must be remembered that one of the chief results of the invagination is œdema and inflammatory swelling, which must be removed before efforts at reduction are made. This can occasionally be accomplished by steady and uninterrupted manual pressure directly applied to the invaginated part. As soon as this swelling is reduced, steady, gentle traction may be made upon the bowel above the neck of the intussusception. Should this fail, combine with the traction manipulation from below. Should you still fail in reducing the parts, the bowel may be steadily inflated, per rectum, with either water or hydrogen gas, at the same time continuing the manipulation and steady traction.

It has been suggested that the finger should be passed round between the intussuscepiens and the intussusceptum, with a view of breaking down any adhesion that may exist. This would be very difficult to accomplish, as the constriction at the neck is usually so great that considerable force would be required to get the finger in. A better plan, if adhesions are suspected, is to pass a flat hernia director around, and in that way break down any obstructing bands. After reduction has been accomplished the affected segment of the bowel should be carefully examined, and small patches of gangrene or rents of the peritoneal coat covered by stitching the peritoneum over them. To resect a large portion of gut is

a most dangerous matter, and should never be resorted to unless gangrene has set in. Intestinal anastomosis can, however, in most instances readily be performed without interfering with the continuity of the gut at all; and this should be done by bringing a portion of the intestine above the obstruction into apposition with a portion below, and fixing them in accurate apposition with decalcified bone-plates, as has already been described. Should, however, the part involved be gangrenous, then it will be necessary to resect it and perform ileo-colotomy by implantation, or by lateral apposition, and approximation plates.

In the event of the intussusception being situated entirely in the small intestine, then ileo-jejunostomy or enterorrhaphy may be performed, with or without resection of the parts involved. The following is a most interesting case illustrating this form of treatment :

Dr. Thomas H. Russell,* of Yale University, reports a case of complete and permanent recovery by jejunostomy with Senn's bone-plates in intestinal obstruction, due to intussusception and sloughing of the intussusceptum. The patient was a boy aged fifteen, who, after an attack of acute obstruction, had been confined to bed for ten months with increasing debility and emaciation, and recurring violent and painful peristalsis. Soon after the primary attack of obstruction a soft fleshy mass had been noticed in one of the stools. Dr. Russell performed laparotomy on August 17th, 1889, and found the obstruction near the junction of the upper and middle thirds of the small intestine. Here the intestine was so extremely contracted that its diameter was not more than a quarter of an inch, and it was firmly bound down by a strong band of old adhesion to the wall of an adjacent loop of intestine. As the obstruction was evidently an

* *New York Medical Journal*, December 20th, 1890.

old one, and it was impossible to restore the calibre of the gut at that point, an intestinal anastomosis, as suggested by Dr. Senn, was established. The recovery was rapid, perfect, and permanent. A large normal stool was passed on the fifth day, and the bowels were afterwards moved regularly. Fifteen months after the operation the boy was in good health, and was strong and able to do work. This, Dr. Russell believes, is the most successful case of the kind that has hitherto been recorded. The commencement of the disease, he believes, was an intussusception. The soft fleshy mass passed in one of the stools about a month afterwards was very probably the intussusceptum, which had sloughed away, and the subsequent stenosis and adhesions may be regarded as results of this process.

These operations are necessarily attended with great danger, and the mortality is still high, although greatly reduced since the study of intestinal anastomosis has become more advanced and understood. It occurred to me when conducting my experiments that should reduction by the means already described fail, it would be quite feasible to remove the intussusceptum through an opening made in the intussusciens, and so imitate nature's process of throwing off the intussusceptum by sloughing, as closely as possible. With this view I have devoted much time, and made several experiments with the object of seeing if this method could not be safely adopted.

It is known that in a certain number of cases a spontaneous cure has taken place by the separation of the gangrenous intussusceptum, which passes away by the rectum, and upon this I based my experiments.

In three experiments on dogs, I made an artificial intussusception by invaginating a considerable length of small intestine into another portion of intestine lower down.

I then fixed this in position by means of a few Lembert sutures. At the end of a week I opened the abdomen

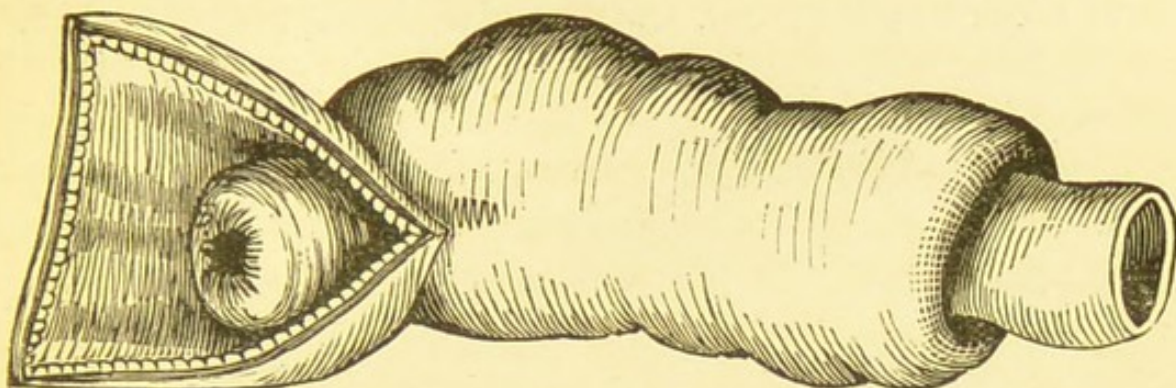


FIG. 30.—Showing portion of intestine invaginated with another—Intussusception.

of the dog again (under an anæsthetic), and found the invagination firmly adherent in two cases. I then (Fig. 31)

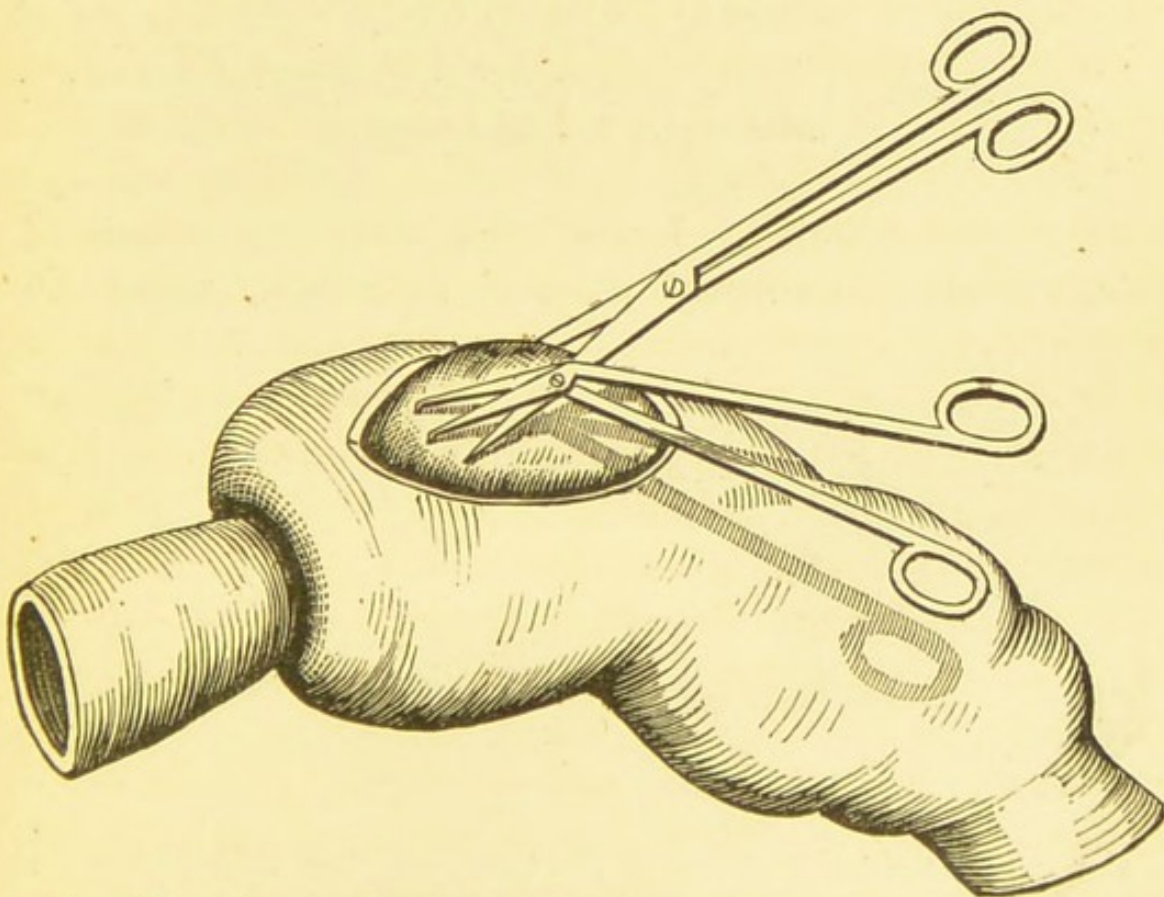


FIG. 31.—Showing incision into intussuscepiens, the intussusception being seized by vulsellum forceps and cut across with scissors (1st stage).

made a longitudinal opening into the intestine, on the side furthest from the mesentery, directly over the intussus-

ceptum, about one and a half inches long, or of sufficient length to allow of my being able to have a good view of, and room to cut across, the root of the invaginated portion

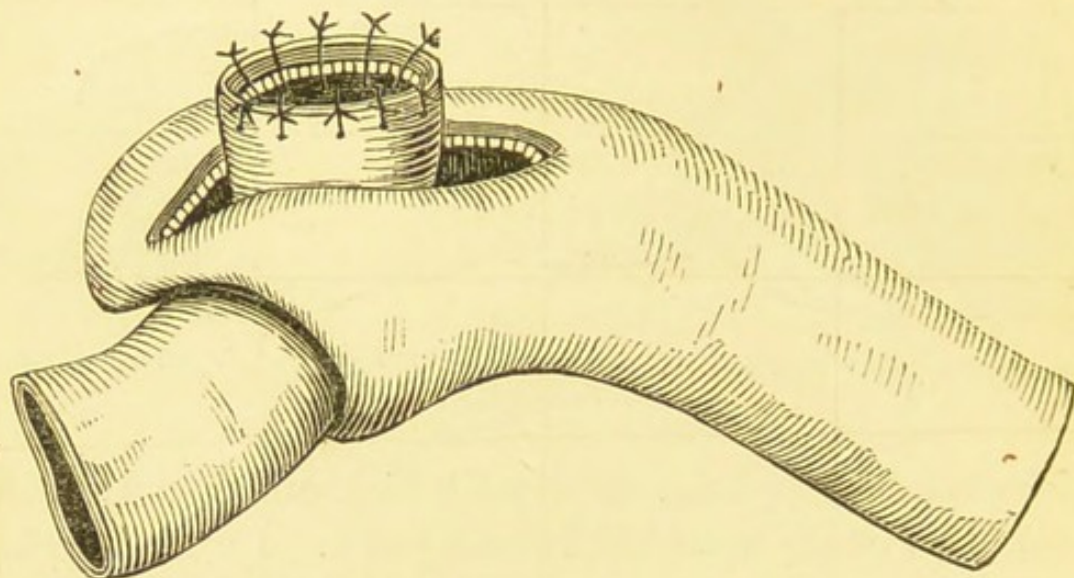


FIG. 32.—Showing intussusceptum detached, and the divided end of intestine sutured (2nd stage).

through the opening. I next (Fig. 31), with a pair of scissors, cut this through close to its origin, seizing the

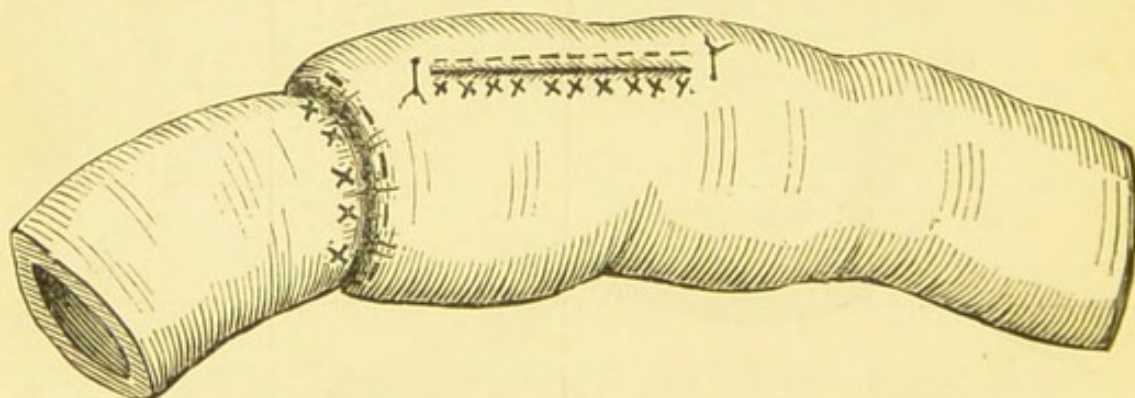


FIG. 33.—Showing incision in the intussuscepiens closed, and the neck of the intussusceptum united at end with sutures (final stage).

distal part with vulsellum forceps, and drawing it out of the intussuscepiens, ligaturing any vessel that required tying; then, with a few sutures, I stitched the cut ends

together (Fig. 32). The stump was then returned into the intestine, and the opening through which it had been drawn out was closed (Fig. 33) by a double row of quilt sutures, and the part dropped back into the abdomen. In one case I sutured the intestine together at the junction of the intussusception part with the lower portion of the bowel, but this is not, I think, at all necessary. These experiments were successful, and there were no bad symptoms afterwards.

Surely this is a rational proceeding; and if it can be carried into practice, how much better to adopt such an operation than to inflict an artificial anus upon a patient for the remainder of his life, or submit the patient to such a dangerous and prolonged operation as excision of the whole part, and restoring the continuity of the intestinal canal by means of ileo-colotomy or enterorrhaphy.*

I am glad to find that Dr. Senn's further experience† coincides very closely to that obtained by me in this experiment.

He affirms that the treatment of intussusception should follow the lines employed in strangulated hernia; that peristalsis should be arrested by emptying the stomach, by suspending stomach feeding, and by the administration of opiates; and that, failing reduction by insufflation (with hydrogen gas), aided by inversion and complete relaxation of the abdominal muscles by the use of an anæsthetic, surgical interference is called for. Enterotomy and colotomy are only warranted if the patient's condition does not allow of the abdomen being opened and the intussusception being reduced or excised, which should be done in all other cases of irreducible invagination.

* Since this was in the press, Mr. A. Barker has suggested and carried into practice a similar proceeding, differing only slightly in detail.—*Lancet*, Sept. 9, 1891. — 1892. I 49.

† *Canadian Practitioner*, August, 1891.

The direct reduction in acute cases is aided by previous compression with a large sponge, to reduce the swelling of the intussusception, and is effected by drawing on the bowel in opposite directions, above the neck of the intussusciens, and upon the sheath below the apex of the intussusception, combined with pressure against the intussusceptum from below upwards. Adhesions between the serous surfaces may be separated by the use of a Kocher's director or a small pair of straight, blunt-pointed scissors before traction is made. After reduction, any small patches of gangrene or rents of the peritoneal coat are to be covered by stitching the peritoneum over them. Recurrence is avoided by shortening the mesentery, by folding it in the direction of the bowel, and fastening the fold in this position with a few catgut or silk sutures. The following are the important conclusions of Dr. Senn :

'1. If the external surface of the bowel presents evidences of gangrene, disinvagination should not be attempted, and in such cases a resection is absolutely indicated. 2. The resection, under such circumstances, should always include the whole intussusceptum, but only so much of the intussusciens as is threatened by gangrene. 3. If the continuity of the bowel cannot be restored by circular suturing, either on account of the difference in size of the lumina of the resected ends or inflammatory softening, the same object is attained in an equally satisfactory manner, and more safely, by lateral implantation or intestinal anastomosis. 4. If the invagination is not extensive, but irreducible, and the bowel presents no signs of gangrene, the obstruction should be allowed to remain, and the continuity of the intestinal canal restored by making an anastomotic opening between the bowel above and below the invagination by the use of perforated decalcified bone-plates. 5. If the invagina-

tion is extensive, irreducible, and the bowel presents no indications of gangrene externally, the intussusceptum should be made accessible through an incision below the neck of the intussusciens and resected after securing the stump with an elastic ligature, after which the obstruction is permanently excluded by an intestinal anastomosis. 6. In irreducible colico-rectal invagination, or when this form of invagination has been caused by a malignant tumour, the intussusceptum should be drawn downward and removed by the operation devised by Mikulicz.'

Three Experiments of Artificial Intussusception, in which a subsequent operation was performed and the Intussusceptum excised through an opening in the Distal Portion of Intestine. Performed at the Laboratory of the Royal College of Physicians and Surgeons.

EXPERIMENT I. — Successful. On June 11th, 1891: Black retriever; being thoroughly anæsthetized, I, with the assistance of Dr. Morotti, performed the following operation. I made an incision in the middle line below the umbilicus, and withdrew the cæcum and a portion of the ileum, and endeavoured to invaginate the latter into the colon; but, as there was some difficulty in doing so, I contented myself by invaginating about 4 inches of the ileum into itself, being careful that the proximal portion was introduced into the distal. The invagination was secured by a few of Lembert's sutures, and the intestine dropped back into the abdomen, and the wound in the parietes closed.

The dog suffered no ill effects. On the sixth day after the operation I again placed the dog under an anæsthetic and reopened the abdomen. The intussusception was

readily found, and withdrawn through the parietal opening.

The intussusceptum was firmly fixed by strong adhesion. I then made a longitudinal incision in the convex portion of the distal part of intestine, directly over the end of the intussusceptum, and readily pushed this out through the opening. I next snipped the intussusceptum away about a quarter of an inch from the point of entrance, caught up and ligatured with catgut a few bleeding points, and inserted six chromicized catgut sutures through the divided end, thus securely fastening the two surfaces of the intussusceptum just at its entrance. The stump was then returned into the distal portion of the intestine and the longitudinal incision closed by a continuous catgut suture passing through all the coats of the intestine, and an outer line of quilt sutures passing through the serous and muscular coats only.

The abdominal wound was closed in the usual manner, and the animal released. The operation did not affect the dog in the slightest. Ten days afterwards he was killed with chloroform.

Post-mortem.—Abdominal incision quite healed. Great omentum adherent to parietal wound. The portion of intestine operated on was removed.

The longitudinal incision was perfectly closed. On slitting up the intestine, the stump of the intussusceptum was found to be quite patent and firmly united. The lumen of the gut was slightly contracted; I have but little doubt, however, in a short time this would have disappeared.

EXPERIMENT II.—Successful. A tan terrier. With Dr. Morotti's assistance, an artificial intussusception was made. Five days after the animal was again anæsthetized, and the abdomen opened. On withdrawing the intussusception, I found the catgut sutures which fixed

it absorbed, and, upon making slight traction, the invagination was readily reduced. The adhesion, which was very slight, only existed at the neck ; the two serous surfaces of the intussusception were quite free, and no sign of lymph was thrown out. I cut a portion of the intestine out, and performed an enterorrhaphy. The dog made a perfect recovery.

EXPERIMENT III.—Successful. A tan terrier. With the assistance of Dr. Morotti, I performed an identically similar operation as in Experiment I., only I allowed ten days to elapse between the first and second steps of the operation.

The dog made a perfect recovery, and was killed with chloroform a fortnight later. The specimen is perfect ; the thickening of the stump of the intussusceptum being greatly reduced.

OBSTRUCTION BY NEOPLASMS.

New growths may be either innocent or malignant. *Innocent tumours*, such as a polypoid growth, may spring from the mucous membrane, and by causing an invagination or flexion of the intestine, cause obstruction.

If the tumour alone is the cause of the obstruction, it should be removed by laparo-enterotomy ; if invagination or flexion be found to exist, it may be often corrected by removing the growth in this manner.

A few cases have recently been reported where the obstruction was caused by cysts attached either directly or indirectly to the intestine. Senn in his work has alluded to this, and has recited cases reported by Buckwald and Kulenkampff. In such cases the abdomen should be opened, and, if practical, the cysts removed, or aspirated, when in some cases they will shrivel and become obliterated.

Malignant Growths.—The treatment of these differs materially as to the position in which they exist. Sarcoma is more commonly met with in the small intestine than in the large, and as it rarely gives rise to symptoms of obstruction it does not usually come under the notice of the surgeon until extensive infiltration of the mesentery and retro-peritoneal tissues has taken place, and when any surgical interference for its removal would be a highly hazardous proceeding.

Should, however, the case be diagnosed before such infiltration has taken place, then undoubtedly the growth, with a portion of intestine and mesentery to which it is attached, should be removed, and the divided ends of the intestine united by circular enterorrhaphy, or by lateral apposition by means of approximation plates.

In the case of carcinoma, which is usually present in the large intestine, the surgical treatment will vary according to its position in different parts of the canal.

This disease often progresses so insidiously that it may be present for months without having been even suspected, until suddenly symptoms of obstruction take place. A case came under my observation some months since, in which I was asked to see an elderly gentleman, who had suddenly been seized with symptoms of obstruction. The abdomen was distended, and the patient complained of much pain and tenesmus. Examination per rectum revealed nothing. No tumour could be discovered. The symptoms all pointed to an obstruction being situated in the large intestine. I advised operation, and suggested right lumbar colotomy. The patient, however, declined all operative interference, and died in great agony the following day.

At the post-mortem examination an annular carcinomatous stricture was found in the descending colon.

In those cases where a distinct growth can be felt

before obstruction takes place, I have no hesitation in recommending cœliotomy to be performed, with a view of removing the growth if possible, and restoring the continuity of the canal by one of three methods, viz. : (1) by lateral apposition with approximation plates, the ends of the colon being closed by inverting the divided edges, and fixing with a continuous chromic gut suture ; (2) by performing ileo-colostomy, by inverting and closing the divided end of the colon by sutures, and implanting the ileum into the colon at the distal side of the growth ; (3) by colorrhaphy, by means of decalcified bone tubes. Should it be impracticable to perform any of these operations another method may be adopted, viz. : to invert and close the distal end of the divided colon and unite the proximal end to the edges of the abdominal wound, and to establish an artificial anus.

The operation of ileo-colostomy, as I have performed it, which will be fully described in a future lecture, is so successful that I should always recommend its adoption in those cases in which the disease is extensive, and is attended with difficulty or danger on account of the patient's enfeebled condition.

I have now practised this operation on three occasions, all of which, so far as the relief to the patient was concerned, were successful.

OPERATION OF ILEO-COLOSTOMY FOR ORGANIC DISEASE OF THE CÆCUM, CAUSING OBSTRUCTION.*

On August 2, 1889, Dr. Hayes, of Basingstoke, asked me to see a gentleman suffering from a tumour which occupied the right iliac fossa, extending upwards to within 2 inches of the false ribs, and forwards to nearly an inch beyond the right linea semilunaris. The patient

* *Lancet*, 1891, vol. i, p. 359.

had suffered considerably from time to time from irritation and discomfort of the bowels. During the two months previous to my seeing him he had been much worse; he complained of constipation, alternating with irritative diarrhoea, general uneasiness, and great pain. He had been seen by a physician, who pronounced him to be suffering from epithelioma of the cæcum, with which diagnosis I fully agreed. The patient was a tall, spare man, over fifty years of age, with sallow complexion and good pulse. He had been losing flesh rapidly, and was very low. The bowels had not been opened for some days. The abdomen was somewhat tympanitic; but he complained of no tenderness excepting over the tumour. A tumour was discovered occupying the situation above described; hard, and somewhat firmly fixed. As the symptoms were urgent, I suggested that the abdomen should be opened, and we should be guided by circumstances what operation should be performed to relieve the patient of his distressing symptoms. The removal of the growth appeared to be impracticable, and I explained to the patient and Dr. Hayes that I should be prepared to perform ileo-colostomy by implanting the ileum into the transverse colon, and by such means trusted that the remaining term of his life might at least be made more endurable. On August 3rd, with the assistance of Dr. Hayes and Dr. Purcell, Dr. English giving the anæsthetic, I opened the abdomen by an incision about 3 inches long over the right linea semilunaris, all bleeding points being caught with pressure-forceps. I opened the peritoneum along the whole length of the incision, and immediately came down upon a large mass of disease, extending from the cæcum nearly as high as the transverse colon. It being quite impossible to remove this, I determined to divide the ileum, and implant the proximal end into the transverse colon.

Passing the index-finger of the left hand along the inner side of the cæcum, a portion of ileum, close to the ileo-cæcal valve, was easily drawn out of the wound; I then passed two pieces of indiarubber cord lightly round the

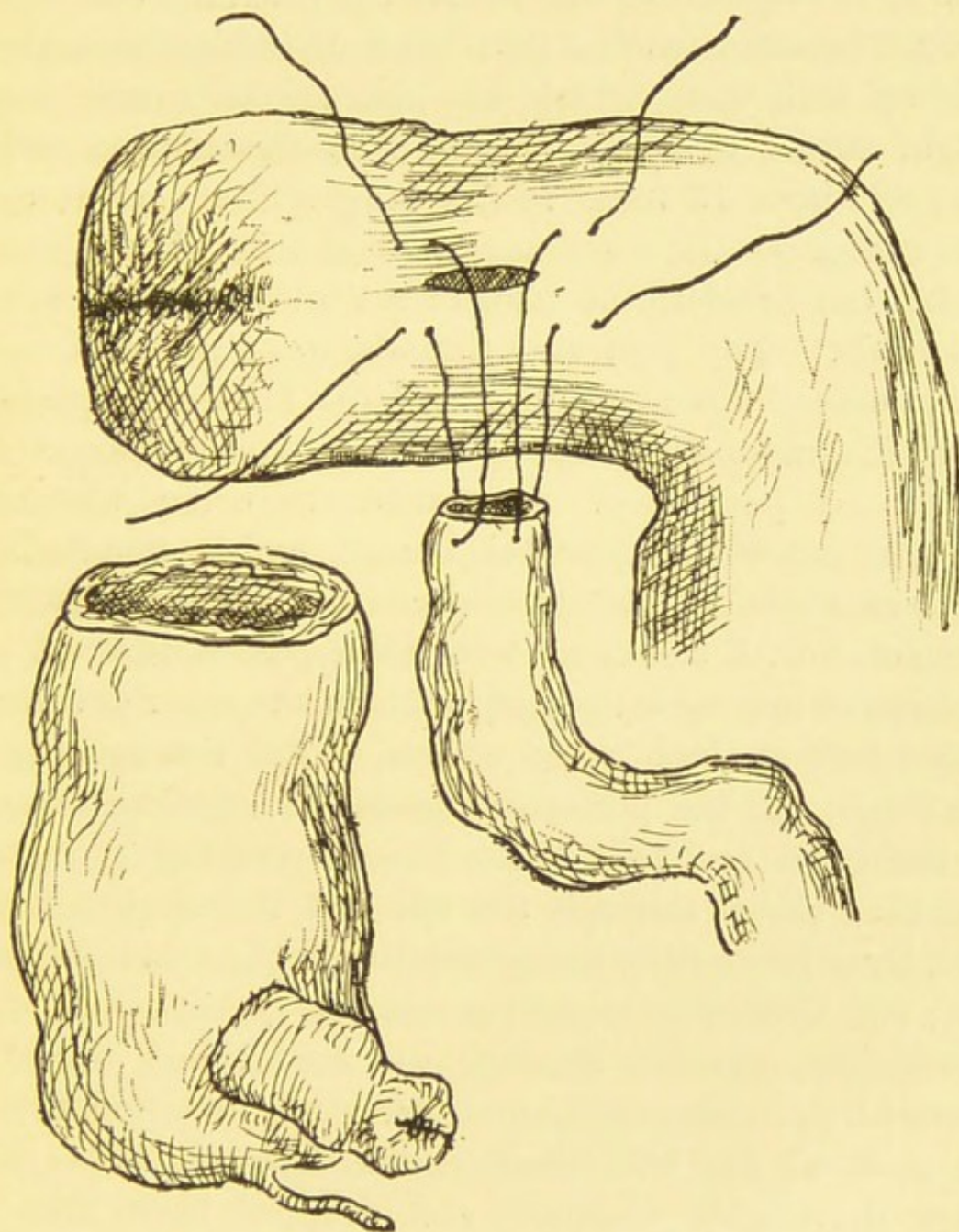


FIG. 34.

intestine, about 4 inches apart, the piece on the distal end being placed about 2 inches from the ileo-cæcal valve; I next divided the intestine completely across, between the two indiarubber ligatures, caught up and

ligatured all bleeding points, and washed the divided ends thoroughly. The cut end of the distal part of the ileum was inverted and closed by stitching together the peritoneal surfaces with a fine silk suture. The next step in the operation was to line the proximal end of the divided intestine with a thin band of indiarubber, about half an inch wide, which was fastened by a continuous catgut suture to its cut edge. Two chromicized catgut sutures about 18 to 24 inches long, and armed at each end with a needle, were next passed through the india-rubber band and all the coats of the intestine from within outwards. The posterior threads were passed one on either side of the mesentery, and the anterior threads at equal distances apart through the convex surface of the bowel. A portion of the transverse colon was next brought out of the parietal wound, and a longitudinal incision made in its convex surface; the long sutures connected with the ileum were then passed through the serous and muscular coats of the colon, the anterior threads about half an inch apart at one end of the opening in the colon, and the posterior threads at a similar distance at the other end (Fig. 34). The open end of the ileum was then thrust through the slit and the sutures firmly tied, thus preventing the possibility of the bowel slipping out; two Czerny-Lembert sutures, one on each side, were introduced, passing through the serous and muscular coats of the colon and small intestine, and tied firmly. An omental flap was finally fastened round. The parts were thoroughly cleansed and dropped back into the abdomen, and the parietal wound closed and dressed in the usual way. The operation lasted about one hour.

The patient stood the operation very well, and was returned to bed, and ordered to be fed with nutritive enemata and zyminized meat suppositories for the first twenty-four hours.

August 4th: Motion passed naturally by the rectum to-day, and continued to do so daily. No tenderness over the abdomen, excepting over the original tumour, the outer and lower side of which is brawny, and had all the appearance of deeply-seated cellulitis. 5th: I visited the patient with Dr. Hayes, and found the bowels had acted naturally and well, and the wound looked healthy. A large abscess was pointing at the upper part of the thigh; this was freely opened, letting out a large quantity of stinking pus; this was kept syringed out and drained. The patient takes his nourishment well, and is kept up with brandy, champagne, beef-tea, etc. The patient had not sufficient vital power left to resist the constant drain of the abscess, and died on August 16th, thirteen days after the operation.

Had this patient been operated on earlier I am convinced that his life might have been materially prolonged. So far as the operation was concerned, it was all that could have been desired. There was no peritonitis, and fæces passed freely from the day of the operation until his death, nearly a fortnight after.

When, however, the disease is situated low down in the sigmoid flexure, or in the rectum, there is nothing open to the surgeon save colotomy either in the right or left loin, or in the left iliac region.

It will be well here to inquire briefly into the danger of these operations, and for this purpose I would refer you to the experimental researches of Professor Senn and myself.

Dr. Weir has collected thirty-five cases of resection of the large intestine in the human subject, the mortality from which, when the symptoms of obstruction demanded coeliotomy, amounted to 100 per cent.

It would appear, then, that operations on the large intestine are much more dangerous to life than similar

operations on the small intestine. Yet by adopting one or other of the operations of implantation or lateral apposition by approximation discs, the mortality is reduced to a third, and no doubt, by practice and in skilled hands, may be reduced still lower.

Professor Senn operated upon six dogs by implantation, seven by lateral apposition with Lembert sutures, and the third set by lateral anastomosis by means of approximation plates, with a mortality by the first operation of 33 per cent., by the second of 28 per cent., and by the third of 33 per cent., while in the three cases reported by myself all recovered.

The following experiments have been performed by me, all of which were successful :

*Three Experiments of Ileo-Colostomy (all successful).**

EXPERIMENT I.—Successful. July 9th. A dog. Incision made in middle line below the umbilicus. The cæcum was drawn out through the wound, and the ileum divided about 3 inches from the ileo-cæcal valve. The distal end was invaginated into itself, and fixed by a continuous catgut suture. The peritoneal end of the gut was lined with a thin piece of indiarubber in a similar manner to that described for enterorrhaphy. Two threads of catgut, some 24 inches long, each thread being armed with two needles, were used. The posterior thread was passed through all the coats of the intestines, one thread on either side of the mesentery, and the other thread was passed through the opposite convex surface of the intestine in two places ; these threads were then given to an assistant to hold, while a longitudinal incision was made on the convex surface of the ascending colon. The sutures connected with the ileum were then

* *Brit. Med. Journal*, 1889, vol. ii.

passed through the serous and muscular coats of the ascending colon at either end of the opening. The mesenteric sutures at the lower and the anterior threads into the upper were about 1 inch apart, and half an inch from the extremities of the incision; the ileum was then pushed into the slot, and the ligatures tied securely at either end. A Czerny-Lembert stitch was inserted on one side where the edge did not appear to be closely approximated. The dog had not the least inconvenience from the operation, and had thriven up to the time he was killed. On November 26th, twenty weeks after the operation, the dog was killed. He had gained 4 lb. in weight since the operation. The union of the ileum with the ascending colon at the seat of operation was perfect, and allowed a full stream of water to pass.

EXPERIMENT II.—Successful. July 16th. Dog. Operation performed exactly in the same manner as last, excepting that the abdominal incision was made outside of the rectus muscle on the right side. The dog made an uninterrupted recovery, and was killed eighteen days after operation.

EXPERIMENT III.—Successful. July 26th. Dog. Abdomen opened by median incision; all other steps of the operation the same as in last two cases. The dog was killed three weeks after operation.

ENTERO-LITHIASIS.

In cases of impaction of foreign bodies in the intestine, cathartics should never be given, as it has been found that ulceration of the mucous membrane around the foreign body often takes place, which may lead to gangrene and perforation.

Should the patient be seen early, massage, combined with large injection, may be tried; and in such cases I

would urge the use of large quantities of sweet oil (a pint or more), followed by copious injection of warm water. The injection should be given very slowly—indeed, in many cases I advise the foot of the bed to be raised some 12 inches or so higher than the head, and a long tube to be introduced into the rectum, and the warm-water injection allowed to permeate into the bowel by gravitation. The water being placed in an irrigator or reservoir connected to the rectal tube, some feet above the patient, by this means I have often been enabled to pass considerable quantities of water into the bowel (Fig. 28, p. 132).

Usually, however, the assistance of the surgeon is not called in until urgent symptoms have set in, and when the patient is somewhat exhausted; in which case time is of the greatest importance, and cœliotomy should be had recourse to without delay.

The most usual position for a foreign body to be located is in the vicinity of the ileo-cæcal valve.

In performing cœliotomy, the incision should be made in the middle line below the umbilicus, and the neighbourhood of the ileo-cæcal valve explored; if the foreign body is not found there, the distended intestine should be traced to the seat of obstruction. This having been determined, the course to be pursued will depend upon the pathological conditions at the seat of impaction.

In the first place, the surgeon should endeavour gently to push the concretion onwards; but it must be always remembered that the coats of the intestine around are often weakened and in some cases ulcerated, so that the greatest caution must be exercised; and for the same reason the intestine should never be punctured or incised directly over the concretion.

Should, however, the intestine appear to be sound,

submural crushing of the stone should be practised, with, in many cases, every prospect of success. If this, however, fail, then Tait's suggestion of attacking the stone by passing a needle obliquely through the intestinal wall and breaking it down should be practised.

Tait directs that a stout steel needle, such as is used in electrolysis, should be introduced obliquely through the intestinal wall, an inch or two below the impaction, in order to secure healthy tissue for the seat of puncture.

After the stone has been broken up, and the débris within the gut has been pushed into a healthy segment of the bowel below, the puncture in the serous coat should be closed by a fine superficial suture for the purpose of preventing leakage.

Should these means fail, the foreign body should be pushed in an upward or downward direction for an inch or two, so as to bring it to a perfectly healthy portion of the intestine, and a longitudinal incision made into the intestine on the side opposite to the mesentery, sufficiently large to allow of the concretion being removed. After its removal, the incision should be closed by a row of quilt sutures passing through the serous and muscular coats. Should the incision have to be made through the inflamed portion, it would be wise to protect it by an omental flap.

In the event of the portion of bowel at the seat of impaction having become gangrenous, it will be necessary to excise it; and as the proximal portion will of necessity be very much dilated, any attempt at performing enterorrhaphy would be futile. The ends of the two dividing portions of intestine, therefore, should be inverted and fixed by a continuous catgut suture, and the continuity of the canal restored by lateral anastomosis by decalcified bone-plates.

FÆCAL ACCUMULATIONS.

These are almost always met with in the large intestine, usually in the sigmoid flexure, cæcum and ascending colon. The treatment of these cases resolves itself into administering large enemata of sweet oil, followed by copious injection of warm soapy water.

Massage and faradic current are also of use, applied over the abdomen; and in the event of the accumulation of fæces blocking the rectum, the masses should be broken up and mechanically removed.

The use of purgatives in such cases is useless; but small doses of strychnine are often of much service, by promoting the contractility of the muscular coat of the intestine. I have never seen a case which withstood the employment of sweet oil and copious water enemata persistently and thoroughly carried out, and accompanied by judicious massage or electricity.

LECTURE III.

SURGICAL DISEASES AND INJURIES OF THE INTESTINES.

Typhoid Ulcer—Appendicitis—Typhlitis—Peri-typhlitis—Para-typhlitis—Cæcitis—Treatment—Indication for Early Cœliotomy—Operative Treatment of Perforation—Peritonitis—Exploration—Operations—Injuries to Intestines—Gunshot Wounds—Incised Wounds—Operations—General Preparations—Rupture of Intestine ; Treatment—Fæcal Fistula ; Treatment.

IN this lecture I propose discussing the treatment of different forms of ulceration of the bowel wall and other perforations of the intestines, and giving a short account of the best methods of treating these, as well as injuries caused by gunshot and incised wounds, and rupture of the intestines.

PERFORATING TYPHOID ULCER.

This is one of the most common forms of ulcer found in the intestine. It is unnecessary to dwell at length on the symptoms met with in this form of ulceration ; but if blood is suddenly discovered passing in the motions in a patient who is convalescing after typhoid fever, and there is pain and tenderness over the abdomen, it may be generally safe to arrive at the conclusion that ulceration is taking place.

Absolute rest and strict attention to diet will be most necessary, and the abdomen and temperature chart should be closely watched, as these ulcers at any moment

may perforate the coats of the intestines into the peritoneal cavity, causing peritonitis, which, if not treated with energy and promptitude, will lead to speedy death; and I have not the slightest hesitation in saying that coeliotomy should be practised at once.

Dr. James Wilson was among the first to recommend operation for these cases, and Morton has reported two cases in which he has operated.*

Median incision will undoubtedly prove best in almost every case. It should be as long as is necessary for efficient work, and commence a little more above the pubes than is usual in such incisions. Extreme gentleness will be required throughout, as otherwise, perhaps in any case, other ulcers may be broken through.

Let systematic search for lesions commence at once upon gaining admission to the peritoneal cavity, starting in order at the points most likely to be involved.

First examine the cæcum and its appendages; then carefully go over the entire length of the small intestine continuously, from its termination in the cæcum to its origin at the pylorus, by passing it between the fingers. This finished, in like manner the colon should be examined. Should the surgeon fail to find the perforation in this manner, hydrogen gas may be introduced by the rectum, when by the escape of the gas the perforation will be readily found.

The treatment of the lesion when found is most important. Perforations in a large majority of cases will be found in the small intestine, corresponding to the position of Peyer's patches. Occasionally a follicular ulcer will perforate near the mesenteric border. In nearly every case such an ulcer occurring in the small intestine would be in a longitudinal direction; hence the entire ulcer can be turned into the bowel, and the peritoneal

* *Phil. Med. Times*, Dec. 11, 1886.

surfaces approximated by introducing a row of Lembert or quilt sutures, beyond the lateral borders. This is undoubtedly the best method of dealing with most perforations or ulcers about to perforate. The probability of narrowing the bowel immoderately must be kept in view, and where the above suggested mode of repair would undoubtedly give rise to such narrowing resection or artificial anus must be substituted.

Here I would insist, if the patient's strength will allow of it, that after resection of any part of the intestine its continuity should be maintained, either by circular enterorrhaphy or by lateral apposition by approximative discs, and that a fæcal fistula should only be established when such a course is impracticable on account of the weak condition of the patient.

Irrigation with warm boracic or iodine solution should in all cases be had recourse to, and in most cases drainage will be absolutely necessary.

The following interesting and instructive case certainly supports the views I have advocated :

*A Successful Case of Laparotomy for Intestinal Perforation in Typhoid.**

Dr. W. Van Hook, in a recent number of the *Philadelphia Medical News*, reports an interesting case of laparotomy for intestinal perforation in typhoid which proved successful, along with two in which the patient succumbed, in the one before the operation could be completed, and in the other, after the lapse of fourteen hours. The patient was a lady, æt. 31, who had only a mild attack of the disease, inasmuch as on the sixteenth day the temperature was normal, and at the end of the third week she was allowed to attend to light domestic

* *Medical Press and Circular*, Dec. 23rd, 1891.

duties. After fourteen days of such duties she was suddenly seized with a severe rigor, followed by a temperature of 104° , high pulse, and severe prostration. The diagnosis was that these symptoms indicated a relapse. On the seventh day of this supposed relapse an enema of warm water was given to relieve constipation, the bowels not having acted for thirty-six hours. Three motions were passed at intervals in consequence, and about an hour after the last the patient was suddenly attacked with great pain in the ileo-cæcal region, followed by coldness of the extremities and other signs of profound collapse. This was recognised as due to intestinal perforation. The abdomen was opened in the median line, about $2\frac{1}{2}$ inches below the umbilicus, and exit given to more than a pint of fluid fæces, mixed with lymph. There was general peritonitis, and on searching the opening was found. It was irregularly circular and about 2 millimetres in diameter. The portion of gut was carefully sponged with sterilized gauze, and the opening closed with three longitudinal rows of interrupted Lembert sutures. The gut walls were so thick and so brittle from œdema that three rows were thought necessary to secure strength. The abdominal cavity was thoroughly washed out with hot sterilized water, and the omentum carefully drawn over the injured coil of intestine and sutured to the mesentery. A large drainage tube was passed to Douglas's pouch, and the rest of the abdominal wound closed. The patient rallied, and in two and a half weeks the typhoid symptoms had run their normal course, the patient ultimately making an excellent recovery.

APPENDICITIS.

The literature of the surgical treatment of the affections in the ileo-cæcal region has been increasing very rapidly

during the last few years. Surgeons have taken widely different views on the subject; and some of those who a year or two since were most loud in their cries for early operative interference in cases of perforative appendicitis, typhlitis, para-typhlitis, and peri-typhlitis, are now modifying their views.

The extensive anatomical researches of Treves utterly disproved the old idea of the cæcum and appendix being continuous posteriorly or otherwise with the sub-peritoneal areolar space. Hence perforating appendicitis, and the still more rare cæcitis, must primarily produce peritoneal inflammation and suppuration, limited or diffused; or else, by the occurrence of adhesions before the accomplishment of the perforation, give rise to a sub-peritoneal abscess—the so-called para-typhlitis. Both varieties undoubtedly exist; but if it be admitted that the first form occurs, it is right that the pus should be evacuated as soon as its presence is recognised. This, according to Fity, who had made observation on 250 cases, is not later than the third day. This observer, Weir, and others, firmly hold the view of the intra-peritoneal origin and seat of these abscesses. Weir, who has had great experience, declares that he has never regretted operating too early in cases of right iliac inflammatory tumours. He remarks that laparotomy was necessitated for an advanced general suppurative peritonitis, or even in the rarer cases of acute perforation of the appendix. By lifting out the intestine filling the right iliac fossa, he says that the entire field of exploration was fully brought into view, and that lesions, difficult to detect at the *post-mortem* examination, could be recognised in the living subject quite readily by changes in colour and consistence which were lost in the cadaveric alteration.

After a careful consideration of the views advocated by different surgeons, I think we must be guided by

the exigencies of cases as they come before us; and from my own experience, which extends over a large number of cases, I think the surgeon who leans to the side of caution will have every reason to be satisfied. In the course of my practice, before abdominal section was so freely resorted to as now, I can recall a number of cases of what was then known as typhlitis and peri-typhlitis which got quite well without any surgical interference whatever; while, on the other hand, I can recall others in which suppuration took place either into the peritoneum, causing speedy death, or extra-peritoneally, the abscess pointing in the right inguinal region, in a few cases ending in convalescence, in others in death from exhaustion, after a long and tedious illness.

I would, then, advise you not to be deluded into recommending too early operative procedures, as in many cases they may be unnecessary, the patient recovering without them; and, further, it must be remembered that such operations are not free from risk in themselves.

From observation I have no doubt that the danger of the abscess opening spontaneously into the peritoneum at an early period has been exaggerated, and cannot be supported by clinical facts. I have but little doubt that, in a very large majority of cases of perforative appendicitis or cæcitis, adhesive peritonitis between the peritoneum covering the appendix or cæcum and that of the iliac fossa preceded the perforation; in which case the ulceration would extend into the sub-peritoneal cellular tissue in that region, and the peritoneal sac would not be invaded. It is for this reason that I would counsel delay in having recourse to operative procedure, as by operating early the peritoneal cavity must of necessity be opened, and the attempts of nature to expel the matter extra-peritoneally will be frustrated; whereas by

delay, supposing the adhesive peritonitis to have taken place, the surgeon, later on, may with much greater safety open the abscess extra-peritoneally.

I believe this to be the view held by most English surgeons and many American surgeons; while other surgeons—notably Professor Senn, Dr. Weir, and Dr. Keen—advocate early operative interference. Thus Senn remarks, ‘Extirpation of appendix at a time before the inflammatory process has reached the serous coat is one of the easiest and safest of all inter-abdominal operations. The operation is performed in a healthy aseptic peritoneal cavity; and if the customary antiseptic precautions are carried out, healing of the visceral and abdominal wounds by primary intention may be confidently expected. The operation eliminates a structure which, if not entirely useless, has, at most, only an unimportant physiological importance.’

I cannot agree with this dictum of Senn, as there can be no possible room for doubting that hundreds of cases of appendicitis get quite well with rest and appropriate treatment.

Dr. W. W. Keen, of Philadelphia, has laid down for our guidance certain indications for early laparotomy in cases of appendicitis.* He describes five different forms: (1) A mild and non-perforative form, ending usually in resolution without suppuration; (2) perforative appendicitis, followed by general peritonitis; (3) the most common form, in which the appendix is perforated and a local abscess forms more or less rapidly, which, if left to itself, ruptures externally or into a hollow viscus, and finally ends within a few weeks either in resolution or the death of the patient; (4) a class in which the abscess forms slowly and follows a chronic course, lasting for months before it either discharges or indicates an operation;

* *Transactions, Med. Soc. of the State of New York*, 1891.

(5) recurrent appendicitis, in which attacks are repeated at longer or shorter intervals. The first class of cases—that of mild appendicitis—may, Dr. Keen holds, be dismissed from consideration as not requiring operative treatment save in exceptional cases. Cases of the second class—in which perforative appendicitis is followed by acute general peritonitis—demand instant laparotomy. No cases in surgery—except, perhaps, those of hæmorrhage from large wounded vessels—require more prompt interference. The indications for immediate recourse to laparotomy in such cases are: brief symptoms of recent appendicitis, or of one or more recurrent attacks, followed by sudden excruciating pain over the whole abdomen, but most severe in the right iliac fossa, with the easily-recognised symptoms of general peritonitis and impending collapse. In cases in which perforative appendicitis takes for a time a mild course, and does not, until after an interval of some weeks, break out into general peritonitis, there is likely, in consequence of the deceptive mildness of the attack, to be much doubt as to the proper treatment. Dr. Keen thinks an exploratory operation should be undertaken when there is persistent pain and tenderness, with even slightly increased resistance without any tumour, and with possibly slight œdema and moderate fever. Many of these cases, Dr. Keen believes, may be included in the third class, in which an abscess—not, perhaps, of large size—has slowly developed, and at last has suddenly burst into the peritoneal cavity. Although there is occasionally much difficulty in distinguishing cases of this kind from those which run a continuously mild course and terminate in resolution, it is not impossible, it is held, to determine whether an abscess has formed or not. Dr. Keen relies mainly on local signs, which he regards as far superior to general constitutional symptoms. Even the tempera-

ture of the body may be a very deceptive guide, as this may be low while the local process is advancing towards a dangerous or fatal issue. He would lay it down as a rule, therefore, that even in mild cases, if the indications point even slightly towards suppuration, an early operation should be practised. An exploratory operation, it is asserted, 'carries with it less danger than the disease,' and no patient should be allowed to run the risk of probable or possible rupture and of general peritonitis. The most reliable symptoms of a localized abscess are pain and tenderness in the right iliac fossa—especially marked at what is called 'McBurney's point,' which is situated $1\frac{1}{2}$ or 2 inches from the anterior superior spine of the ileum, in a straight line towards the umbilicus—and œdema of the groin. If these signs be present, together with nausea and vomiting, rigidity of the abdominal wall on the right side, and fever, an exploratory operation should be performed on the second or third day. If no pus be found, the vermiform appendix should be sought for, and if—as Dr. Keen believes will almost uniformly be the case—it be found thickened, distended, occupied by a concretion, or otherwise abnormal, even without perforation, it should be tied and cut away.

In writing upon the subject, and upon the operative treatment of perforative peritonitis, J. Mikulicz (Konigsberg), says: The results so far of the operative treatment of perforative peritonitis, however brilliant in single cases, are not as a whole satisfactory. Not only the numerous failures, but still more the circumstance that the favourable termination depends in most cases less on our procedures than on accidents, fortunate, but beyond our calculation, show the present methods of treatment still contain gross and manifold defects. There is scarcely any doubt that by the operative interference many a patient is directly injured, *i.e.*, death is hastened. It is

but a poor consolation to us that the said cases would have all ended fatally without an operation. Consequently it is our task to determine the factors which in the present methods act injuriously. To secure a rational basis for this we must first of all study more closely the pathology of septic peritonitis, divide the blended description heretofore presented of peritonitis in general into a series of distinct types. For our purposes we must do this in two directions :

1. With regard to the starting-point of the peritonitis, it is clear that for the operative therapy in the individual case an exact knowledge of the point of perforation is of the greatest value.

h.B. 2. With regard to the form of the peritonitis, Mikulicz distinguishes, in agreement with other authors, two forms, which, while they may pass into one another, represent as a rule two essentially distinct types. The first form is the acute or peracute peritonitis following the immediate infection of a large portion of the peritoneal surface, *e.g.*, where a quantity of the intestinal contents suddenly pours into the abdominal cavity through a large perforative opening. When death does not result in a few hours under the symptoms of an intoxication, this form is characterized by a sanguiniferous or purulent-putrid thin fluid exudation of variable amount. The peritoneum is injected, at times covered by a thin fibrinous deposit. Firmer and more extensive peritoneal adhesions are wanting. Mikulicz proposes to use exclusively for this form the term *diffuse septic peritonitis*.

In the second form, which runs acutely or subacutely, the peritoneum is at first only infected in the immediate vicinity of the perforation. A fibro-purulent exudation is formed, which at the start excludes the focus of infection from the still intact peritoneum by peritoneal adhesions.

The process successively spreads, whilst between the glued viscera larger or smaller quantities of purulent exudation are encapsulated; thus the inflamed portion of the peritoneum remains continuously separated from the healthy, only that the limits are steadily spreading. For this form Mikulicz proposes the term *progressive fibro-purulent peritonitis*.

The separation of these two forms Mikulicz considers important, because in his opinion the operative procedure must be essentially different in each. In the first form the present method of freely opening the abdomen, finding and suturing the perforative opening, as well as disinfecting the whole peritoneum so far as possible, appears entirely rational. It is to be hoped that future experience will teach how to accomplish this in the most practical and yet uninjurious manner.

In the second form this way would be wrong. The point is to protect most carefully the adhesion limiting the infected peritoneum. Mikulicz is convinced that not a small portion of previous operations have failed because just these adhesions were freed, and thus the entire peritoneum given over to infection. It follows that in this form not the peritoneal cavity in its whole extent, but each intra-peritoneal focus of exudation must be opened separately. On this principle Mikulicz operated the following two cases with success:

1. A boy, æt. fifteen years, was suddenly attacked, November 15th, 1888, with symptoms of peritonitis. Admitted to the surgical clinic November 19th. A peritonitis starting from the cæcum was diagnosticated, and immediately an intra-peritoneal pus-cavity located over the right crista ossis ilei opened. November 20th, the incision was lengthened along Poupart's ligament to the rectus muscle. A second large cavity was opened, and the perforated vermiform appendix resected. Novem-

ber 29th, incision over the left Poupart's ligament. About one-half litre of stinking pus was discharged. December 5th, two cavities in the median line, each egg-sized, were opened. December 17th, opening of a larger abscess in the left pelvis, starting from the inner angle of the former wound. Complete relief followed. The pelvic abscess was drained upward by caoutchouc tubes, the remaining abscess cavities filled with iodoform gauze.

2. A man, æt. twenty-nine years, slender build, was attacked the beginning of June, 1887, with the symptoms of peri-typhlitis. June 12th, symptoms of a peritonitis involving the lower half of the abdomen. Discharge of 100-300 cm. of stinking pus through an incision over the left Poupart's ligament. June 12th, discharge of about a litre of similar pus from the pelvis through an incision in the rectum. June 20th, a pus cavity was opened over the right crista ilei, and anus preternaturalis formed, opening from a loop of the ileum. Although the symptoms of peritonitis now subsided in a few days, the patient recovered but slowly. Hence the cure of the anus preternaturalis was not undertaken until January, 1888. As the opening of the ileum into the cæcum seemed to be impermeable, an ileo-colotomy was performed above the cæcum. Since March, 1888, the patient has enjoyed undisturbed health, and presents a vigorous appearance.

In the first case six intra-peritoneal pus cavities were emptied through three incisions, in the second case three cavities by the same number of openings. In each case the openings were made at different times according as the separate foci became evident. The diagnostic indications were increased resistance and pressure-sensitiveness, dulness, as increase of the previously lowered bodily temperature. In doubtful cases an exploratory puncture was made. Moreover, Mikulicz believes that fibro-purulent peritonitis does not spread as erratically as we may

have heretofore supposed. Probably certain rules will be found even here. According to Mikulicz, the incisions must divide the abdominal parietes where the pus cavity appears most prominent; they must not be too small.

Mikulicz advises not to sew them up, but to fill the cavities loosely with iodoform gauze, possibly putting in a caoutchouc drain. For washing out the abscess cavities use as simple fluids as possible (boric acid). The washing-out must be done with extreme care (very weak current) lest the adhesions be ruptured.

As to after-treatment, he recommends keeping the bowels quiet by the free use of opium and suitable diet. Finally, Mikulicz says the patient should be kept under close observation until the abdomen is everywhere soft and painless, the bodily temperature has remained normal for several days, and the general feeling of well-being is completely established.*

In discussing the subject, Koenig mentioned the extensive and favourable results of American surgeons in cases of traumatic perforative peritonitis. He also described a case of stabbing in the left inguinal region, admitted fifteen hours after the injury, with distension and sensitiveness of abdomen, and vomiting. He enlarged the wound, let out turbid fibrinous fluid, and sewed up four punctures with two linear injuries of the gut wall. Ablution with warm-water, reduction, closure of external wound with drainage. In three weeks the patient was completely cured.

Dr. Rosenberger (Wurzburg) reported a successful operation on a boy, æt. twelve years, moribund from perforative peritonitis. Incision as for ligation of left iliac artery. Discharge of stinking pus and a large faecal concretion. After holding patient so as to allow

* XVIII. *Germ. Surg. Cong., Author's Report. Centbl. f. Chir.*, No. 29, 1889.

the pus fully to discharge, drain and dressing were applied without irrigation. Cure.

Dr. Wagner (Koenigshutte) had operated three times within a year. (1) For typhoid perforation in a convalescent woman; eventeration of intestine, irrigation, suture of wound without drainage; cure. (2) For traumatic perforating peritonitis eighteen hours after injury. Intestine perforated at three points, which were sutured. Irrigation. Putrid peritonitis already existed. Death in fourteen hours under collapse. (3) Powerful man suddenly attacked with symptoms of ileus. Putrid peritonitis from perforation about a handsbreadth above the cæcum. Suture of the opening. Result as yet uncertain—operated only a few days previously. Wagner reduces the protruding intestines by a piece of iodoform calico pinned at the corners to the abdominal wall.

Dr. Steltzner (Dresden) reported two cases of round ulcer of the stomach in young girls, operated on within twelve hours of the perforation. Both were fatal, one from perforation of a second ulcer. Still he favours operating in such cases.*

In mild cases the patient should be kept in bed at perfect rest. Hot fomentations and turpentine stupes should be constantly applied over the whole abdomen.

The colon should be emptied by enemata, and the patient fed upon liquid and non-stimulating diet, which is easily assimilated. The patient must be most carefully watched, and should the symptoms continue to intensify, and point to the patient drifting into a condition in which the chances of recovery after operation are markedly diminishing, the surgeon should hold his hand no longer.

Exploration with Aspirating Needle.—In those cases in which no distinct tumour can be felt, but yet the

* *Centbl. f. Chir.*, No. 29, 1889.

symptoms point to the formation of pus, many surgeons have advised the use of a fine aspirating needle for the purpose of exploration and localizing the seat of the abscess. I cannot recommend this practice, as I am sure I have seen much harm done by it, and in any case it cannot be devoid of danger. It has been proposed also to use an exploring needle by the rectum, but here also its use is not free from danger. If, therefore, operative proceedings are indicated at all, I should always select free incision over the seat of mischief.

Operation.—Numerous incisions have been recommended for opening the abdomen in these cases. Some surgeons recommend a median incision, others an oblique, above Poupart's ligament; others cut through the right linea semi-lunaris.

There can, however, be no hard and fast line laid down as to what incision shall be employed, but I think the best situation for it will be found to be that which is directly over the seat of mischief.

In a large number of cases the incision adopted for ligaturing the external iliac artery is a good one, as by this the peritoneum can be gently raised, and if the abscess has formed in the sub-peritoneal tissues, it can be evacuated and washed out without opening the peritoneal cavity at all; and in such a case Mr. Pearce Gould has recommended that the vermiform appendix should not be removed, but the wound be thoroughly cleansed and irrigated with antiseptic washes and drained.

The incision which I have adopted for removal of the appendix is that over the right linea semi-lunaris, as by it I come directly down upon the long axis of the cæcum and ascending colon. The incision should be about 4 inches long and directly over the centre of the cæcum, and commence at about 1 inch from Poupart's ligament. The skin, fascia and muscular layer of the parietes being

divided, and all bleeding points caught in pressure forceps, the peritoneum is to be divided the whole length of the incision; and I find a good plan is to catch the peritoneum on each side with pressure forceps, and let them hang out of the wound. This has the advantage of preventing oozing from the divided parietes running into the cavity of the abdomen.

The peritoneal cavity being opened, a small, flat sponge should be packed to the inner side of the cæcum, to prevent the prolapse of small intestines. If the appendix is below the cæcum it will come into sight at once, when it can be examined and dealt with.

If, as is more frequently the case, it is behind and towards the inner side, its size and direction can be readily ascertained by palpation, or the lower margin of the cæcum can be raised for its more careful examination.

If the serous coat has not been implicated by the inflammation, the only attachment to be separated is the mesentery of the appendix. This is always present, but varies greatly in length and width. If it is attached to the whole length of the appendix, it should be ligated in several sections with fine silk or chromicized ligatures as far as the cæcum. If inflammatory adhesions are present they are to be separated, and all bleeding points carefully tied. When the appendix has been thus completely isolated, a ligature of fine silk may be tied around its base, close to the cæcum, and about a quarter of an inch below it the section should be made with scissors, or it may be dealt with in the manner directly to be described.

As the interior of the appendix under such circumstances necessarily must always contain pathogenic micro-organisms, it is necessary to disinfect the cut surface of the stump thoroughly. This can be done with one of the disinfectant solutions, after which the stump should be dusted with iodoform.

The ligature approximates a diseased mucous membrane, and if after the operation the entire stump is not speedily surrounded by a wall of impermeable granulation tissue, which is later transformed into a connective-tissue capsule, there is great danger that perforation will take place after cutting through the ligature, thus exposing the patient to the same danger he was in before the operation. Senn, to obviate the possibility of such an occurrence, directs that the stump, after thorough disinfection and iodoformization, should be covered with peritoneum, by stitching the serous surfaces of the cæcum from both sides over it by a number of Lembert sutures. The serous surfaces will become agglutinated in a few hours, and in a few days the adhesions will have become sufficiently firm to protect the surrounding tissues and the peritoneal cavity against extravasation should leakage take place at the point of ligation. By resorting to this precaution we protect the patient against all possibility of the occurrence of perforative peritonitis subsequently, as the perforation, should it occur, of necessity would take place into the cæcum.

The plan that I prefer is to divide the appendix about half an inch from the cæcum, seize the serous and muscular coats on each side, and with a small curette thoroughly scrape out the mucous lining; then wash the raw surface, and invert the divided serous and muscular coats as far as possible, and, finally, with a continuous suture of fine chromicized catgut, close the opening. By adopting this plan the diseased mucous membrane is removed, and in some cases it will be found quite easy to invert the whole stump into the cæcum, thereby preventing any possibility of future trouble.

After the operation the bowels should be kept quiet for several days. This can be accomplished by giving small doses of opium, and placing the patient on low diet

for at least two or three days. On the third day a saline cathartic should be administered, and, if necessary, this should be followed by an enema. The sutures are removed at the end of the first week, but the patient is not allowed to leave the bed for another week for fear that the adhesions might yield, and a hernia follow. For several weeks after convalescence an efficient abdominal support should be worn to guard still longer against the same accidents.

The abdominal incision must be closed in the ordinary way.

INJURIES TO THE INTESTINES.

I must now pass on to the treatment of abdominal injuries and wounds of the intestines, and under this head I propose to include gunshot and penetrating wounds, and rupture of the intestines.

Gunshot Wounds.

Gunshot wounds of the abdomen are happily not of frequent occurrence in this country, whereas in America they are far from being uncommon. I cannot do better, then, than to draw largely from the experiences of American surgeons for the treatment of this form of injury. Dr. T. A. McGraw (Detroit) gives the following noteworthy points in laparotomy for visceral injuries :*

‘ 1. There are many viscera in the abdomen which are practically immovable—so immovable as to forbid operations upon them through the median line. When a gunshot wound is so located and so directed as to make the injury of an immovable viscus probable, the external incision should be made with reference to that fact.

* *Chicago Med. Journal and Exam.*, July, 1887.

'2. The course of a gunshot wound is determined not by chance, but by the operation of immutable laws.

'3. When a gunshot is deflected from its course, it is always at an acute angle, and, when deflected by a very soft substance of little resistant power, the angle of deflection must be exceedingly small. When, therefore, a gunshot passes into the abdominal cavity, the deflection of the ball from the time it leaves the aperture of entrance until it strikes the opposite wall cannot be sufficient to appreciably alter its course.

'4. The initial direction of the ball through the abdominal wall indicates very nearly its subsequent direction through the abdominal cavity. The careful study of the wound of entrance is, therefore, of the greatest importance, and no surgeon should open the abdomen for the repair of visceral wounds without first exploring the wound of entrance sufficiently to make sure of its course through the parietes.

'5. The ball, after passing through the abdominal cavity, may be deflected by the bones or soft tissues; but as it, in the vast majority of cases, pursues the remainder of its course outside of the abdominal cavity, these deflections should have no influence in determining the line of incision.

'6. Gunshot wounds of tortuous course frequently owe their apparent deviations from a straight line to a change in the shape of the abdominal wall subsequent to the shooting.

'7. In general, the course of the bullet through the abdominal wall, prolonged by a line drawn on the external abdominal surface, will indicate the course of the bullet through the cavity if its velocity is great. If at angles of 5° or of not more than 10° with this line, two other lines are drawn on either side of it, beginning at the wound of entrance, we will have represented on

the abdominal surface the greatest deflections of which a bullet is capable during its passage through the abdominal cavity. An incision, therefore, along the whole length of the first straight line could not fail to uncover every part of the course of the ball, provided that there has been no subsequent displacement of the injured tissues.

'8. For this reason an incision, beginning at the wound of entrance and prolonged to a sufficient distance in its course, is often the very best which the surgeon can make. This is especially true of such wounds as, beginning at a distance from the *linea alba*, pass in a direct line away from that line.

'9. The immovable viscera can be best exposed by incisions made parallel to their long diameters.

'10. When abdominal section is made for abdominal wounds, every organ and part of an organ which could possibly have lain in the path of the ball or weapon should be thoroughly explored by the surgeon, but to examine an exposed viscus or portions of viscera which could not possibly have been injured would be an error in practice.

'11. The prognosis of wounds of the empty stomach is not necessarily bad.

'12. Large accumulations of fat in the abdominal wall and cavity may sometimes contra-indicate laparotomy for visceral wounds.'

He narrates the following interesting case of recovery from penetrating gunshot of the abdomen, with wound of intestine, after laparotomy and suture of the intestine :

'Maggie McMahon, æt. twenty-four, was shot in the abdomen at three o'clock on Tuesday morning, December 21st, 1886. She was carried to St. Mary's Hospital at half-past eight o'clock, and I saw her at nine o'clock on the same morning. I found her vomiting bile, and com-

plaining of great pain. Her pulse was 120 per minute, her respiration 30, and her temperature 120° F. The bowels were moderately bloated and very tender, and two inches above and two inches inside of the right anterior superior spine of the ileum there was a gunshot wound with black edges. There was no tympanitic resonance over the liver, no extravasation of faecal matter, no emphysema, and no general meteorism. The pain was located in the hypogastric right iliac and right lumbar regions. The wound was supposed to have been made by a ball from a revolver of 32 calibre, although that point was never fairly settled. At twelve o'clock noon, I cut through the abdominal wall at the site of the wound, by making an incision of four inches long in the direction of the fibres of the external oblique muscle, the wound being in the centre of the incision. It was easy to trace the wound into the abdominal cavity by the discolouration of tissues, and it soon became evident that the ball had passed from before backwards, and from above downwards, into the peritoneal sac. My finger, on entering the cavity, immediately detected a hole on the anterior surface of the ascending colon, which I thereupon drew out on to the abdomen. This wound, from which the faecal matter was constantly pouring, was an oval with its long axis transverse to that of the intestine. It was about half an inch long and a quarter of an inch wide. I sewed it up with a continuous suture of catgut, in a double row, after Czerny's modification of Lembert's method. Searching then for the wound of exit, I found it also vomiting faeces directly behind at the junction of the meso-colon with the intestine. The meso-colon and meso-caecum in this case were long and completely surrounded the gut with peritoneum. The ileum was united to the intestine on its inner and posterior surface midway between the two wounds. The second wound had its long axis also

transverse to that of the bowel, and was sewed together in the same way as the first. This done, I was able to trace the track of the bullet down into the femoral canal before the external iliac and femoral artery, by a ragged opening in the muscle, but its course afterwards is a matter of great uncertainty. I carefully examined the small intestines without withdrawing them from the cavity, but found no other wound. The abdominal cavity was washed out and closed with wire sutures, and a drainage tube inserted. The patient began immediately to improve, and her temperature fell a degree on the same day; she vomited less frequently, and the ejecta contained only mucus and swallowed fluid. Her pulse fell to 100, but her temperature rose again on the second and third days to 102° F. After the third day the improvement was more marked, and on the sixth day she ceased altogether to vomit, and her temperature fell to 99° and 100°. The drainage tube was then withdrawn, without having discharged one drop of pus. Subsequently, however, a small superficial abscess formed in the track of the wound, and on the tenth day discharged a teaspoonful of pus. Her convalescence was thenceforth uninterrupted, and she left the hospital, February 2, suffering only from a lameness consequent upon the passage of the ball into the thigh.*

Sir Wm. MacCormac, in his admirable address delivered before the Medical Society in the year 1887, did much towards bringing the surgical treatment of these injuries to the intestines prominently before the notice of surgeons in this country, but probably the correspondence published in connection with the murder of President Garfield by a gunshot wound of the abdomen forced the subject more particularly before the attention of the profession.

About one-tenth of those slain in battle perish,

* *Chicago Med. Journ. and Exam.*, July, 1887.

Sir W. MacCormac says, from abdominal injuries, but only three or four per cent. of those who come under treatment suffer from bullet wounds in the abdomen. Wounds of the duodenum are rare and usually associated with other severe injuries, the jejunum is more frequently wounded, but the ileum is the most frequent seat of gunshot injury, and often the intestine is wounded in several different places.

Treatment.—All cases of gunshot wounds of the abdomen occurring on the battlefield should be rapidly and gently transported to the nearest field hospital, as it is obvious that among the hurry, excitement, and dirt in the field it would be impossible to attempt to search for the bullet with a view to its extraction, or to attempt to hunt for and close the wound in the viscera.

General Preparation before Operation.—The patient in every instance after an abdominal wound suffers more or less from collapse. It is very important therefore that stimulating enemata should be given, and every effort made by the constant administration of small doses of stimulants to restore the patient from this collapse before administering an anæsthetic or attempting anything in the way of operative interference. It having been decided to operate, hot-water cushions should be placed upon the table, and a well-warmed blanket placed over them. The patient should have his extremities wrapped in a hot blanket and his chest covered, and the blanket over the hot-water cushions should be packed round the sides. The abdominal parietes, after being well washed first with a strong solution of liq. potass., and then with a solution of hyd. perchlor., should be covered with an ovariotomy waterproof sheet, with an opening in the centre of sufficient size to allow of free manipulation; this sheet will allow of the peritoneal cavity being thoroughly irrigated, the water being con-

veyed into a receptacle under the table; by this means the patient is kept quite dry, a very important point. I have my ovariectomy sheet arranged with a funnel at the side, the outlet of which opens into a vessel under the table, which prevents the trouble of forming a gully to carry off the water.

Operation.—The first step of the operation should be to explore the wound of entrance of the bullet with a probe or the finger, with the object of ascertaining if the ball has penetrated the parietes, and also to ascertain the direction in which it has travelled. Care must be taken to use no force in passing the probe, for Esmarch, Schachner and others have pointed out that this often proves a source of infection in gunshot wounds. The ball may be deflected by the bones or soft tissues after passing through the abdominal parietes, but this need not influence the surgeon in determining the line of incision.

Senn,* after a series of carefully conducted experiments, has recommended the method of inflating the intestine with hydrogen gas for the purpose of diagnosing visceral perforations. He has reported three cases in which he has practised this method with satisfactory results. In one, perforation of the stomach could scarcely have been diagnosed without inflation, and in two others, rectal inflation was of value not only in proving the existence of the perforation but in showing that another perforation low down in the sigmoid flexure had been overlooked after the operation was thought to be concluded. The inflation is conducted in the manner which has been already described, and the parietal wound being made patulous, the gas escapes audibly and may be ignited, the flame being easily extinguished by a wet sponge.

From experiments on dogs and from actual experience in abdominal gunshot wounds, it has been proved that a

* *Philad. Med. News*, Aug. 25 and Nov. 28, 1888.

bullet traversing the abdomen in almost every case wounded the intestine in one or more places, with consequent extravasation of fæces ; in one case narrated by Sir Thos. Longmore the intestine was wounded in sixteen places by the same bullet. It is obvious, therefore, that in all cases of abdominal gunshot or penetrating wounds which are found to extend into the peritoneal cavity, abdominal section should be made early, and I agree with Dr. McGraw that the incision should be made over the wound of entrance and prolonged to a sufficient distance in its course to allow of the surgeon obtaining ample space for a thorough examination. Schachner, MacCormac, Parkes, Bull and Morton, however, insist upon a median incision. Possibly an incision in the middle line, by affording more room for exploration, may in some cases be of advantage, but I, however, think the incision advised by McGraw is the best, in a large majority of cases. He has reported a number of cases in which he has operated by this method successfully. One great advantage of this incision is that if any pieces of clothing are carried into the wound by the bullet, the surgeon is sure to find and remove them ; further, should the tissues be much injured or dirty they can be cleansed or even cut away, thus allowing healthy tissues to be approximated when closing the wound.

On the abdomen being opened, should the intestine be wounded and there be an escape of fæces, the abdominal cavity should be thoroughly irrigated with some weak antiseptic fluid, *i.e.*, boric acid or iodine solution ; there will rarely be much difficulty in finding the wound in the intestine from which the fæces is escaping. It must always be remembered that the bullet will usually pass completely through the intestine, so that the surgeon should always examine for a second wound unless a piece of the intestine is notched out. The wounded intestine

should be thoroughly washed and the torn edges brought together by a double row of sutures placed, when possible, in the long axis of the gut. Occasionally this is not possible. The intestine should then be carefully examined to see if there are other wounds which may have to be closed. Senn has advised for this purpose the inflation of the intestine with hydrogen gas; the value of this method has, however, been questioned by Schachner and Dalton, as the latter surgeon found, in a case in which he employed it, serious damage was occasioned by the gas so distending the intestines that their return was exceedingly difficult, and even provoked a rupture of the parts already sutured; it would appear, therefore, that it would be better that the search for other wounds of the intestines, or stomach, should either be made through a large parietal incision with eventration, or through a smaller one, then drawing out a coil of the intestine and carefully tracing the whole tract from end to end. The apparent advantages of the former plan are that it affords an easier access and better command over the wounds of the intestines and their attachments. Both have been employed in experiments and each seems to have its advantage. Where there is profuse hæmorrhage or extensive damage of the intestines with danger of extravasation, eventration would be the shortest way of discovering the bleeding-point, and the best method of controlling extravasation of fæces; but where upon opening the cavity it is apparent that little or no hæmorrhage has occurred, a loop of intestine can be carefully hooked up through a small opening, and the whole intestinal tract examined without exposing more than about six inches at one time. In adopting this course it will be convenient to pass a tape through the mesentery, around the intestine, to mark the point at which the examination commenced. In those cases where from the position of the wounds of entrance and exit the other organs can

be safely excluded from the path of the ball, such an examination will suffice; otherwise, if necessary, the incision can be enlarged till a satisfactory ocular and digital examination will prove the absence or otherwise of injury to any other viscera.

The surgeon, having satisfied himself that all wounds in the gastro-intestinal tract are securely closed, should proceed to search for the bullet and if possible remove it, and any wounds that may exist in the other viscera should be attended to.

For closure of intestinal wounds there is no suture to be relied upon so surely, as the square quilt suture. Care must in the first place be taken, however, to unite the opening by means of a continuous suture of chromicized gut through all the coats of the intestines close to the divided edges, and over this a line of square quilt suture of chromicized gut; should the intestines be much bruised and the edges of the wound be jagged, it would be well to cut the ragged parts away before closing the wound. Care must be taken not to tie the sutures too tightly, as the apposition is soon followed by a slight œdema; the early exudation of lymph from the opposed peritoneal surfaces, which takes place within an hour or so, adds to the safety of the union.

Wounds of the mesenteric border of the gut are always troublesome and frequently require complete resection. Those of a small size (Fig. 35) are conveniently closed by drawing together a fold of the mesentery upon one side and the border of the intestine upon the other, but in those where there is a complete division of the mesenteric border resection is the only alternative (Fig. 36). The divided ends must then be either reunited by one of the operations for circular enterorrhaphy, or the ends inverted and closed, and the continuity of the canal re-established by lateral anastomoses with approximation plates. If the portion of

intestine to be excised is only of small extent, the mesentery need not be interfered with, but if it is found necessary to remove several inches, then a wedge-shaped piece of the mesentery must be removed with it.

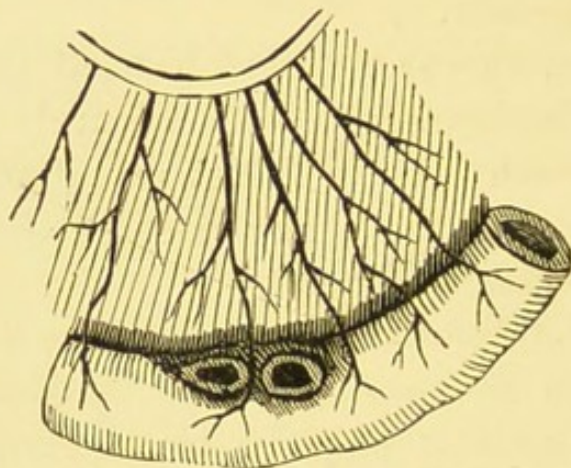


FIG. 35.—Showing wound of the mesenteric border of intestine (Schachner).

In those cases where the intestine is seriously damaged and a large ragged opening made which it would be difficult to close by suture, I consider the portion of

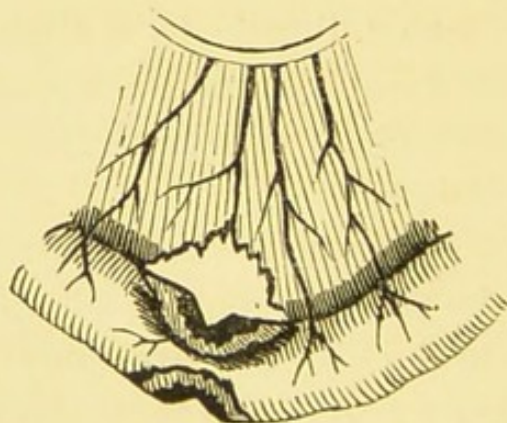


FIG. 36.—Showing complete division of the mesenteric border (Schachner).

injured intestine should be excised and the divided ends united by circular enterorrhaphy, by one of the methods to be described in my next lecture, or by lateral apposition by approximation discs, or by Halsted's operation.

Gunshot injuries of the intestinal tract may be variable in character. For clinical and prognostic purposes they can be arranged as contusions, penetrating, and non-penetrating wounds. The contusions are often quite large and attended with corresponding hæmatomata. The penetrating wounds for the purpose of treatment admit of the division into those isolated from, and those involving, the mesenteric border. By the latter is meant such as encroach upon that portion of the intestine which is devoid of serous covering, and contained in the triangular interspace formed by the union of the two folds of mesentery (see Fig. 36). Because of this absence of the peritoneum, which precludes the possibility of obtaining 'plastic adhesion' in a few hours, which is so indispensable in the closing of intestinal wounds, as well as the almost certain injury of some of the bloodvessels supplying the intestine which attends wounds of this description, they are justly to be regarded as the most serious of intestinal wounds.

Hæmatomata are frequently met with at the intestinal border of the mesentery and sometimes about the intestine proper. When unattended with a wound they may usually be left untouched without any harm resulting, but in the cases in which the serous membrane is torn or wounded, these injuries are best treated as I have described for perforating wounds.

The abdominal cavity in all cases should be thoroughly washed out before closing the parietal wound, and if the injuries have been severe, undoubtedly it will be wise to insert a large glass drainage tube into the most depending part of the abdominal cavity. This is useful not only to enable the removal of any discharge which may occur, but also to warn the surgeon in case of hæmorrhage taking place upon reaction setting in when the collapse has subsided.

In those cases in which the patient is profoundly collapsed no operative procedure should be adopted until reaction has set in, and in such cases I consider it would be wiser, on finding the wound in the intestine, to bring it up and fasten it to the abdominal incision and form a fæcal fistula, dealing with this at some future date, when the strength is somewhat restored, by re-opening the abdominal wound and excising the injured portion of intestine and treating it by one of the methods to be described when speaking of fæcal fistula, viz. : by uniting the divided ends by circular enterorrhaphy or restoring the continuity of the canal by lateral anastomoses with approximation discs. This plan of treatment should be adopted as early as possible, as the adhesions formed between the parietal and visceral peritoneum can be then more easily broken down, and the intestine much more readily dealt with than if a fæcal fistula were allowed to establish itself and strong adhesions established. In this operation, moreover, by following a line from the point of entrance into the abdominal parietes to that of exit into the peritoneal cavity, the probable destination of the bullet may be ascertained.

Should the wound of the intestine be so extensive as to preclude the possibility of closing it with any amount of safety, one of two plans should be adopted.

(1) If the patient is very collapsed, the wounded part should be attached to the parietes, forming an artificial anus, to be dealt with at a future date.

Stimulating enemata should be administered by the rectum, or, if the patient is able to swallow, small and repeated doses of brandy and beef tea should be given by the mouth, coupled with a mixture of sulphuric æther. He should be packed in warm blankets, with hot-water bottles applied, and the head should be kept low.

Before fastening the intestine to the parietes it must be

ascertained if there is any other wound present in the intestine, and also, and this is most important, if any of the mesenteric vessels are wounded, as hæmorrhage from these vessels is very profuse. The abdomen should also be thoroughly flushed out with a 2 per cent. solution of warm salt and water, or some antiseptic fluid, before closing the wound, and a large glass drainage tube inserted into the most dependent part of the abdomen.

(2) If the wound is limited to one spot, and there is no hæmorrhage and the patient is not suffering severely from collapse, the wounded part may be excised and a wedge-shaped piece of mesentery removed, the divided ends of the intestine being united by circular enterorrhaphy and the mesentery united by a few stitches—or the divided ends may be inverted and closed and the continuity of the canal restored by lateral anastomoses by means of bone plates, if at hand; if not, by Halsted's operation.

Gunshot Wounds of the Large Intestine.—In wounds of the large intestine, cases have been reported in which the bullet has passed into it and the retained fæces has offered sufficient resistance to arrest its further progress, the bullet being passed per anum later on. This, however, must be of very rare occurrence. Taken as a group, however, Sir W. MacCormac says these injuries to the large intestine are much less fatal than wounds of the small intestine.

The annexed woodcut (Fig. 37) from Sir W. MacCormac's work is of great interest as showing the length of time a person may live after being wounded in the abdomen, and having the intestines penetrated, without any operative interference being attempted for the removal of the bullet or the closing of the intestinal wound. It also shows one of the dangers that may arise from the irritation caused by the bullet setting up local peritonitis and thus creating

adventitious bands, and subsequent strangulation of the intestines.

Gunshot Wounds of the Stomach.—The principal signs of wounds of the stomach are extreme shock, escape of the

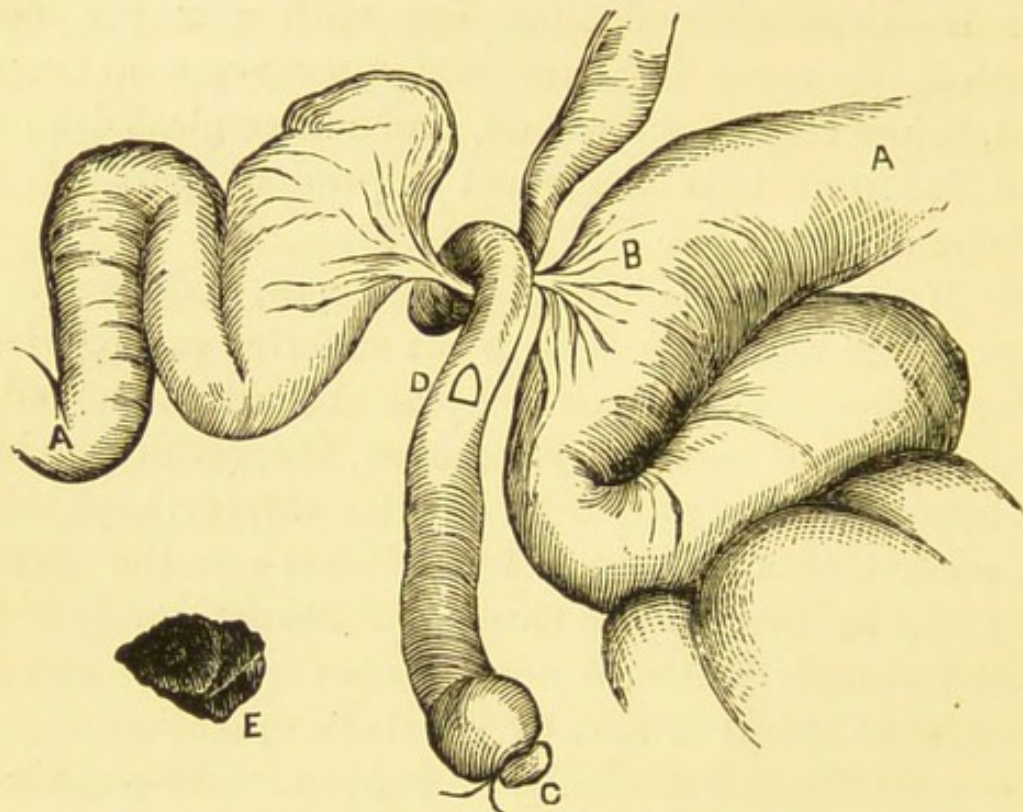


FIG. 37.—Sketch of a strangulation of the ileum caused by an adventitious fibrous band due to the irritation produced by a bullet. A, A, Coils of the intestine united by the fibrous band, B, around which the gut, C, became entangled. D, Bullet lying loose in canal. E, Size and shape of the bullet. This injury occurred to an officer of the Royal Artillery, in 1858, seven and a half years before death. The bullet entered the abdomen two inches above and one inch to the right of the umbilicus. At first but little hope was entertained of the patient's recovery, but the wound healed in about five weeks, and he regained health and strength. In 1865 he suddenly experienced sickness, severe abdominal pain, constant vomit of dark foetid fluid, and in a few hours became collapsed, and died with cold skin and imperceptible pulse (Sir W. MacCormac).

contents of the organ, and vomiting of blood. Wounds of this organ are best dealt with either by establishing a gastric fistula or closing the wound by suture. The injury, Sir W. MacCormac says, is occasionally but very rarely recovered from, and the mortality may be set down at 99 per cent.

From the experiments of Senn and from the advancement made in abdominal surgery when a wound of the stomach is suspected, and its presence is corroborated by the introduction of hydrogen gas and general symptoms, I should not hesitate to open the abdomen and suture the wound in the stomach, by this means I am sure the patient would have the best chance of recovery.

OPERATION FOR PENETRATING WOUNDS OF THE ABDOMEN.

The operations required for this class of wounds of the intestine are attended with much more favourable results than similar operations for gunshot wounds. In the majority of cases the original wound in the parietes should be enlarged and the wound in the intestine at once searched for, and when found turned in and closed by the ordinary Lembert's or quilt suture. In some instances, however, no doubt it would be wiser to open the abdomen in the middle line.

Treatment.—At the eighth Congress of the Italian Surgical Society, recently held at Rome, Clementi* reported the results which he had obtained in cases of penetrating wounds of the abdomen in the Santa Maria Hospital at Catania since 1888. Sixty-five cases were treated; of these fifty-nine were cured and six died, giving a mortality of 9·2 per cent. Cœliotomy was performed in twenty-four of the cases with two deaths; forty-one were treated without cœliotomy and four died. Clementi draws the following conclusions from his experience:

1. If surgical interference is possible immediately after the injury and under strict aseptic conditions, cœliotomy affords the best chance of success in such cases.

2. When there is reason to suspect that any of the

* *Rif. Med.*, October 30th, 1891.

internal organs are wounded, the surgeon should, under all circumstances, enlarge the wound or make an incision in some other place; the wounded organ should then be sought for and treated in the way that may seem best.

3. These rules are subject to the necessary modifications when the cases have to be treated without the resources found in hospitals.

4. When cœliotomy is done it is not essential or useful to draw out the whole mass of the intestinal coils.

At the same Congress Postempski presented a communication embodying the results of fifty-eight cases of cœliotomy performed by him for abdominal wounds. In twenty-two of the cases there were wounds of various viscera, while thirty-six were cases of simple penetrating wound. In the first group there were four cases of wound of the liver, one of the bladder, two of the stomach, and one of the transverse colon. The cases of simple penetrating wound were all cured. Among the twenty-two cases of wounded viscera, twelve were cured and ten died. The fatal cases included three of injury altogether beyond surgical treatment. Postempski maintained that his experience showed that diagnostic cœliotomy in cases of injury is much less dangerous than Senn believes. By diagnostic cœliotomy, Postempski means the complete examination of the intestines, the whole of which are brought out for inspection through a long incision of the abdominal parietes. He thinks that exploratory cœliotomy should be performed in all cases where it is certain that the wound is penetrating, even when wounds of the viscera are only suspected. In the discussion which followed, Durante pointed out that, though Postempski's practice might advantageously be followed in large institutions provided with the necessary equipment, expectant treatment would probably give more satisfactory results in other places. Manara held that

secondary surgical interference was useless, and that in primary operations a long incision was not required. D'Antona, on the other hand, pointed out that in one of Clementi's cases secondary intervention had been successful.

RUPTURE OF THE INTESTINES.

Rupture of the intestines is most commonly caused by injury, either a kick from a horse, persons being run over, blows or falls. The extent of the rupture, and the size of the rent, vary considerably, and the danger to the patient does not appear to be influenced particularly by these different conditions, so long as the mesenteric vessels are not damaged or ruptured.

When the surgeon has decided that after an injury to the abdomen the intestines are ruptured, he should lose no time in opening the abdomen and searching for the lacerated bowel. For this purpose the incision should be in the middle line, the centre of the incision being at the umbilicus. The incision should be sufficiently large to allow of thorough examination of the intestines. On opening the peritoneum it will be at once manifest if any important vessel is torn across by the presence of a blood clot, or, if there is a large rent in the bowel, by extravasation of fæces. In this case, as in the operation for bullet wounds, the patient should be wrapped in hot blankets, and laid upon hot-water cushions; the abdomen should be protected by a waterproof ovariotomy sheet for the conveying away of all fluids. The cavity of the abdomen should be thoroughly irrigated with a 2 per cent. solution of warm salt and water, or a 20 per cent. boracic solution, of a temperature of 100° to 105° F., and the peritoneal cavity cleansed of all clots and fæces, after which, in the case of a torn vessel, the bleeding point will soon

be found and controlled by pressure forceps while the rent in the intestine is being examined. If this is small it may be turned in, and the serous surface brought together by means of Lembert's suture, the bleeding point ligatured, and the cavity of the abdomen again washed out with some disinfectant, and the intestines returned, care being taken to replace the omentum over the intestines.

In all these cases I think it wise to introduce a large glass drainage-tube, which should be emptied every three or four hours by means of an exhausting syringe. If at the end of twenty-four hours there is found to be no hæmorrhage or much exudation taking place, the drainage-tube may be withdrawn.

In cases where the rent is extensive, extending perhaps completely across the gut, and the injury to the mesenteric vessels is extensive, the injured part of the bowel should be excised.

The injured intestines should be brought well outside of the abdomen and all the future steps conducted outside the cavity, two india-rubber ligatures being tied lightly around the intestine about three or four inches above and below the part to be excised. The part must be thoroughly washed with antiseptic warm solution, and excised, as possibly the blood supply may be interfered with, or the part so contused in the proximity of the rent that gangrene would be likely to supervene.

The question next arises as to what is the best method of dealing with the divided end of the injured intestine in these cases. This must of necessity depend to a very great extent upon the state of the patient. If very collapsed, I should advise the open ends of the intestine to be fastened to the parietes and left *in situ* until reaction had sufficiently set in for the surgeon to deal with the divided

intestines by endeavouring to restore the continuity of the canal by one of the methods of enterorrhaphy or lateral anastomoses.

Should, however, the patient's strength be sufficiently good to warrant it, I would at once restore the continuity of the bowel by one of these methods.

Drainage in such cases should always be employed, and here I would counsel the keeping the drainage-tube in for some few days, or until the fluid drawn off is quite colourless and sweet.

All such cases should after operation be kept very warm, and be fed by stimulating nutritive enemata with opium. Nothing but a little warm water, and perhaps small doses of solid opium, should be given by the mouth for the first twenty-four hours, after which Brand's essence of peptonised milk and water in very small quantities may be given frequently, to be increased day by day as the patient improves.

Should peritonitis declare itself, the cavity must be kept washed out with warm salt or boracic solution, and it will be well to allow a certain quantity of the fluid to remain in the abdomen, as by this means, should the patient recover, adhesion will be to a great extent prevented.

In a paper upon this subject Dr. Wylie, after extensive researches, has advanced the following conclusions :*

‘ When there are symptoms of local peritonitis, intense pain and tenderness followed by tympanitis and vomiting with chilly sensation and rise of temperature, search should be made for the cause. If signs of a tumour or exudation can be definitely made out and the general symptoms indicate the formation of pus, then the patient should be etherized and the pus reached by incision, the

* *American Journal of Obstetrics and Diseases of Women and Children*, March, 1890.

pus evacuated, the cavity washed out and drained. If the general symptoms are severe and no localized centre of pus is made out, then an incision should be made in the median line and the peritoneal cavity explored with the index finger. If then a pus sac is found, and if it be so situated that it can be reached by another lateral incision and the pus evacuated without allowing it to escape into the free peritoneal cavity, this should be made and the median incision closed. If it cannot be reached by a lateral incision where the wall of the sac is adherent to the abdominal wall, then the pus should be drawn off by an aspirator or trocar, and the cavity washed out clean with an antiseptic solution before it is freely opened and a drainage-tube inserted.

‘If signs of general peritonitis show themselves, that is by vomiting, obstinate constipation, tympanitis, etc., then a free incision should be at once made into the median line and the starting-point of the peritonitis found if possible. If it is over the cæcum, an incision should be made and the pus washed out by means of hot water of a temperature of 110° to 115° from a large fountain syringe, with a large glass drainage tube attached to the rubber. After the free pus about the cæcum is washed out, several fingers or the whole hand should be put into the abdominal cavity and the intestinal adhesions broken up and all puddles of pus completely washed out. Then a drainage-tube should be introduced into the opening and the parietal wound closed.

‘In all cases of general peritonitis an exploratory incision should be made as early as possible after trying to lessen the tympanitis. If an exploratory incision does no good it is not likely to add much to the danger. There may be cases of idiopathic peritonitis, but I have never seen one proved by anything to be relied upon. Certainly in septic peritonitis, where shock is not too great, free opening,

washing out and drainage will cure some cases. It helps if it does not cure tubercular peritonitis and exploratory incision has proved to be in the hands of experts almost entirely free from danger, and it must become the practice in almost all cases of general and local peritonitis where there are marked symptoms of the formation of pus.'

In closing his remarks Dr. Wylie says: 'What I wish to especially advocate is early operation in cases of general peritonitis, both those starting from a local peritonitis and those due to the escape of septic matter into the peritoneum, and to make it plain that to succeed in such cases it will not do to merely open the belly, allow pus to escape, put in a drain-tube or gauze, and leave intestinal adhesions causing obstruction to remain, to kill even more certainly than septic poison, or fail to empty and wash out all puddles of septic fluid encysted among the coils of intestines; but we must make free incisions large enough to introduce the hand and break up all adherent intestines and freely wash the whole cavity of the peritoneum and put in two or more drainage-tubes.'

Dr. Jahoda has reported two cases of traumatic rupture of the small intestine without any evident injury to the abdominal parietes. In both cases the symptoms set in after a severe contusion, with nausea, belching culminating in vomiting, bowels confined and urine retained. An operation was performed, in the first, eighty hours after the accident; in the second, twenty-five hours. In both cases fluid fæces was found in the abdominal cavity, whose serous surface was deeply injected and covered with fibrinous fluid. A small opening was found in both cases in the wall of the intestine at the attachment of the mesentery, whose diameter would be about one centimètre. The rupture was closed with a Lembert stitch, the peritoneal cavity carefully cleaned out, and the outer walls brought firmly together,

terminating in perfect health and complete success, except a slight gaping of the external wound in one of the cases.

Jahoda's conclusions are that laparotomy is the proper course in cases of intestinal rupture, and that the incision should be made in the median line. To discover the rupture after entering the cavity will always be a difficulty that no rule can be offered to alleviate.

Mechanical cleansing of the serous cavity must be very carefully manipulated, but drainage is unnecessary.

Mr. Croft has recorded two* cases on whom he operated for rupture of the intestines. In the first he established a fæcal fistula, and after the space of a month a resection of the artificial anus was made, but owing to the combined effect of the first lesion and the long second operation the patient failed to recover and died thirteen hours after the operation.

On May 21st, 1890, the second patient came under his care. He was a boy, æt. 14, who had been kicked in the abdomen by a horse; symptoms of ruptured intestine manifested themselves, and Mr. Croft made an exploratory incision and performed the following operation. The patient was kept under ether, the operation lasting an hour and three-quarters. Mr. H. B. Robinson rendered very valuable assistance.

On dividing the linea alba, an œdematous condition of the subperitoneal tissue was observed. As soon as the peritoneal cavity was opened a faint fæcal odour was observed. When the omentum was drawn aside about an ounce and a half of turbid dirty-brown fluid escaped, with a distinctly fæcal odour; its under surface was adherent to some coils of intestine, and was coated with exudation and the same dirty-brown fluid. The coils of

* *Clinical Soc. Report*, 1888, 1890.

bowel were matted together and more or less stained. On breaking through these adhesions and separating the coils on the right side, about two inches below the umbilicus, the region of chief injury became more evident. A small rupture was found on the under surface of the ileum, measuring about three-eighths of an inch in diameter. This lesion was in the centre of a small areola of ecchymosed and inflamed tissue. On the opposite wall of the gut there was another ecchymosed spot, corresponding with the first lesion. After cleansing and examining this portion of the bowel, Mr. Croft determined to resect it, as he deemed it unsafe to return the contused as well as the ruptured pieces.

Makins' forceps were applied below the spot at which the incision was to be made, and Mr. Robinson took charge of the upper portion. A V-shaped segment of the gut was cut out with scissors and snipped from its mesenteric attachment. Immediately after excision the mesenteric wound appeared to be not more than three-eighths of an inch in width.

When bleeding had been arrested, the mesenteric wound was carefully closed from side to side by eight sutures, passed after Lembert's manner, four above and four below. The cut ends of the intestine were next carefully adjusted, and opposite the attachment of the mesentery sutures were passed, so as to draw together the muscular coats, applying these coats *dos-à-dos*. Five sutures were needed for this. In bringing together the rest of the bowel Lembert's sutures were employed, about twenty being inserted. Extra sutures were put in where they seemed to be indicated, bringing up the total to over forty.

As the piece of omentum opposite the injury was the reverse of pure, it was thought best to cut it right away. It was therefore ligatured and excised.

After this the peritoneal cavity was carefully purified with hot boracic solution, about 20 per cent. in strength, and the toilet of the peritoneum was completed. The external wound was closed by silk sutures. No drain was put into the peritoneal cavity. Antiseptic precautions were observed throughout. The operation lasted an hour and three-quarters.

A detailed report of the after progress and treatment is not needed. He made an uninterrupted and easy recovery. No constitutional nor local disturbance ensued.

In the night following the operation his temperature reached 100.4° , and then subsided to normal. During the fifty-six hours ensuing upon the operation he was fed exclusively by the rectum. Afterwards a graduated scale of fluid nourishments was allowed until convalescence was quite established.

Remarks.—Mr. Croft says: ‘This case appears to me to give most valuable support to the formula that in cases of abdominal injury without external wound, when the injury is followed by symptoms of internal lesion and peritonitis, an exploratory laparotomy should be performed.’

Symptoms.—In this case, as in the first, peritonitis was indicated by certain well-marked symptoms; there was distinct febrility, there was rigidity of the abdominal muscles, and there was pain with tenderness on pressure. These symptoms, taken with the fact of a severe injury like that of a kick of a horse below the navel, were quite enough to guide one.

Mr. Croft adds to his paper a table of the cases which strictly belong to the same category we are describing, viz., rupture or contusion of intestine without external wound, for which he is indebted to Mr. Battle and Mr. H. Betham Robinson for the careful search they have made

through the records of past years. I cannot believe that any case of a similar character has escaped them.

The table contains fourteen cases, including the two of Mr. Croft's.

An analysis of these yields the following facts: there are twelve deaths and two recoveries—thirteen deaths if the fatal result after secondary operation for artificial anus is included.

The causes of the deaths are—

Exhaustion after secondary operation for	
artificial anus	1
Hæmorrhage from unsecured artery	1
Other abdominal visceral injury	2
Peritonitis	2
Failure of suture and suppurative peritonitis	1
Shock and exhaustion	5
Peritonitis and shock	1
	13

Primary artificial anus was made in two cases. The lesion in one case (death from other abdominal injury) consisted of a contusion of the colon and mesocolon.

In the other twelve cases the small intestine had been injured.

Date of Operation.—In one case the operation took place on the fourth day. The shortest time that elapsed between the accident and the operation was nine hours: the patient died of suppurative peritonitis.

The ages of the patients vary from eight years to fifty-eight. We may infer, therefore, that age did not materially influence the results, for the majority of the patients were between twenty and forty.

The three factors influencing the operation favourably are—(1) its early and (2) absolutely complete

performance, and (3) the induction of an aseptic condition.

FÆCAL FISTULA.

Fæcal fistula may be intentionally formed (1) by the surgeon for the immediate relief of an over-distended bowel in a patient who is so collapsed that to attempt any prolonged operation for the search of the cause of an obstruction would be attended with the greatest risk to life. (2) It may be the result of ulceration or injury. (3) The most common form is that which follows gangrene of the intestine, supervening on strangulated hernia. (4) It may and very often does follow on operations on the uterus and ovaries. (5) Carcinoma of the intestine is a not uncommon cause. These fistulæ are the greatest possible source of annoyance and discomfort to the patient, and anxiety to the surgeon; and should they be situated high up in the small intestine, will cause the death of the patient by marasmus if large.

To understand the most appropriate form of treatment it will be necessary to consider shortly the pathology of these fistulæ.

The edges of the aperture of the gut are glued to the parietal peritoneum by strong plastic lymph; and whether the whole or a portion only of the calibre of the intestine is destroyed, the apertures of the upper and lower end, though at first lying in almost a continuous line, soon unite at a more or less acute angle.

These are at first similar in size and present no material difference in shape or appearance. As the disease becomes more chronic, they gradually alter in their character; the lower aperture, being no longer used for the transmission of fæces, gradually becomes narrower, until in time, if not interfered with, it may become almost obliterated; whilst the upper portion of the intestine becomes dilated.

The mesenteric portion, opposite the aperture, becomes drawn out into a kind of prolonged spur, the full importance of which was first pointed out by Dupuytren.

The spur-like process projects between the two apertures, and being deflected by the passage of the fæces, has at last a tendency to act as a kind of valve, and thus to occlude the orifice of the lower portion of gut.

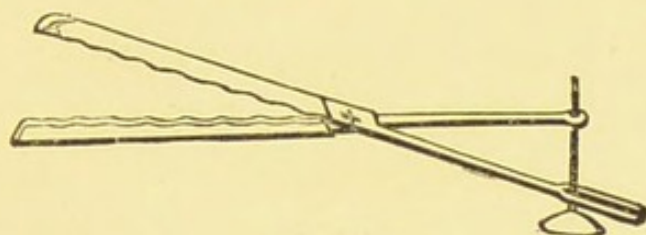


FIG. 38.—Dupuytren's enterotome for dividing the septum in cases of artificial anus, and restoring the continuity of the bowel. (One-fourth size.) (Sir W. MacCormac.)

It will not be necessary to describe the different forms of fæcal fistulæ. Suffice it to say they may occur in any part of the abdominal wall, but most frequently at the inguinal region, where possibly they result from a gangrenous portion of the intestine of a hernia.

In these days of abdominal surgery they are not

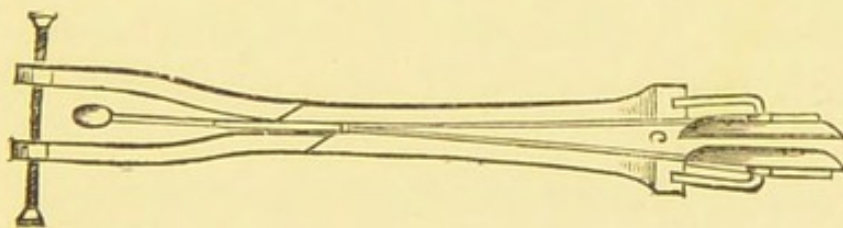


FIG. 39.—Reybard's clamp for the operation to cure a preternatural anus. (Sir W. MacCormac.)

unfrequently met with in the seat of the wound which has been made for a hysterectomy; and the vagina is not at all an uncommon situation to meet with them.

The treatment of these fistulæ has exercised the minds of surgeons for many years, but I trust the time has now arrived when the surgeon will be able to cope with them with every hope of cure.

In cases which have become chronic and in which a long spur has formed, no doubt the plan of treatment by the enterotome, as suggested by Dupuytren, is excellent

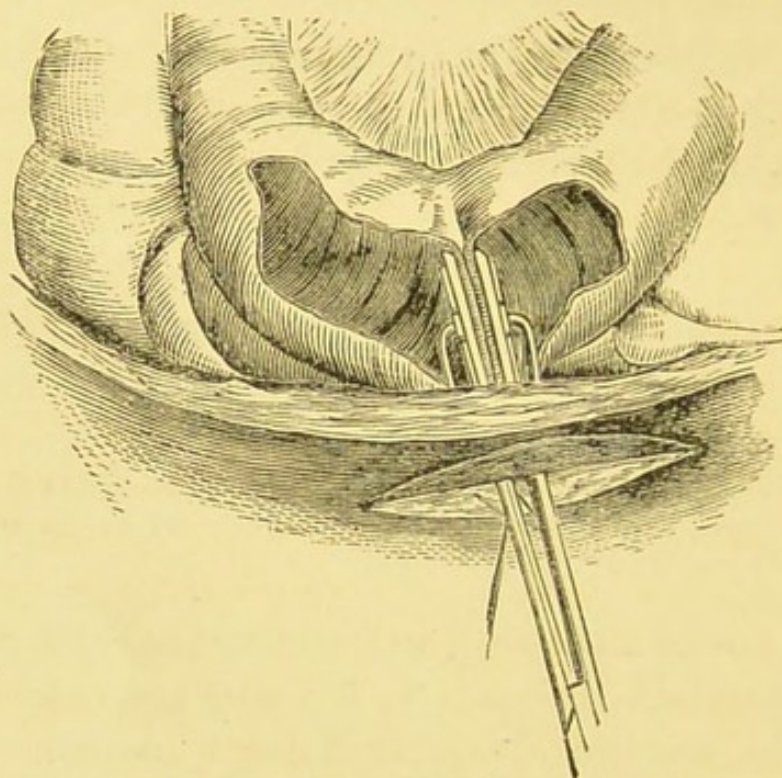


FIG. 40.—Reybard's instrument applied for the division of the *éperon* of Dupuytren. (Sir W. MacCormac.)

(Fig. 38), and by its use the continuity of the canal may be re-established. Various instruments have been devised to accomplish the same object, viz., to destroy the *éperon*

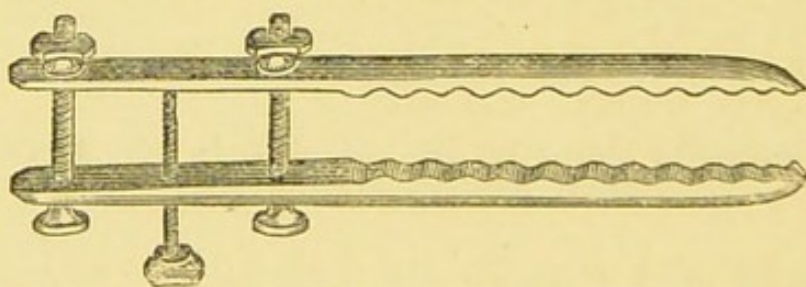


FIG. 41.—Blasius's intestine forceps. The blades are parallel, thus obviating an objection to the use of Dupuytren's instrument, which divides the parts nearest sooner than the more distant portions. (Sir W. MacCormac.)

of Dupuytren. The best are probably those suggested by Reybard (Fig. 39) and Blasius (Fig. 41). But I venture to think that, with the knowledge we now

possess, a fistula would rarely be allowed to advance to such an extent without surgical interference.

If the fistula is very small, doubtless it may close spontaneously without any operative procedures. Many cases of such are now on record, and I have had two such cases which followed the operation of hysterectomy in which the fistula closed without operative interference. Mr. Lawson Tait and Dr. Heywood Smith inform me they have had similar experience.

In these cases of small fistulæ, however, if they do not close after a short time, the edges of the opening may be pared and a couple or three sutures be introduced, which in most instances will ensure the closure of the fistula.

Mr. A. Barker suggested that the spur of the mesentery should be destroyed by pressure-forceps applied, that the intestines should be lined with a piece of a thin sheet of india-rubber* one and a half inches long and five-eighths wide, which is to be fastened *in situ* by silver-wire sutures passing quite through the abdominal parietes. He then pared the edges of the fistula and stitched them together; when they were united, he withdrew the silver-wire sutures, and the piece of rubber which lined the bowel was passed per rectum; or, as in the case he published, he withdrew the rubber at the end of a week through the wound and let it close by granulation.

In cases in which the fistula is too extensive for there to be a possibility of closing the fistula by these means, abdominal section should be performed.

The object of the operation should be, if the fistula is of recent date and the adhesion not too firm, to detach the intestine from the parietes by breaking down the bands of lymph that connect the two layers of peritoneum, and then deal with the opening into the bowel. Should this be small or in a longitudinal direction, so that the

* *Lancet*, 1880, vol. ii., p. 970.

calibre of the gut is not materially interfered with, then the mucous edges should be turned in and brought together by means of a continuous chromic gut suture, and a second line of Lembert or quilt sutures introduced to bring the peritoneal surfaces together in a similar manner to that already described in the case of typhoid ulcer and gunshot wounds.

Should the opening into the intestine be large, then it would be wiser to cut a piece of intestine out and unite the two ends by circular enterorrhaphy by one of the methods to be described in my next lecture. In this case there would be no need to remove any of the mesentery.

If the surgeon prefer it, he may invert the ends of the divided intestine and secure the continuity of the canal by lateral apposition either by Halsted's method or by means of approximation plates.

The incision in the abdominal walls in these operations is of importance, and should always be in a vertical direction, either directly above or below the fæcal fistula, and great care will have to be exercised in making the incision, as often the intestines directly beneath the incision may be found adherent.

In the case of a fistula situated in the abdominal wall of some considerable standing, the wiser course undoubtedly would be not to attempt to detach the adherent intestine, but to place an elastic ligature around the intestine about four inches from the adhering part in each side and divide the intestine about one inch from the adhesion. The cut ends of the intestine should then be brought out through the abdominal incision and either united by circular enterorrhaphy or the ends be inverted and closed, and the continuity of the canal restored by lateral apposition. This being done, the intestine should be dropped back into the cavity of the abdomen, and the two divided ends of the adherent portion of intestine be inverted and closed.

Finally, the mucous surface of the intestine should be thoroughly removed with a curette through the fistula, the edges pared, and a strip of iodoform gauze introduced, so as to allow of the opening closing by granulation.

The parietal wound is then to be closed and dressed in the usual manner.

In cases where the fæcal fistula is connected with the bladder or vagina, the only course open is to perform abdominal section and search for the point of union between the intestines and bladder or vagina, as the case may be. This usually will be excessively difficult to find, as the intestines will be often found matted together in the pelvis.

If the surgeon is successful in tracing the intestine to the seat of the fistula, one of two courses is open to him—(a) to break down the adhesion and strip the intestine from the adjacent viscus, and then carefully suture the openings with a Lembert's or quilt suture, and thus close them; (b) to divide the intestine about an inch from the fistula on each side and restore the continuity of the gastro-intestinal canal by circular enterorrhaphy or lateral anastomosis of the proximal and distal portion of the intestine by means of approximation plates; then, cutting and scraping the mucous surface of that portion of the intestine in which the fistula is situated, and thoroughly inverting the divided ends and fixing these with catgut sutures. Should the fistula be connected with the bladder, it will be well to keep a winged gum-elastic catheter retained in the viscus, to prevent any fear of extravasation of urine through the fistulous opening into the adherent portion of intestine.

In those cases where the intestines are so matted together that there is difficulty in tracing the exact position of the fistula, I have practised with success the plan of dividing the ileum as closely as possible on each side of

the fistula, and inverting and closing both ends of the intestine connected with the fistula, and then performing ileo-colostomy by implanting the proximal end of the ileum into the divided ascending colon.

In a case of Dr. Burton's, one of fæcal fistula opening into the upper part of the vagina, he successfully performed ileo-colostomy, but instead of adopting the method by implantation, he brought the ileum and ascending colon together by lateral apposition by means of approximation discs.

Weber designed and Heine successfully carried into practice an operation similar to that adopted by Dupuytren in cases of fæcal fistula in other parts of the body. Heine used an enterotome, which was a modification of Dupuytren's instrument, introducing one arm into the afferent and the other into the efferent portion of the injured bowel; and having destroyed the spur-like process, and restored the calibre of the gut, he closed the anus præternaturalis after several plastic operations, the patient making a complete recovery. In 1828 Roux devised an operation for the cure of anus præternaturalis, which at that time was a very daring innovation. His plan was to perform abdominal section, resect the injured intestine, and suture the divided ends. Unfortunately, however, owing to his having made too short an opening in the abdominal wall, he made a series of errors which ended in disaster. Having freed the upper portion of the injured ileum only, he brought up and divided the descending colon; and here again he made a further mistake by uniting the upper portion of the descending colon. In most text-books it is stated that Roux intended to unite the ileum to an opening made in the large intestine, but this is an error, for he did this in mistake and not by design.

Dr. Smyly narrates the following very interesting case which had been under his care :

The patient, a well built countrywoman, æt. 30, who had borne five children, had always been in good health until the birth of her last child, when she was attended by a midwife, who allowed labour to go on for fifty-six hours before she sent for a medical man. He stated the case was one of cross birth and immediately proceeded to deliver, which was effected with much difficulty. Two days after fæces began to escape *per vaginam* and continued to do so up to the time of the operation. She was admitted into the Rotunda Hospital under Dr. Smyly's care on Feb. 25, 1891.

Upon examination in the Rotunda Hospital fæces was found to be escaping from the vagina, which was much inflamed, as were also the parts surrounding the vulva and inner sides of the thighs. The cervix was split on the left, above the vaginal fornix, and the rent extended into the latter for about half an inch. All fæculent evacuation occurred through the vagina, and there was no defæcation per anum during her stay in the hospital. From the chymous character of the yellow discharge, it was evident that it came from the small intestine, and this was confirmed by rectal examination and injection, no fluid injected into the rectum escaping through the fistula. In determining the proper course of treatment in this case, Dr. Smyly had to review the experience of others, never having met with a similar one himself.

Caustics were, of course, out of the question in dealing with such an extensive opening, nor did he feel inclined to repeat the attempt to close it by a plastic operation, not only because of the ill success of the previous effort in that direction, but chiefly because he could not tell to what extent the lower portion of the ileum was occluded either by a valve-like process from the uninjured side, or from the sloughing having destroyed so much tissue as to completely separate the part above from the part below the

injury; in other words, he thought it might be a fæcal fistula with a valve-like process, or an anus præternaturalis. In either case the attempt to close the fistula would fail, and besides, the idea of converting the uterus into a cesspool was repulsive to him. For similar reasons he rejected Simon's method of providing an opening high up in the recto-vaginal septum for the escape of the fæces and closing the vagina below it. And also because by shutting off so large a portion of the alimentary canal the death of the patient from marasmus, signs of which were already apparent, would only be a matter of time.

The abdomen having been opened, and the uterus drawn forward by a vulsellum, a coil of the ileum was discovered attached to its posterior surface, the upper and lower portions of the loop running parallel and being adherent to each other for about two inches. These two portions being controlled by the fingers of an assistant, Dr. Bagot, Dr. Smyly detached the intestine from the uterus without any difficulty, and brought it out upon the abdomen. A rupture of the posterior wall of the uterus in the lower part was then apparent, and into it he thrust a strip of iodoform gauze, so as to preclude the possibility of infection from that direction. The intestine was found in so damaged a condition that it was thought better to remove the injured portion, close the cut ends, and restore the alimentary canal by ileo-ileostomy by bone plates. The only difficulty which was encountered during the operation was due to the contracted state of the lower portion of the intestine, which only admitted the plate when pared down to the narrowest practicable dimensions. The sutures attached to the ends of the plates were of silk, the lateral ones of catgut. Unfortunately, as the last ligature was being tied it broke, and he was obliged to introduce fresh plates, which caused delay. A few Lembert

sutures were inserted on both sides for greater security, the bowel returned, and the abdomen closed. Convalescence was uninterrupted except by diarrhœa, which set in immediately after the operation, and was controlled by lead and opium pills. For three weeks the bowels continued abnormally loose, but after that she had one motion each day. She returned to her home in perfect health.

In a somewhat similar case, that of a woman who came under my care with a fæcal fistula opening into the vagina, I successfully opened the abdomen, divided the intestine on each side of the fistula, and finding that the fistula was within a few inches of the ileo-cæcal valve, I invaginated the distal end into itself and secured it with a few catgut sutures, and then implanted the proximal end into the ascending colon by the method presently to be described under the head of ileo-colostomy. I scraped the mucous membrane from the portion of intestine attached to the vagina, and inverted the two open ends, fastening them with a few catgut sutures. The patient made an uninterrupted recovery.

Dr. Burton, of Liverpool, has sent me the following particulars of the case, referred to p. 208, upon whom he had operated for a fæcal fistula opening into the vagina. He says:

‘The operation was performed on Thursday, August 22nd. It took rather a long time—nearly two hours, I should say, but am not sure. There was no drawback from the first. After the operation the highest temperature reached was 99. Flatus passed freely from the third day, but no proper motion came until last night, when the bowels were opened well about eight o’clock and again through the night and again to-day. It was this I was waiting for, but I never had any

misgivings as to the result from the first. The only fear I had and have, was and is, that the opening between the two portions of intestine will not remain sufficiently long for the purposes required.

‘ As to the operation itself, the patient had a hæmatocele on or about July 30th. On opening the abdomen in the middle line, the omentum was found to be adherent to the anterior abdominal wall. The whole of the contents of the pelvis, uterus, tubes, and intestines were united together by bands and bridles, and it was some time before I could work my way down to the seat of the fistula. I identified the different parts at last. The condition as found here will be easily understood—the anterior wall of small intestine having sloughed along with the lower part of cervix and roof of vagina three to four inches from the ileo-cæcal valve. It took me a long time to find this out. It was quite clear there was not room to make an ileo-ileostomy; the only thing to be done was to unite the cæcum with the ileum. I therefore cut this across and turned the ends in, fastening the serous surfaces with a continuous suture, as you suggested, and dropped the lower end. A longitudinal opening was then made in the convex surface of the ileum and a bone plate inserted, three silk threads being passed through all the coats of the gut, the fourth not. I did this because I had seen a tendency to tilt out in manipulating on the cadaver. I then made another incision into the colon, and inserted the other plate and tied the opposing threads. The actual operation took but a short time. I used the finest silk for the plates, and found that the knots were so small as to be of no account. When brought together the two pieces of gut lay closely together. There was not space enough to bring them together the other way thus. You will see that I made use of the ileo-cæcal valve to block the gut at one end.

The mesentery was stitched all across between the two divided ends by a fine continuous chromic catgut suture. In order to invert the ends of intestine I had to separate it from the mesentery for about three-fourths of an inch.'

Cases of fæcal fistula of the large intestine are very uncommon. I have, however, lately come across a case in which a large fistula existed in the sigmoid flexure. The patient was a girl, aged 16, upon whom Mr. Reeves had operated for a cyst in the broad ligament. When Mr. Reeves, knowing I was interested in these cases, most kindly asked me to see her with him, she was suffering from a fæcal fistula connected with the sigmoid flexure. This case has been described by Mr. Reeves in the *Lancet*.* In consultation with Mr. Reeves, we agreed that the only chance of closing the fistula was by short circuiting the bowel by implanting the ileum into the upper part of the rectum and then endeavouring to close the opening into the sigmoid flexure.

On January 29th, 1891, the following operation was performed by Mr. Reeves, who most courteously asked me to assist him.

I give details of the operation as described by Mr. Reeves:

The previous history is shortly condensed thus:

'Cyst of broad ligament, extensive adhesions, partial removal of cyst, recovery; formation of fæcal fistula about six weeks after. Second operation, for closure of fistula, artificial anus made of opening in sigmoid. Third operation about three months after to cure artificial anus, ileo-rectostotomy, recovery.

'With Mr. Jessett's assistance I made an elliptical incision around the artificial anus rather more than one-eighth of an inch from the junction of skin and mucous

* *Lancet*, vol. i., 1891, p. 109.

coat, and dissected carefully down until I came to the union of parietal peritoneum with the bowel, then the peritoneal cavity was carefully opened upwards and the gut freed all round. On attempting to still further separate the sigmoid it soon became clear that its adhesions to the cyst wall and neighbouring small intestine were so intimate that injury would probably be done to the latter in persevering, so I gave up the attempt, and at once proceeded to do the major operation. The ileum being traced to the cæcum, a pair of pressure forceps was passed through the mesentery about three inches on either side of the place of division of the gut, and a piece of solid rubber cord, about one-eighth of an inch in diameter, carried through. These were gently knotted, and a pressure forceps applied to keep the knot from slipping. If the intestines have been kept empty and well disinfected there will not be need even of an assistant's fingers, as any slight secretion from the divided gut can be sponged away. A flat sponge being passed beneath the gut, it and its mesentery were divided about four inches from the cæcum, and all bleeding points ligatured with fine catgut. The incision in the mesentery was continuous with that in the gut—not wedge-shaped—and a good inch in length. The cæcal portion of the ileum was then invaginated and sutured with a continuous catgut suture. A rubber ring about one-thirty-second of an inch thick and about three-fourths of an inch in depth was cut from a piece of rubber of sufficient length, when its ends were united to fit the lumen of the gastric end of the divided ileum, and this was stitched to the lower end of the bowel by means of a continuous catgut suture. Through its upper end, and from within outwards, a long piece of catgut, with a needle at each end, was passed, using each needle separately, about a quarter of an inch from the upper end of the ring, through it and

the bowel coats at the free or convex side of the gut, and also on either side of its mesenteric attachment. A longitudinal opening, of sufficient extent just to allow the ileum to be implanted, was made on the right side of the upper part of the rectum. The four long sutures were held by the fingers while the ileum was being invaginated, and Mr. Jessett's finger being introduced into the lower opening of the artificial anus was able to make out that the implanted gut was in proper position. As the opening made in the rectum was slightly smaller than the calibre of the ileum with the rubber ring inside,

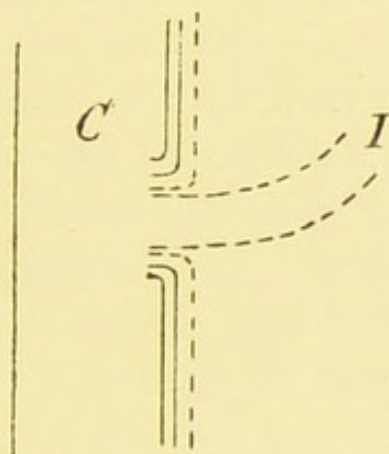


FIG. 42.

Diagram of the proper mode of implanting small into large intestine. C is colon, I is ileum. The dotted line represents peritoneal coat. For clearness' sake the other coats of the ileum and the rubber ring are omitted.

a small part of the serous coat of the rectum became turned in, and apposed to that of the ileum, as represented in Fig. 42. I discussed the propriety and probable advantage of this before operation with Mr. Jessett, and it appears to be an additional security against leakage, and a modification of some practical importance. The sutures through the ring in the ileum were passed through the serous and muscular coats of the rectum before invagination, and gradually tightened as the ileum was getting into place, and when *in situ* they were secured

and two additional stitches were, for further security, passed laterally, and all were cut short. On introducing my finger through the abnormal anus, to ascertain the condition of parts, I thought the aperture in the implanted ileum was too small, as it would only admit the little finger. Evidently tightening of the sutures had caused puckering; but a second's reflection consoled me, for the contents of the small gut are usually semi-solid or liquid, and the opening would suffice. Now I should have liked to have excised the abnormal anus, and invaginate both ends of the sigmoid as in Fig. 43; but, as already explained, there was not enough peritoneal coat on the bowel, and the adhesions prevented this; so that I had to content myself with cutting circularly through the mucous coat of the sigmoid below the artificial anus, and after stopping bleeding to turn it in, as in the diagram, and suture. The artificial anus was then stitched to the lower end of the abdominal wound, the peritoneal cavity washed with salt solution, the wound closed, and dressings and a many-tailed bandage applied. The object of invaginating and suturing the mucous membrane was to shut off and prevent any reflux in case the rectum did not act well (Fig. 43 demonstrates the nature of the operation). The operation lasted an hour and three-quarters. It is important to mention that in closing the abdominal wound I could scarcely get hold of any parietal peritoneum, only a slender bit here and there, and had to trust to union of the musculo-cutaneous structures. Small intestine was adherent to and flattened out against the parietes, and only the greatest care prevented my puncturing it when applying sutures to the abdominal incision. It will be observed that the serous and muscular coats of the posterior wall of the sigmoid are still continuous, and that only the mucous lining of the upper part of the rectum has been

invaginated. The patient bore the operation pretty well, was put into a warm bed with hot bottles to the feet, and had one-third of a grain of morphia subcutaneously. At night she had rallied well, but had been slightly sick from the ether. The next day, however, she became very ill, the pulse running up to 152 and the temperature

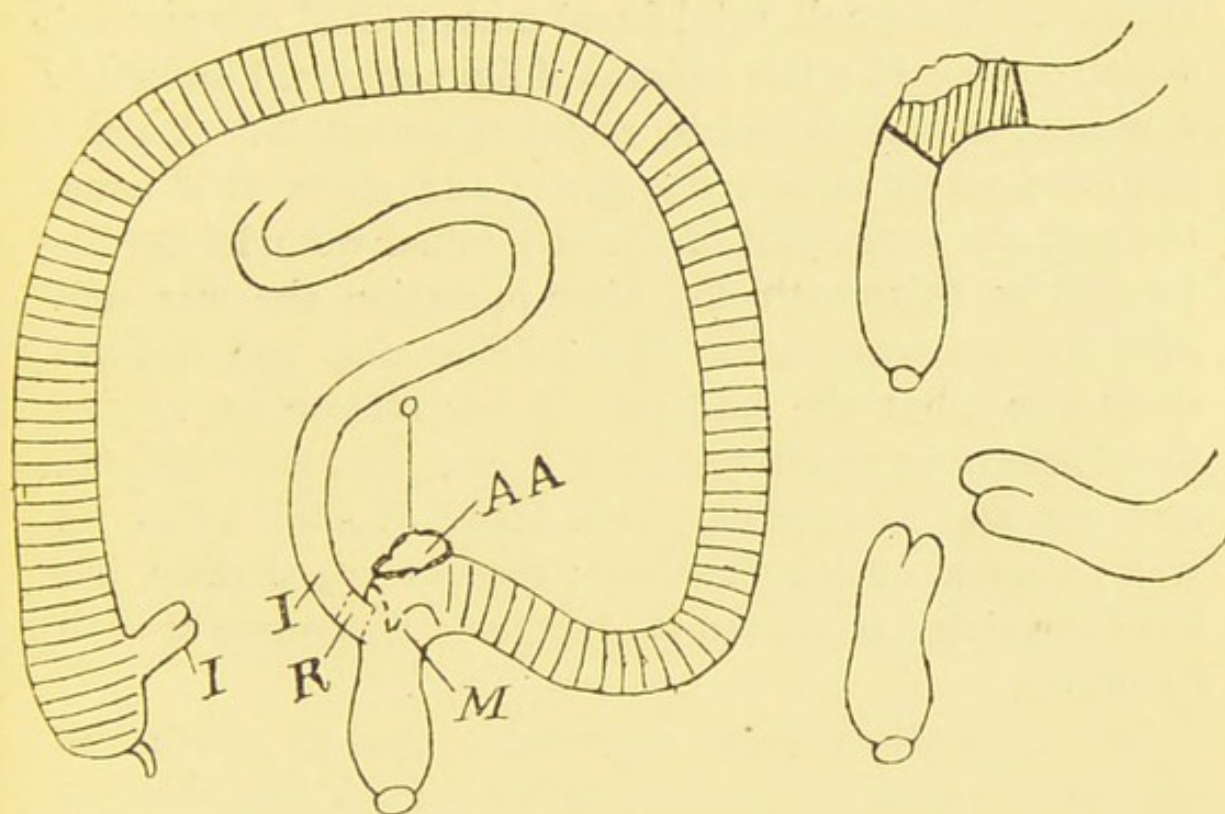


FIG. 43.

Diagram of the operation and its results. A A, artificial anus; I I, ileum. The cæcal end invaginated and sutured, the proximal end with R; a rubber ring implanted into the upper part of the rectum. M indicates the inverted and sutured mucous coat of the rectum. The figures to the right show the complete operation as intended. The upper one represents the abnormal anus excised, the lower one the sigmoid and rectum invaginated and sutured. The abdominal incision is wrongly represented as extending to the umbilicus. The shading shows that the whole of the large intestine is abolished by the operation.

102°. On Feb. 1st the pulse was 120; temperature 98·6°. She was frequently slightly sick, and took very little nourishment. There was a good deal of discharge from the wound. The stitches at the upper part of the wound had given way, but the peritoneal cavity was shut off by

granulations. Has had one hypodermic injection of morphia daily. On Feb. 2nd the lower part of the incision, above the sigmoid, had given way, and a large granulating surface was left. Intestinal contents escaped from the lower part of the wound, showing that the inverted mucous lining of the rectum had not united. On Feb. 5th a small, solid fæcal mass passed per rectum, which contained a fair amount of light-coloured intestinal contents, as ascertained by rectal examination. A small soap-and-water enema was given, and much of it came through the lower part of the abdominal wound. On the twelfth or thirteenth day after operation she was sent into the general ward. The rubber ring had not yet come away, but she had passed per rectum on two or three occasions small masses of fæces. She was cheerful, and ate and slept well. Feb. 24th: Wound filling up well; general health excellent; rectum acts slightly, but until the ring has passed it is unlikely to assume its full functions.'

Dr. Abbe (New York) reported a case in which the patient was in a desperate condition from the effect of fæcal fistula, the result of a tear in the intestine during the removal of a small, densely-adherent suppurating ovary, probably tubercular. On section, the intestines were found to be firmly matted together and studded with tubercles. The intestine leading to the fistula was dissected out on either side of it for four inches, and cut squarely across. The ends were then turned in for half an inch and closed by a continuous Lembert suture of silk. As it was impossible to turn the ends in opposite directions, they were laid side by side, split open longitudinally for an inch and three-quarters nearly to the end, and united with catgut apposition rings, with half a dozen reinforcing silk sutures outside. The entire wound was douched liberally with hot water, and a portion of

the deeply-adherent gut between the cut ends was dissected away and the wound closed, except for a small tampon of gauze at the site of the fistula. On the fourth day temperature 102°. A mild aperient was given, with immediate improvement. The patient convalesced rapidly.

LECTURE IV.

OPERATIONS ON THE INTESTINE.

Instruments — Operation Table — Decalcified Bone-plates — Abbe's Rings — Robinson's Plates — Brokaw's Rings — Jejuno-ileostomy — Halsted's Operation — Circular Enterorrhaphy — Bishop's Operation — Senn's Operation — Maunsell's Operation — Paul's Operation — The Author's Operation by bone Tubes — Operation by removal of Mucous Membrane — Excision of Cæcum — Ileo-Colostomy — Anchoring — Statistics — Colotomy — Sigmoidostomy — Lumbar Colotomy — Excision of Rectum.

I PROPOSE in this lecture to describe the different operations that are at the present time accepted as being the best and safest to perform on the intestine, when the continuity of the gastro-intestinal canal is interfered with, either by accident or disease. These operations have been the subject of study and experiment by me for the last three years, and although considerable improvements and advances have been made in Intestinal Surgery, I yet look forward to a still greater perfection than we have hitherto attained.

INSTRUMENTS.

I will in the first place enumerate the instruments and accessories that every surgeon should have with him when called upon to perform any of the operations I am about to describe. They should be as few and as simple as possible.

In the first place a good, firm table is indispensable,

and for this purpose the table should be of narrow dimensions, and not too high. As in many cases the surgeon is called upon to operate in the room in which he finds

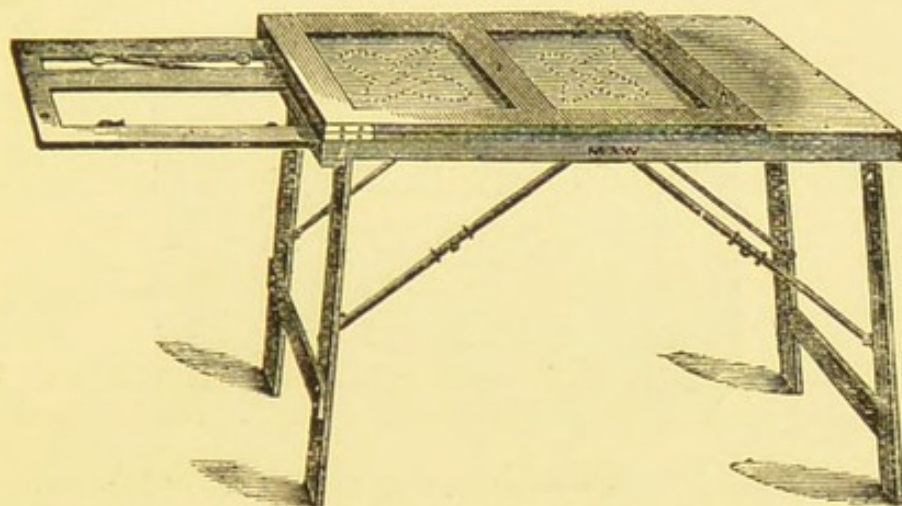


FIG. 44.—Portable operation table, partially closed.

his patient, it is a great desideratum to have a portable table, which is easily carried from place to place, readily put up in a few minutes, and yet combines with this

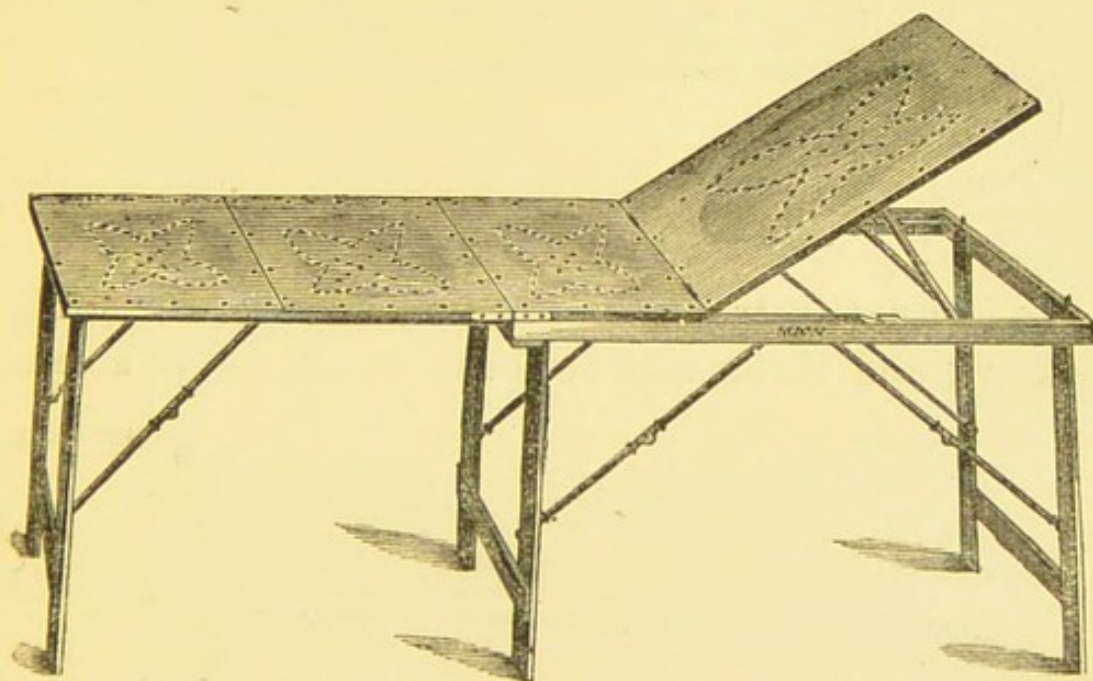


FIG. 45.—Portable operation table ready for use.

strength. Such a table (Fig. 44) has been made for me by Messrs. Maw, Son and Thompson, after a model I supplied them with, and the comfort of having this table

for use in all abdominal operations I cannot estimate too highly.

I have a couple of hot-water cushions, which fit the top

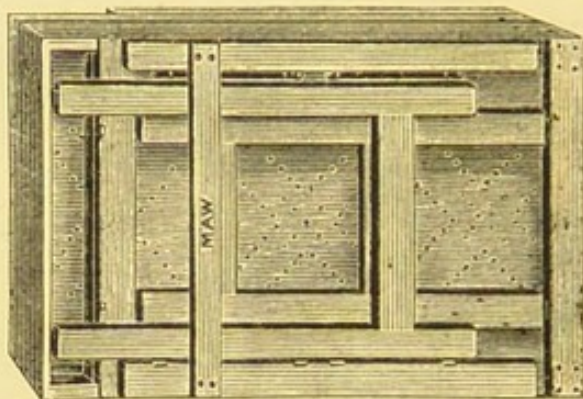


FIG. 46.—Portable operation table, closed.

of the table, for use in cold weather, or when the patient is very collapsed.

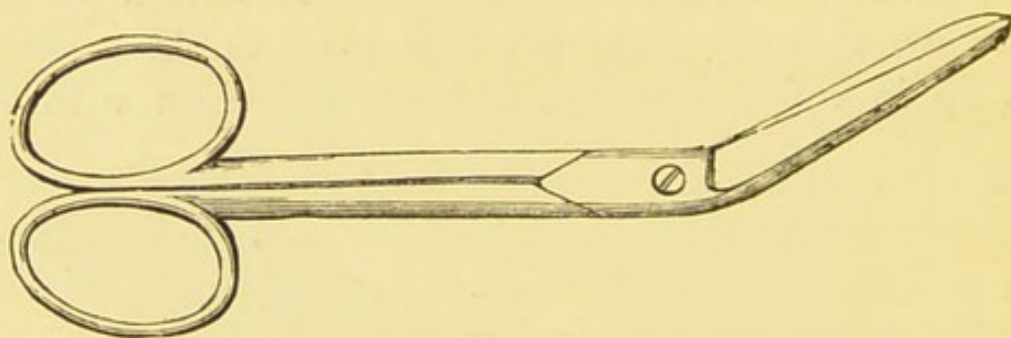


FIG. 47.

The actual instruments required are scalpels, straight scissors, and those that are bent on the flat at an angle

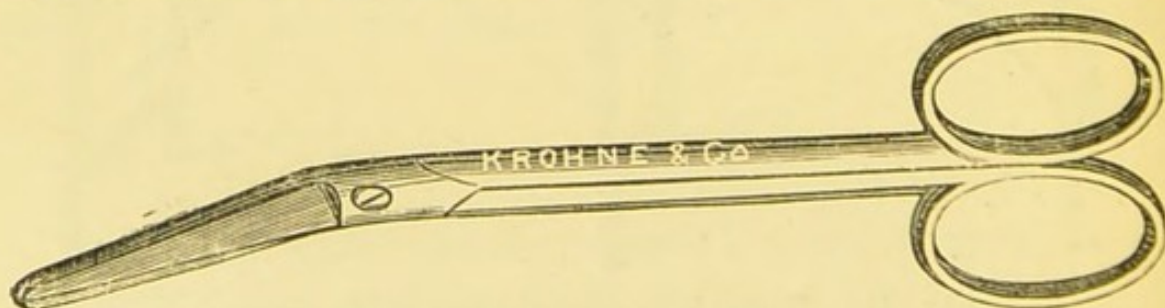


FIG. 48.

of 45° (Fig. 48) ; a pair of angular scissors (Fig. 47) ; some 20 pairs of pressure forceps will be necessary ; two pairs

of hæmostatic forceps (Fig. 50); dissecting forceps; two pairs of toothed forceps; and one or two pairs of vulsellum forceps; with one flat and one ordinary director;

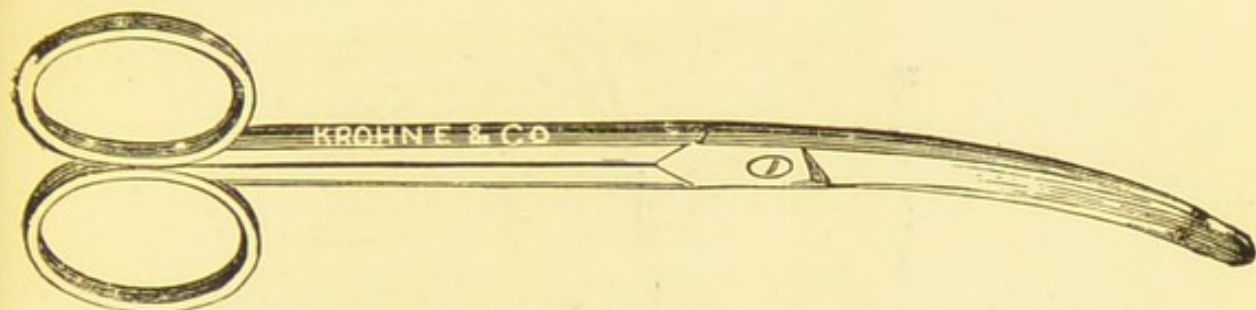


FIG. 49.

some common sewing needles; and a selection of Hagedorn's curved and intestinal needles; Hagedorn's needle holder as modified by myself (Fig. 53), and an ordinary

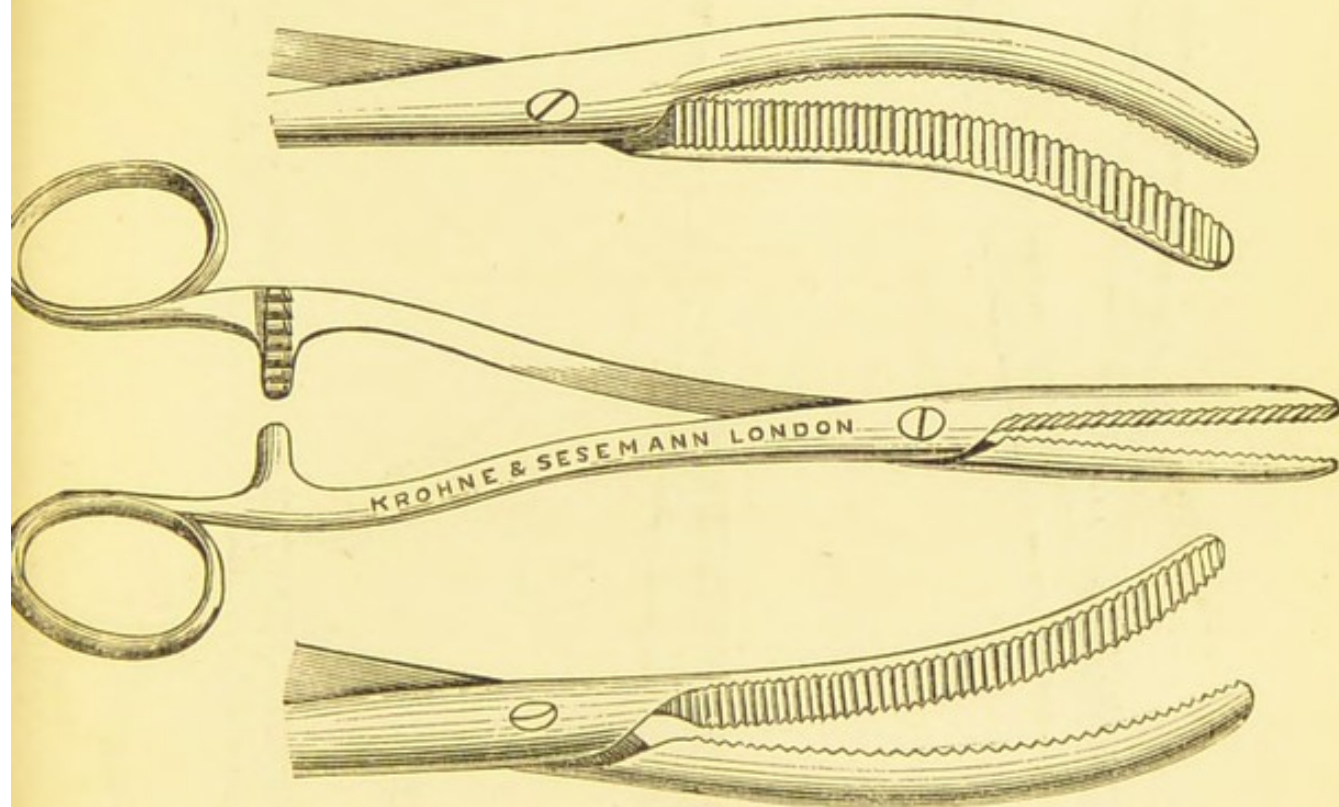


FIG. 50.—Hæmostatic Forceps.

needle holder; aneurism needles; long pedicle needle (Fig. 52); a length of india-rubber ligature to act as an intestinal clamp; a piece of rubber sheeting; decalcified bone plates, threaded; decalcified bone tubes; fine

silk, Nos. 1 and 4; chromic catgut, Nos. 1, 2 and 4; ordinary catgut, Nos. 1 and 4, for ligatures; silkworm

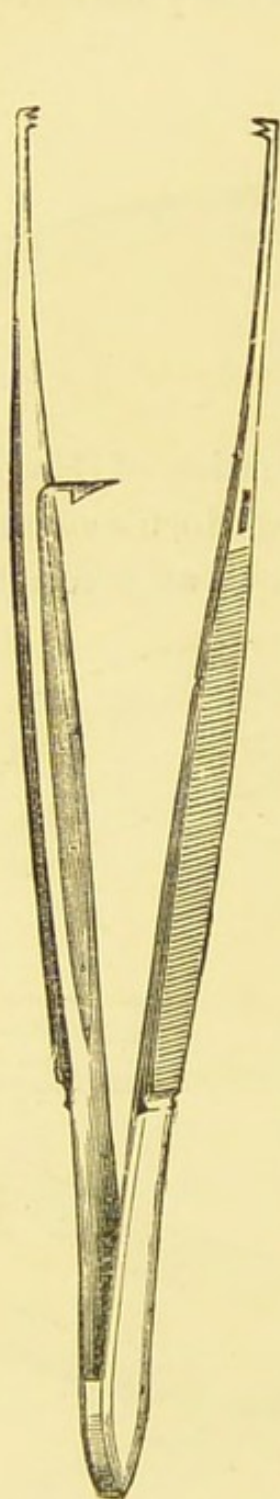


FIG. 51.—Forceps,
Toothed, with
catch.

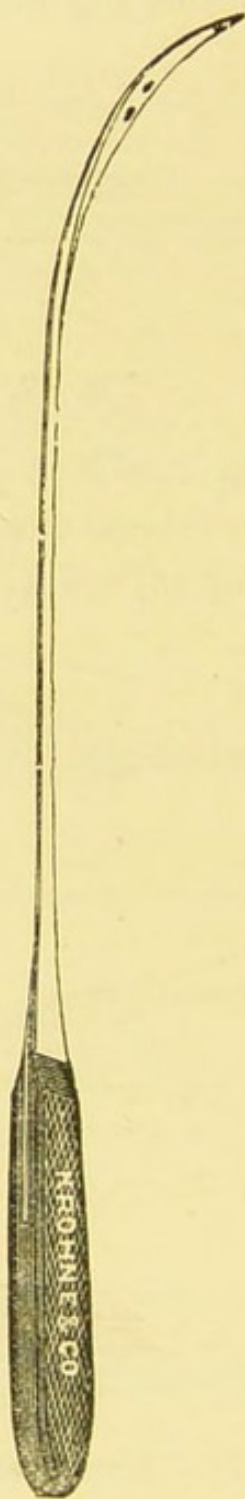


FIG. 52.—Pedicle
Needle.

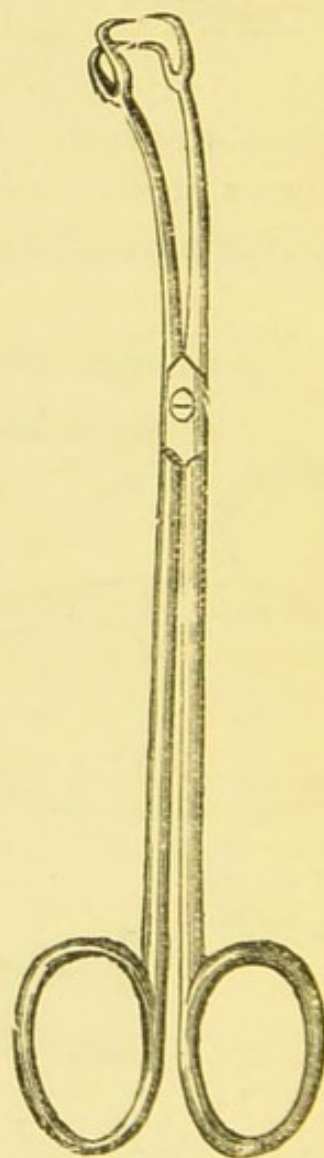


FIG. 53.—Needle
Holder.

gut; an ovariectomy sheet; drainage tubes, glass and rubber; finally, surgical dressings of gauze, and one or

other of the antiseptic wools ; and a many-tailed bandage made of flannel or swansdown.

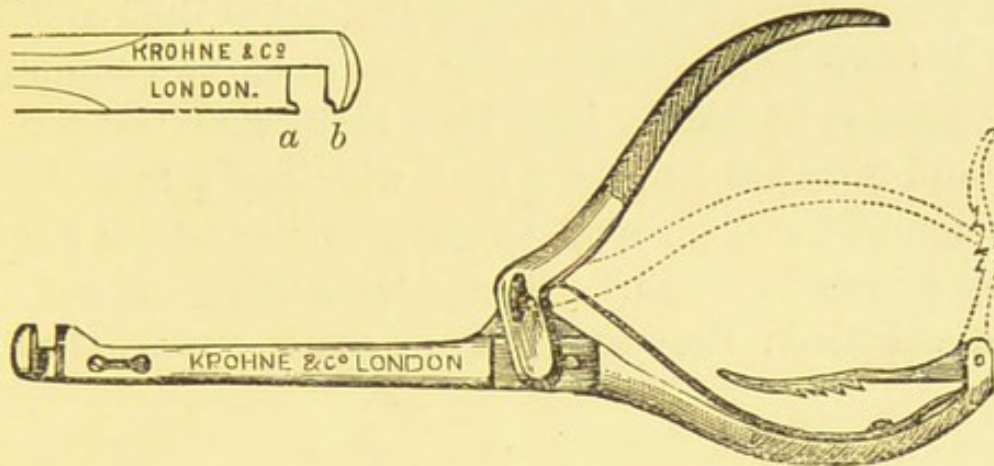


FIG. 54.—Hagedorn's needle holder, with author's modification of catch.
(a) Spur on catch fitting into the notch (b) which prevents the possibility of the needle slipping out.

With these instruments at hand any operation on the intestine may with safety be undertaken.

SENN'S BONE PLATES.

There have been a number of different forms of plates suggested by different surgeons for carrying out the

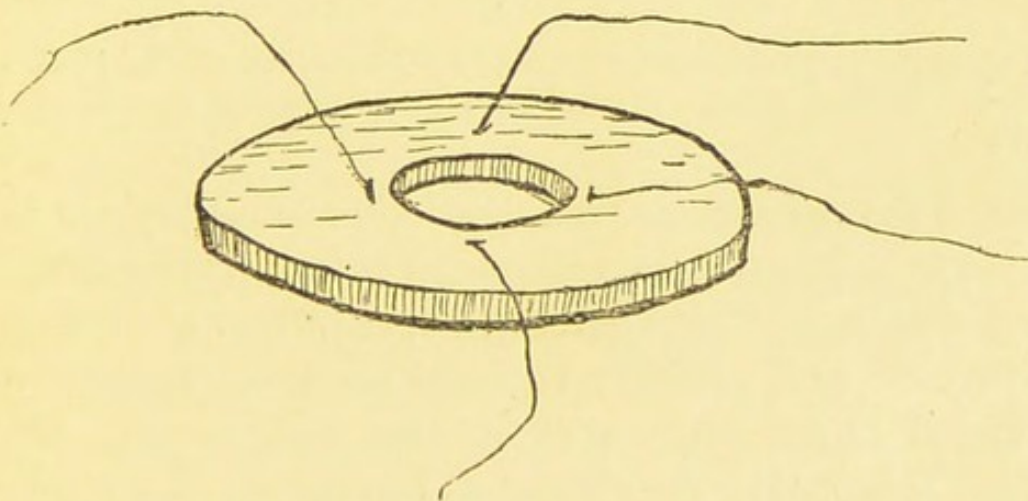


FIG. 55.—Senn's decalcified bone-plate, threaded. (About half-size.)

operative union of the intestines by lateral apposition, and it will be convenient to describe them briefly.

The plates that I use are cut slightly thicker than

Senn suggests (Fig. 55) and they are threaded quite differently, but in other respects they are the same.

The plates are, in the first instance, cut of the requisite size. I have had those I use made of two uniform sizes, namely, $2\frac{1}{2}$ inches long by 1 inch wide and $\frac{1}{4}$ inch thick, and 2 inches long by $\frac{3}{4}$ inch wide and $\frac{1}{6}$ inch thick. They should have an oval opening in the centre $\frac{3}{4}$ inch long by $\frac{1}{2}$ inch in width. These plates when cut out are to be decalcified; they can then be easily cut smaller at

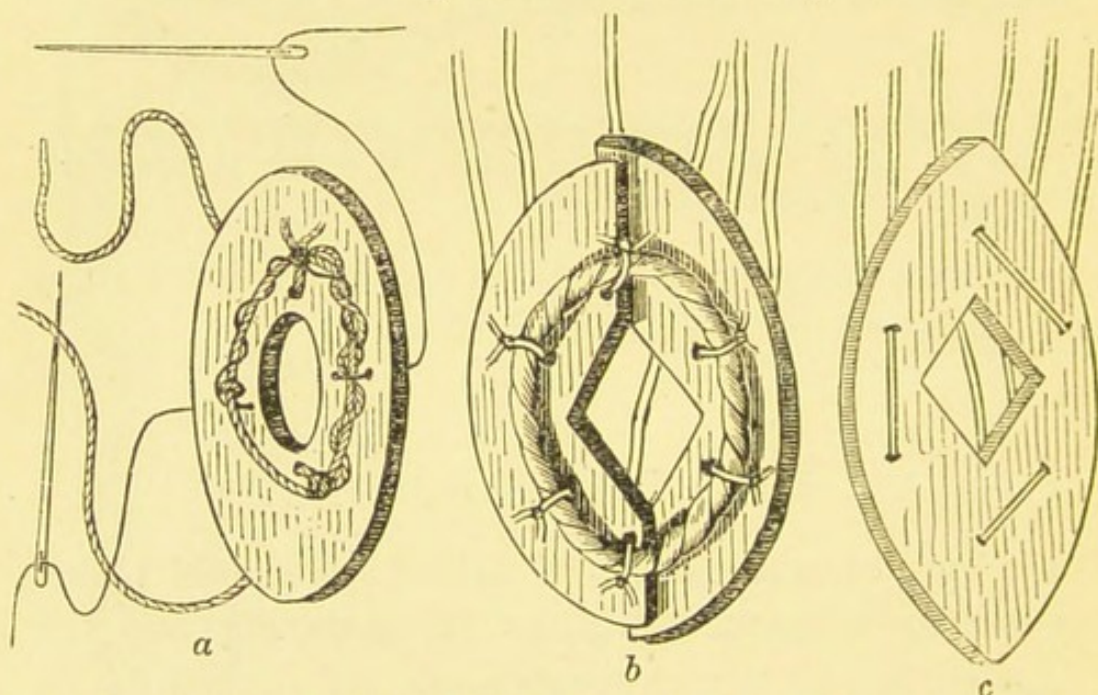


FIG. 56.—(a) Decalcified plate as threaded by the author. (b) Robinson's segmented rubber plate. (c) Robinson's raw hide plate. (About half-size.)

the time of the operation. To decalcify them they are to be placed in a 10 per cent. solution of strong hydrochloric acid and water, and allowed to remain in this until they are quite soft and pliable; the acid solution requires to be changed about every second day, and usually the plates are thoroughly decalcified in the course of a week. They are then washed, and allowed to lie in plain water for some hours to get rid of the superfluous acid, and finally they are preserved in rectified spirit and hyd. perchlor. $\frac{1}{5000}$, until required for use.

In preparing these plates for operative purposes, two threads, from 18 to 24 inches long, are required, one of No. 1 chromicized gut, and one of Chinese No. 1 silk. A ring of Chinese silk is formed slightly larger than the central opening in the bone plate. Senn uses silk for all the threads.

The Author's method of threading the plate.—The gut ligature, armed with an ordinary sewing needle at each end, is passed through the plate about an eighth of an inch from the central opening at the side. This can readily be done, as the plate is quite soft, and the needle easily pierces it. The ligature, being drawn about half its length through the plate, is knotted by an ordinary crochet stitch on to the silk loop at the back; the ligature is then twisted two or three times round the loop for half the circle, and again knotted on to the loop; the needle is then passed through the plate on the opposite side of the central opening and pulled taut. Next the silk ligature armed with a needle is passed from before backwards about an eighth of an inch from the end of the central opening, and knotted on the silk loop at the back, a few twists round the loop are made, and the ligature again knotted on to the loop on the opposite extremity of the opening, and passed through the plate. For use the two lateral gut threads are armed with ordinary sewing needles (Fig. 56a).

I have had a modification of these plates made which has the advantage of steadying the plates and keeping them more secure when fixed. The modification consists in having a decalcified bone cylinder (Fig. 57a) fixed on to one of the plates (Fig. 57b), which exactly fits the oval central opening. The cylinder, when the plates are in position, either in the case of gastro-enterostomy or jejunio-ileostomy, is made to pass into the oval opening in the other plate. When the threads are tied the

opposing serous surfaces are kept very steadily and firmly in position. This form of approximation plate is chiefly of use in the operation of gastro-enterostomy; in the operation of jejuno-ileostomy, it is very difficult to introduce the plate with cylinder attached into the intestine unless the upper part is very dilated. I have used this form of plate experimentally in cases of gastro-enterostomy, and have been well satisfied with it.

Abbe of New York has suggested the use of apposition rings formed by a coil of catgut. He gives the following direction for making them.*

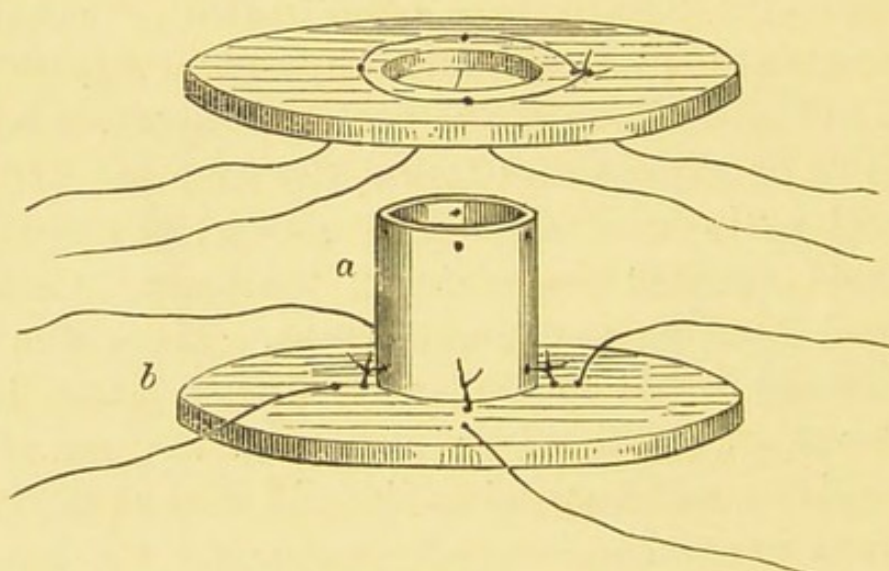


FIG. 57.—The Author's decalcified bone-plate fitted with cylinder (*a*) which fits accurately the opening (*b*).

A moderately heavy juniper catgut is wound closely on a test tube and soaked in hot water. After a while it is straightened out, wound again loosely, and soaked in hot water once more until it ceases to twist. Eight or ten turns are now made with this gut, over two pins stuck in a cork two inches apart, making a bundle somewhat smaller than a lead pencil. This is tied at four places with fine silk, to secure the strands parallel to each other while being wound around like a cable with a continuous piece of the same catgut. The end of the piece is secured by threading

* *Med. News*, June 1, 1889.

it with a Hagedorn needle, and transfixing the whole bundle obliquely with it at the place of finishing. Six strong but small braided silk threads are now fixed to each ring, equidistant, on the face looking toward the other ring, which is to be laid against it. No knots are used. A needle pierces the ring between the strands, carrying the thread, which is drawn through all but 8 inches, and wound once and a half around, sinking between the encircling catgut, piercing the ring again, and is cut off. Curl the threads up between the oval, tie the rings tightly between two glass slides, so as to compress them, and preserve in alcohol.

In using the rings, let each thread have its own needle. Pierce intestine from within outward, less than a quarter of an inch from its cut edge. The ring should be laid on a damp folded towel, while the operator quickly pulls the threads through and passes the rings into the interior of the bowel. When the threads are tied and cut off, the apposition is perfect, but by a quickly made running suture outside all, a half inch of peritoneal surface is at once secured beyond the possibility of breakage. More than this is superfluous.

In invaginating the cut end of the intestine after excision, time will be wasted if an attempt is made to turn in first one and then the other edge, and it will be found that the mesenteric edge turns in. To prevent this difficulty the mesentery should be turned back at least half an inch from the cut edge, and then both lips of the divided end should be seized with two forceps and plunged directly into the lumen. The entire edge of the divided intestine is thus turned in, and being held by the left index finger and thumb, is quickly united by a continuous suture.

Robinson, of Toledo, has suggested the adoption of raw hide plates (Fig. 56c) and also segmented rubber plates

(Fig. 56b) formed of two elliptical pieces of india-rubber, with a coil of catgut fastened to the back, to which are attached six threads of ordinary sewing-thread.*

He directs that the raw hide plate should be made by shaving the hair from the 'green' hide of an ox, and cutting it in strips an inch wide and two and a-half inches long. A diamond-shaped hole, one-half by three-quarters of an inch, is then made in the centre. From four to six sutures, armed with needles, are attached to the plate, and it is ready for use. In one of his experiments he killed a dog seventeen days after operating, and found the hide plates *in situ* in the same condition as when introduced. This must, I think, be a drawback to their use.

He directs that the segmented rubber plates should be made of rubber bands, which should be four and a half to three inches long, three-quarters of an inch wide, and about one-twelfth of an inch thick. Very thin rubber is the best, a piece of an Esmarch bandage being sufficient. The corners of the rubber are clipped off from one side of each segment, and a triangular piece is cut out of the opposite side of the segments to allow a channel for the passage of fæces. The rubber segment should then be stitched together at each end with catgut. After making a ring of raw hide, catgut, or sheepskin, it should be stitched to the sides of the rubber plate with two catgut sutures: thus the rubber plate and ring are held together by catgut only.

The six sutures, armed with round needles, are then applied, and the plate is ready for use.

Dr. A. V. L. Brokaw (St. Louis) makes use of segmented rubber rings, which he has made by passing catgut through four or more segments of rubber tubing in the following manner (Fig. 58): All that is necessary

* *Med. News*, vol. lviii., No. 11, p. 284.

is some rubber tubing, or a soft, ordinary rubber catheter, and some catgut. He prefers tubing one-sixteenth to one-eighth of an inch in diameter. A section of this, of sufficient length to make a ring of the desired aperture, is cut into from four to eight segments. Passing heavy strands of catgut through the lumen of these pieces, the ends are tied tightly enough to bring the ends of all the segments together, forming an oval ring. To the catgut strands are tied from four to six silk apposition threads, 12 to 14 inches long, and the

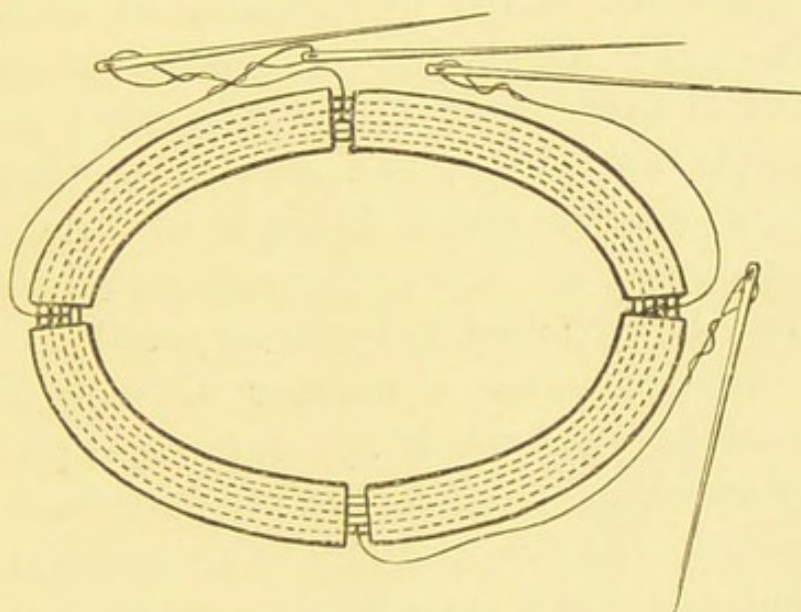


FIG. 58.—Brokaw's segmented ring threaded and ready for use.

attachment of needles to these threads renders the ring ready for use. Another method is to pass a heavy, double strand of catgut continuously through the segments several times; approximate the ends of the segments, and push the ends of the catgut into the tubing. This ring will have a better surgical finish, and, after the apposition threads are tied between the segments, the ring will maintain its perfect form until the catgut is absorbed. The rings were passed as early as the fifth day, in one of my experiments. In forming an anastomosis, after ordinary No. 6 darning-needles are

attached to the apposition threads, compress the ring and pass it through the opening made in the lumen of the bowel, then pass the threads through the intestinal wall from within outward. Ascertaining that the ring rests well in place, proceed to the second in the same manner; appose, and after scarification of the marginal serous surfaces, as suggested by Senn, tie the apposition threads. When possible, it is well to utilize omental grafts, which add to the security.

To Senn is due the credit of making the most substantial advances in the performance of intestinal anastomosis. He, like other surgeons, recognised the importance of bringing two large surfaces of peritoneum into accurate apposition, and also the further importance of introducing some method whereby the time hitherto occupied in the performance of these operations should be curtailed as much as possible. For this purpose, he performed a number of experiments on dogs, and adopted the use of approximation plates in the shape of decalcified bone discs, for the purpose of bringing into apposition the two portions of peritoneum covering the stomach and bowel in performing gastro-enterostomy, and two portions of intestine in performing ileo-ileostomy or ileo-colostomy by lateral apposition.

I have since then performed a number of experiments with a similar object, and have succeeded in perfecting these operations to such an extent, that I am convinced they may now be performed with the same confidence of success as can other abdominal operations.

In Lecture I., I described the operation connected with the stomach. I shall now proceed to demonstrate the different operations on the intestine as I have performed them.

Sutures of Intestine.

Before describing the different operations on the intestine it will be as well to briefly describe some of the forms

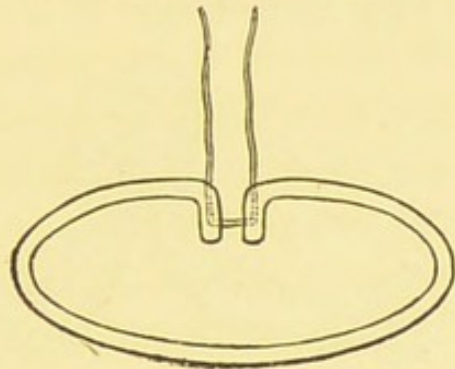


FIG. 59.—Lembert suture. In this method the mucous membrane is excluded. (Sir W. MacCormac.)

of suture that are now commonly in use. Lembert was the first surgeon who drew attention to the importance of passing the suture through only the serous and muscular

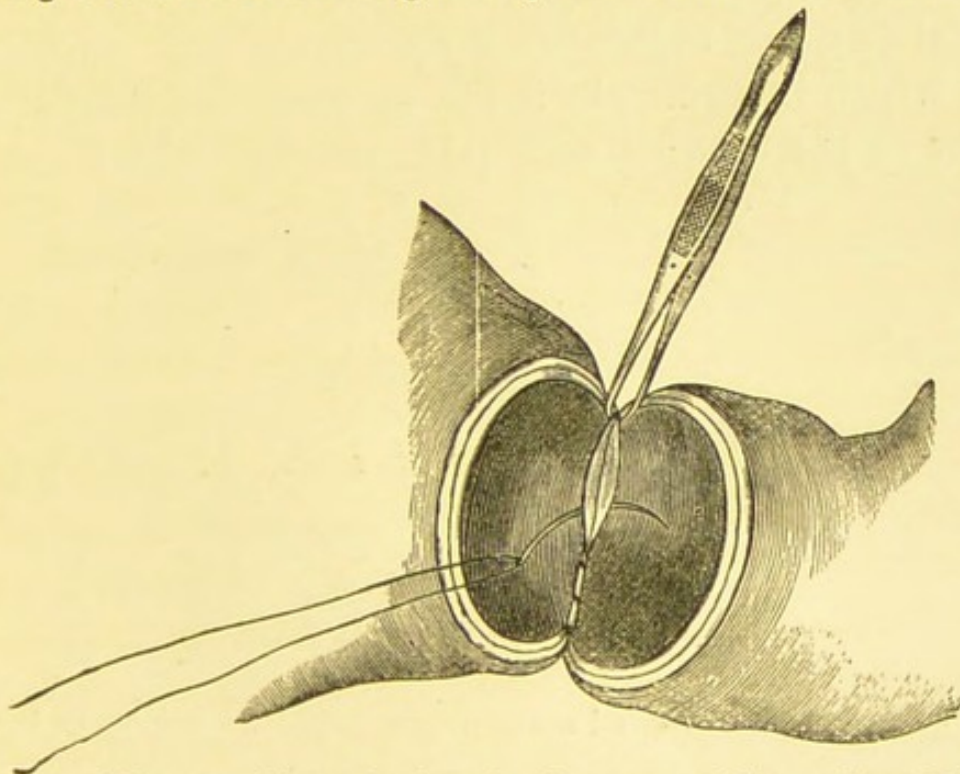


FIG. 60.—Manner of introducing the first row of Czerny's or Wölfler's sutures, which include mucous membrane only. (Sir W. MacCormac.)

coats of the intestine, taking great care not to puncture the mucous coats, in all operations on the intestine. The suture that carries his name is depicted in Figs. 59 and 62.

Czerny introduced a double suture, one of which united the mucous surfaces together, while the second is introduced in identically the same manner as the Lembert suture, bringing the serous surfaces into apposition. Wölfler has introduced a modification of this

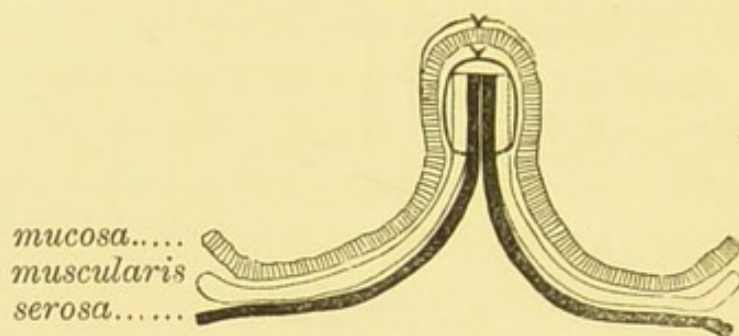


FIG. 61.—Wölfler's modification of Czerny's suture. The loops are drawn tight and knotted. (Sir W. MacCormac.)

suture by stitching the divided edges together from the inside of the intestine (Fig. 60). When the sutures are drawn tightly they appear as in Fig. 61.

Halsted has suggested a square or quilt suture (Fig. 65), which in principle is the same as Lembert's, so far as by it the sutures only pass through the serous and

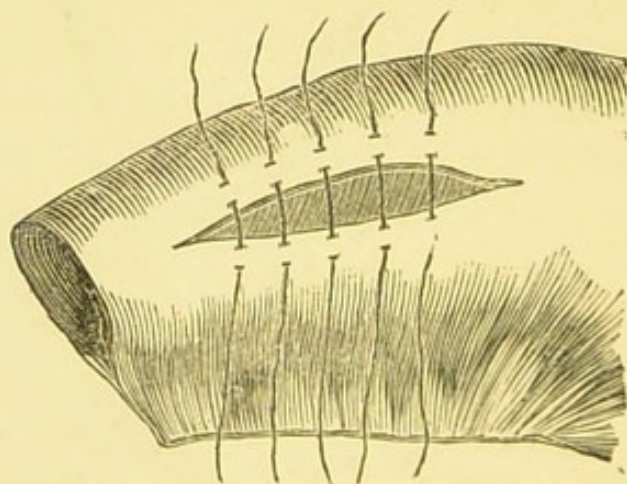


FIG. 62.—Five interrupted sutures introduced according to Lembert.

muscular coats, but owing to the secure hold this suture obtains, I consider it the best form at present in use.

For continuous suture of the intestine may be mentioned Dupuytren's and Appoleto's, but these I think have but little advantages over the ordinary glover's suture.

JEJUNO-ILEOSTOMY.

If it is not desired to remove any portion of the diseased small intestine, but simply to form an artificial communication between a portion of small intestine above and another portion below an obstruction, the operation is conducted exactly in the same manner as that described for gastro-enterostomy. Should it, however, be deemed necessary to excise a portion of the gut, the operation will have to be modified somewhat. In this case, the intestine, being drawn well out of the abdominal wound and gently squeezed at the seat of the operation, to empty it of its contents as far as possible, should be clamped, either by means of india-rubber bands or one of the numerous clamps devised for the purpose, about four inches on either side of the portion of diseased or injured bowel to be removed. Sponges should be carefully packed round the opening into the abdomen to prevent any faecal matter that may escape from the divided intestine entering into the peritoneum, and the bowel cut directly across with scissors, and a V-shaped piece of mesentery also removed. All bleeding points being secured with fine catgut ligatures, the two ends of each portion of bowel are to be invaginated into themselves, and, when invaginated to the extent of one inch, the serous and muscular coats of each are stitched together by means of a continuous catgut or Chinese silk suture. The two ends of the gut are next placed parallel to each other, with their convex surfaces in apposition. It is of importance to notice that the two portions of intestine are applied end on, so as not to interfere with the peristaltic action of the bowels. An opening about an inch and a quarter long is made longitudinally in each portion of the gut on its convex surface,

and the bone plates slipped in; the needles of the two lateral catgut threads of each plate are then passed through all the coats of the bowel close to the cut edge, and unthreaded, the two end threads being brought out of the wound in the gut; these threads are then carefully arranged so as to bring the corresponding threads of the two plates opposite to each other (Fig. 63).

The two openings are next accurately adapted to each other, and the bone plates held firmly in position by an assistant while the surgeon ties the corresponding threads

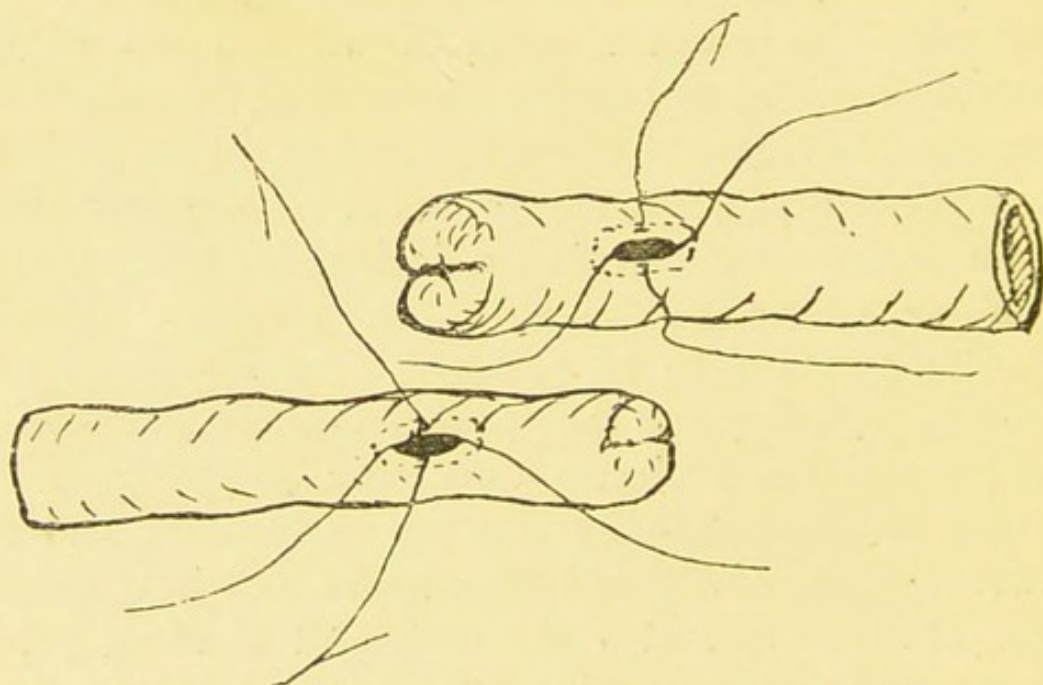


FIG. 63.—Jejuno-ileostomy. Bone-plates in position.

of each plate. The lower lateral threads should be tied first, then the end ones, and finally the upper lateral. It is wise to insert a few Lembert sutures at each end, and along the upper side. The jejunum being now firmly fixed to the ileum (Fig. 64), the parts are dropped back into the abdominal cavity, the toilet of the omentum attended to, and the abdominal wound closed in the usual manner.

The divided mesentery is united by a few stitches of catgut. This operation can be performed in twenty minutes. I have performed jejuno-ileostomy on several patients

who were suffering from intestinal obstruction, and with good results in those cases which were seen early enough. I have practised similar operations on dogs in six cases; in these cases portions of intestine, varying in length from 3 to 12 inches, were removed; the two ends of the divided bowel were invaginated into themselves, and in five cases the convex surfaces of the intestines above and below the excised portion were brought into apposition by means of decalcified bone plates. All these dogs made an uninterrupted recovery, and never seemed to suffer the slightest pain or inconvenience from the operation.

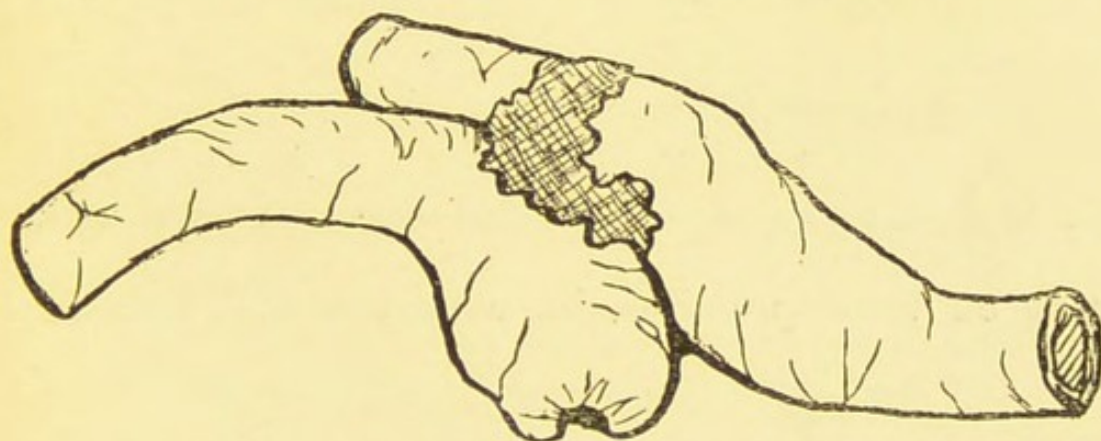


FIG. 64.—Jejunio-ileostomy. Intestine united.

At the *post-mortem* examination the omentum was found to be adherent to the bowel at the seat of operation. The two portions of intestine were united firmly (Fig. 64), and there existed a good and sufficient opening between them to allow of the contents of the bowel passing. In every case the dogs increased in weight after the operation.

HALSTED OPERATION.

Dr. W. J. Halsted (Baltimore) lays great stress on all sutures used in intestinal surgery penetrating the sub-

mucous coat, and has suggested the use of the quilt or square stitches in preference to Lembert sutures.

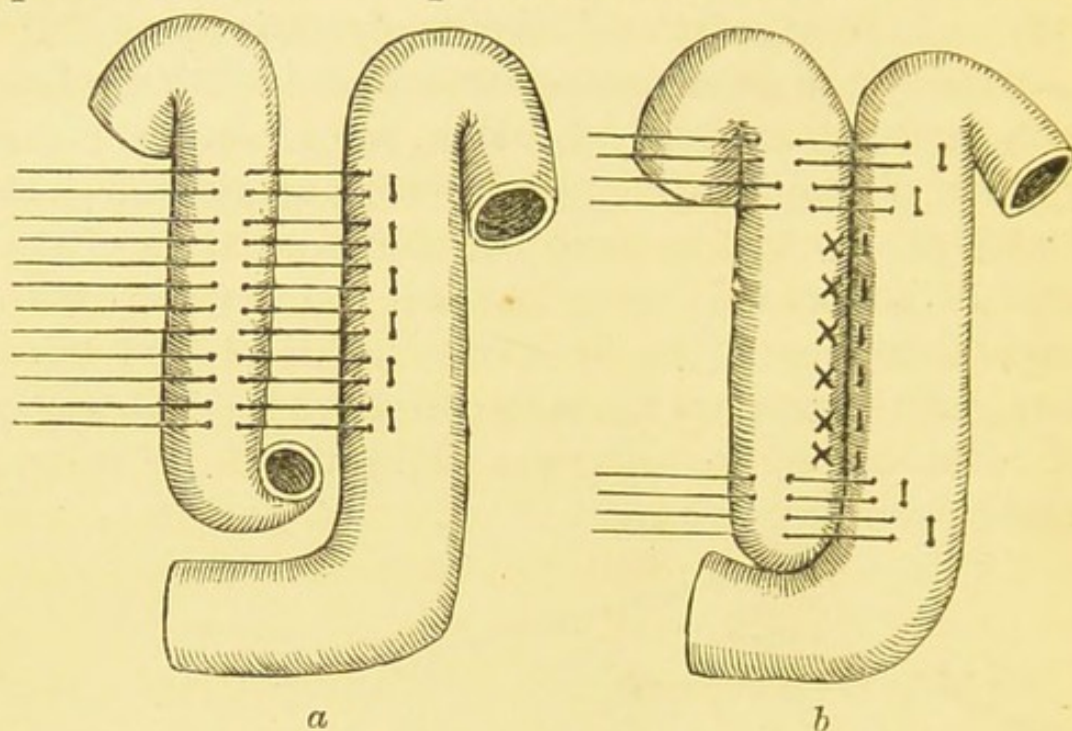


FIG. 65.—Halsted's operation. (a) First stage. (b) Second stage.

Acting on these premises, he considers that intestinal

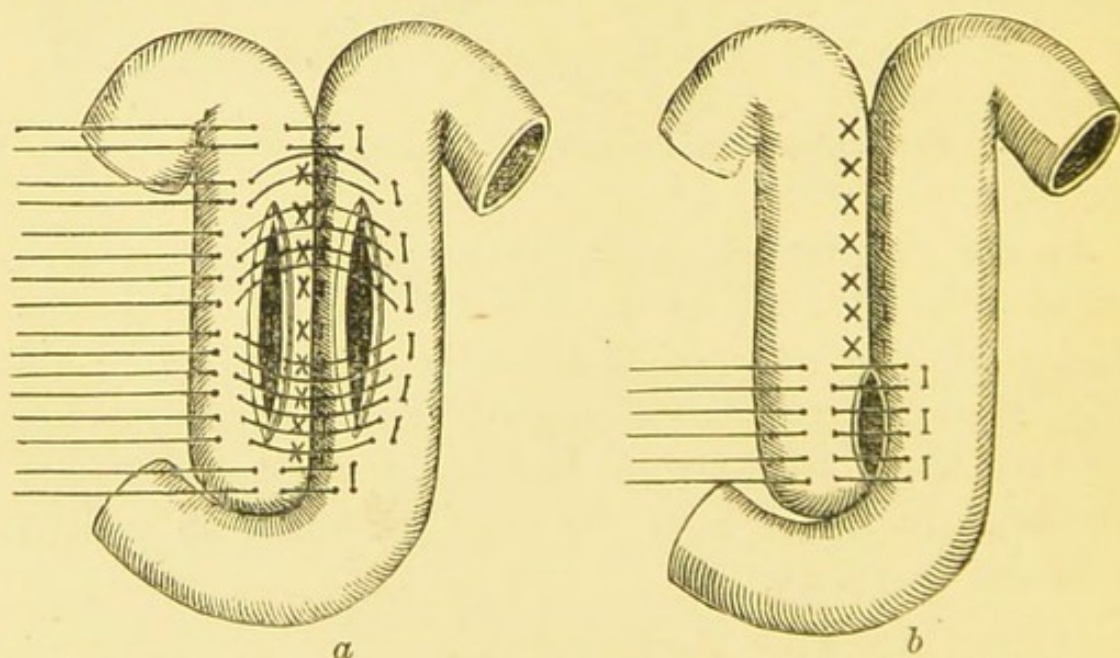


FIG. 66.—Halsted's operation. (a) Third stage. (b) Fourth and final stage.

anastomosis can be more advantageously carried out by the method he suggests without the aid of any rings or

approximation plates.* He says: In operating for intestinal anastomosis, we proceed as follows: six square or quilt stitches are taken in a straight row near the mesenteric borders of the selected portion of the intestine and tied (Fig. 65*a*). At each end of this posterior row of stitches, and nearer the convex border of the intestine, two lateral square stitches are applied (Fig. 65*b*), and tied; a little beyond the convex border the eight or nine square stitches which constitute the anterior row and complete the oval are applied, but not immediately tied. They are first drawn aside (Fig. 66*a*) to make room for the knife or scissors, with which the intestines are then opened. Finally, the sutures of the anterior row are tied (Fig. 66*b*), under a constant gentle irrigation with a tepid salt solution, 6-1000, which is poured from the flask in which it was sterilized.

Advantages.—1. None of the stitches perforate the intestinal wall.

2. All of the stitches are applied, and more than half of them tied before the intestines are opened.

3. The square stitches are employed.

I have employed this method in several experiments, and can bear witness to the success of the operation. In one case, with the kind assistance of Dr. Morotti, I located an artificial volvulus, and united the portions of intestine above and below the obstructed portion by lateral apposition by Halsted method; the dog made a perfect recovery. This specimen was shown at the Clinical Society last session (1891). In another case, also with Dr. Morotti's assistance, I excised a portion of the intestine, closed the divided ends by inversion and catgut sutures, and renewed the continuity of the canal by Halsted's method of lateral anastomosis, with perfect success.

* *Bulletin of John Hopkins' Hospital*, vol. ii., No. 10, p. 1.

In a case of pylorotomy on the human subject, which I performed successfully, I used Halsted quilt suture for uniting the divided ends of the stomach and duodenum, with great success.

I have seen time after time Lembert's suture cut out and tear the peritoneum when any strain is put upon it. With Halsted square stitch well applied through the muscular and into the submucous coat, this accident has never occurred to me in any cases that I have had to deal with.

Numerous other substances have been suggested for the formation of plates, but none of them need more than a passing notice. Thus Drs. N. Ashton and J. Baldy (Philadelphia), adopt the use of solid rubber cord, Davis's catgut mats, and Penrose's discs.* Then again Dr. Dawbarn, New York,† has suggested the adoption of the vegetable plate, made by cutting slices of raw potatoes.‡ None of these methods are of importance.

It will be seen then that the majority of surgeons who have made intestinal surgery their study, appear to be pretty well agreed that intestinal anastomosis, by the use of approximation discs in certain cases is the best to be adopted, the only source of difference being of what these discs shall consist. In my experimental research I have given most of the forms of plates and rings a fair trial, and am bound to say I consider the decalcified bone plate by far the best. They exert uniform pressure in all directions; there is no fear of gangrene supervening if the surgeon is only contented not to tie the ligatures too tightly.

Of the different plates which have been described, I am strongly of opinion that there is none that can be compared to the decalcified bone discs. They are soft, easily cut to

* *Medical News*, vol. lviii., No. 9, p. 230.

† *Medical Record*, N. Y., June 27, 1891.

‡ *Medical Record*, vol. xxxix., No. 26, p. 725.

any size you require, last sufficiently long to enable nature to effectually glue the apposing portions of intestine together; and, having fulfilled their mission, they are dissolved and digested, no more being seen of them, whereas the india-rubber segmented ring, or even the raw hide, may give trouble by becoming hung up in some part of the intestinal tract.

These plates can be kept any length of time in spirit, and should always be in the possession of surgeons who may be called suddenly to perform operations on the intestines. I keep my plates ready threaded in a solution of perchloride of mercury and absolute alcohol, $\frac{1}{5000}$. I believe this to be the best solution to use, as it keeps the plates aseptic and of good consistency.

In case the surgeon has not these plates by him, I consider the segmented rubber rings, as recommended by Robinson and Brokaw, the next best. They are readily made and certainly answer admirably well. In case the thin india-rubber for the formation of Robinson's segmented plates is not obtainable, the surgeon may substitute a piece of canvas, which should, of course, be thoroughly sterilized before use.

It will be noticed that Senn and other surgeons recommend the serous surface to be scarified before finally tying the ligatures. I consider this totally unnecessary. I have never done so in any of my operations, either experimentally or otherwise, and have never had cause to regret not having adopted this course. In fact, I consider by adopting this proceeding you are subjecting your patient to a not inconsiderable risk, as with a peritoneal surface in which solution of continuity has been broken there is a danger of infection, from which an uninjured peritoneal surface would be free. Moreover, as can be amply proved by gastrostomy and inguinal colostomy, lymph is thrown out so quickly by the peritoneal surfaces

that within an hour a quite thick coating is present, glueing the contiguous surfaces together.

I must not conclude the remarks upon these operations without saying a word in favour of Halsted's operation. My experience of this has been so good that I should always adopt it in case I were called upon suddenly to operate on a case of intestinal obstruction, and had not my plates with me.

Size of Opening.—The size of the incision which is to form the artificial opening in the intestine is of great importance; in my experience I find the artificial opening does contract to a certain extent, and cases have been reported wherein the opening has entirely closed after a few weeks or months. To obviate this, I consider the opening should be made of such a size as to allow for this contraction, and should be quite from one and a quarter to one and a half inches long, and if the mucous membrane protrude very much, I have in many cases trimmed it off, and in some cases stitched the mucous and serous surfaces around the opening together by means of fine continuous catgut sutures.

Let me here once more lay great stress upon the lateral ligatures, which pass through all the coat of the intestine or stomach, being of chromicized catgut No. 1, while the end ligatures are No. 1 Chinese silk.

CIRCULAR ENTERORRHAPHY.

It has been recognised by all surgeons that if it were possible to unite a divided intestine end to end with equal safety to the patient as by lateral apposition, it should be done. The number of operations that have been proposed to accomplish this desirable end has been so numerous, that it would be difficult, and, indeed, quite unnecessary, to reproduce them here.

Now the difficulties and dangers which have to be contended with in uniting one portion of intestine to another, end on end, are numerous. (1) The need for the operation is usually on account of obstruction existing, by which the proximal portion of the intestine is much dilated and possibly hypertrophied, while the distal portion is greatly contracted. (2) Even when this state of things does not exist, on account of the divergence of the two layers of the mesentery (Fig. 67) as they approach the bowel, a portion of its circumference is left destitute of serous investment, and it is at this point the surgeon

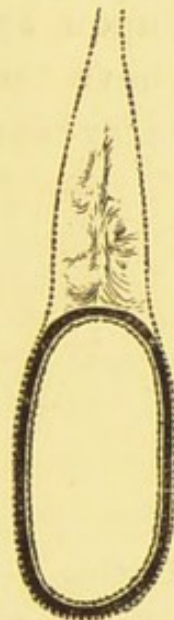


FIG. 67.—Section of ileum. (Natural size.)

finds his greatest difficulty, as it is obvious that a Lembert's suture may fail to bring the opposing layers of the serous surfaces of the intestine at the mesenteric attachment into intimate union, and leakage from the interior may follow. (3) In circular enterorrhaphy paralysis of the gut at the seat of operation takes place, and hence it does not readily relieve the fæcal obstruction, which is the immediate object of surgical interference. (4) A fæcal fistula is apt to arise at the point of operation. (5) Gangrene may arise from the pressure on the tissues of the sutures or tubes. (6) The gut may be so thin from

distension, that a needle cannot be passed between the muscular and mucous layers without great danger of penetrating the latter, and thus creating a fæcal fistula. (7) Circular stricture may follow the operation. (8) It is difficult in many cases to distinguish the proximal from the distal portion of intestine. This must, however, be definitely determined, as it would be a fatal mistake to invaginate the distal divided end of gut into the proximal. Prof. Nothnagle's test, in which he claims to have discovered that when potassium salt is applied to the gut wall, circular constriction occurs, and that ascending peristalsis takes place upon applying the sodium salt, cannot be relied on. I have tested this in many of my experiments, and have never been satisfied as to the result.

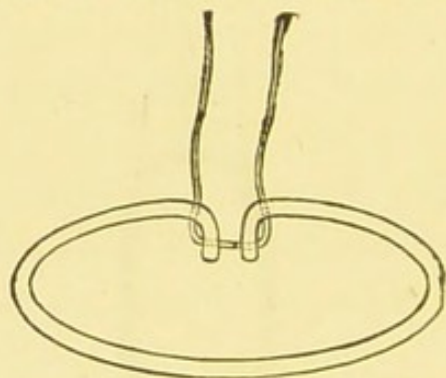


FIG. 68.—Jobert's suture. In this method the mucous membrane is included in the loop. (Sir W. MacCormac.)

To Jobert is due the credit of first proposing the idea of invaginating the upper into the lower portion of intestine for the union of the intestines, so as to invert the edge of the lower portion, and allow the serous surfaces of the two portions to be brought in actual apposition. As will be seen from the diagram, he made the mistake of passing the sutures through all the coats of the intestine (Fig. 68). Jobert's method was introduced in 1822. The upper and lower ends of the gut being identified, Jobert dissects away the mesentery for one-third of an inch from each end. One suture is inserted one-third of an inch from the divided margins of the upper extremity

of the bowel. A second suture is similarly introduced at the mesenteric border of the bowel (Fig. 69). The edges

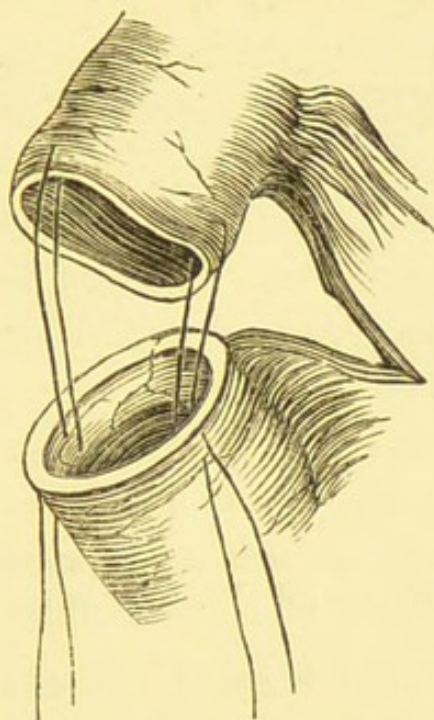


FIG. 69.—Sutures placed preparatory to invagination (Jobert). (Sir W. MacCormac.)

of the lower cut end are to be invaginated, and the upper portion of the bowel is then invaginated into the lower

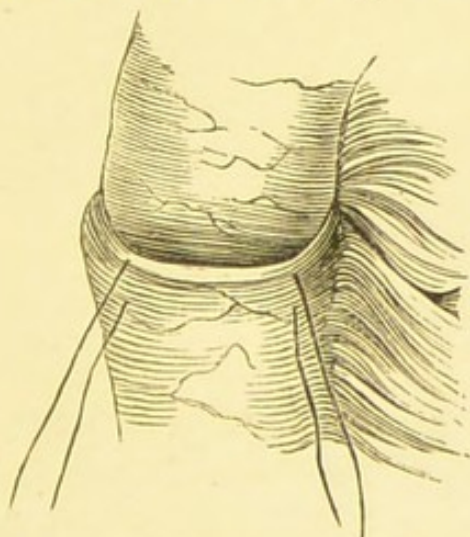


FIG. 70.—The upper extremity of the bowel invaginated within the inverted lip of the lower (Jobert). (Sir W. MacCormac.)

and secured (Fig. 70). The ends of the sutures are brought out of the external wound, and withdrawn by traction on the fourth or fifth day.

In place of passing the sutures, as advised by Jobert (Fig. 71), through the whole thickness of the invaginated

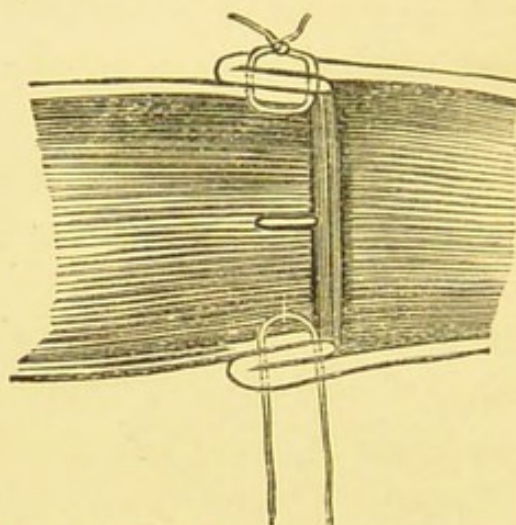


FIG. 71.—Diagram of the relations of the intestinal coats and sutures (Jobert). (Sir W. MacCormac.)

intestine, which would include the three layers of gut, Madelung sutured the serous layers together around the

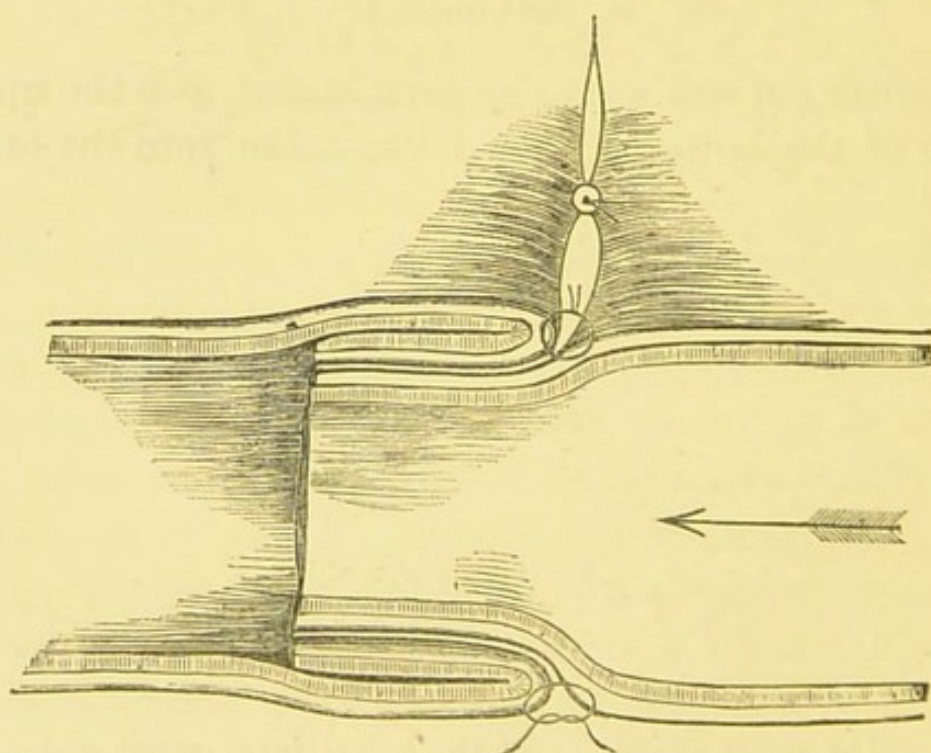


FIG. 72.—Jobert's method of suture as modified by Madelung. (Sir W. MacCormac.)

line at which the invagination begins. The invaginated portion will thus be directed valve-like whichever way

the intestinal current passes, and the danger consequent upon mistaking the upper for the lower end of the bowel is avoided.

Circular enterorrhaphy has, however, attracted the attention of surgeons in this country and elsewhere very much of late. A substantial advance was made by Mr. Stanmore Bishop, who, in a series of experiments on dogs, conducted in Paris, adopted the following ingenious methods of uniting the two divided ends of the intestine by circular enterorrhaphy; and although this method possibly may be now superseded by the further experiments conducted by Senn, Brokaw, Paul, Maunsell, and myself, yet the operation is most ingenious, as I can testify by having, through the courtesy of Mr. Stanmore Bishop, seen him perform the operation. I cannot do better than describe it in the graphic words used in his paper, read before the Royal Medical Chirurgical Society on May 10th, 1887, and published in vol. lxx. of their Transactions.

Stanmore Bishop's Operation.—To clear the way he starts with four propositions.

1. Union of the intestine is peculiar in this, that in no other tissue is it so imperative that absolute and perfect apposition should be obtained and maintained until organic union has taken place in every part. Anything less than this may result in a leakage, septic peritonitis, and death. (Blood-vessels are of course excepted, but I am not aware that any serious attempt has ever been made to suture these with a view of restoring their lumen.)

2. Our ideal object in operations on the intestine is to restore the *status quo ante*, that is, to reproduce a tube of normal calibre, with no contractions at the point of suture, and free on its serous surface from any adhesion to parts around which may restrict its normal movements or act as a band under which another loop may become strangulated.

3. Nothing traceable to the surgeon himself should be left behind when the operation is finished, which may render the patient liable to a second interference to obviate or remedy its effects.

4. It is necessary in order to obtain rapid and firm union that the two serous surfaces should be applied face to face, in other words, the coats must be turned

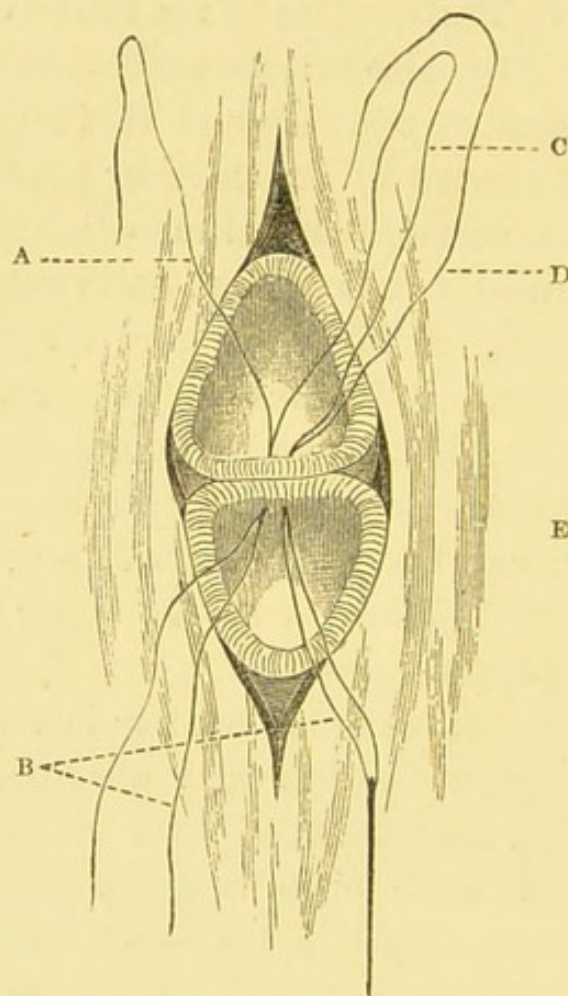


FIG. 73.—A, First thread left by dividing one of the first two loops. B, Threads which drawn up and tied will form the first loop. C, First loop. D, Left limit of second loop. E, Abdominal wound.

inwards. A valvular, ring-like projection must thereby necessarily result, surrounding the entire lumen, and narrowing by so much, and for so long as it exists, the calibre of the gut.

He thus shortly described his method of operating.

The two divided ends of intestine being brought to-

gether so that their mesenteric borders lie in an exact plane, a fine round needle, No. 11, armed with a long double silk thread, is passed from the mucous surface of one, through the entire walls of both, to the mucous surface of the other. The needle, and with it the double thread, is drawn through until about five inches of the

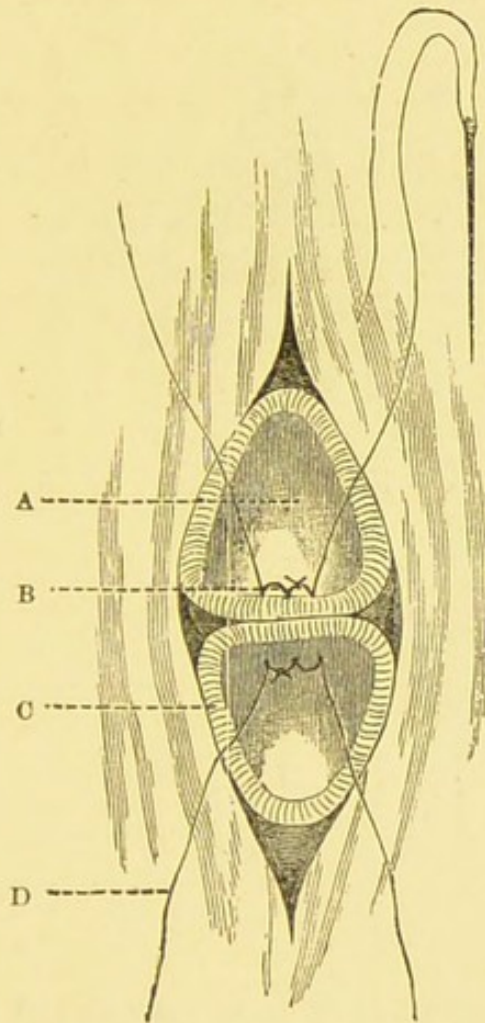


FIG. 74.—A, Lumen of intestine. B, Knots of suture inside intestine. C, Everted mucous membrane. D, First thread left to unite with last to form last loop.

thread are left on the side from which it has been passed. The needle is then again passed in the reverse direction, at a distance of 2 to 3 mm. from the first puncture, and the threads drawn through until a double loop is left, having also a length of five inches. (Fig. 73.) One of the loops is cut through, the other is drawn up, and

knotted with a reef-knot on the side started from. When the knot is made the ends are cut off close. Thus one loop has been formed, uniting the two bowel walls by their serous surfaces. On the far side of the loop a long single thread is left, passing through the same opening as that passed through by the distal limb of the loop. (This

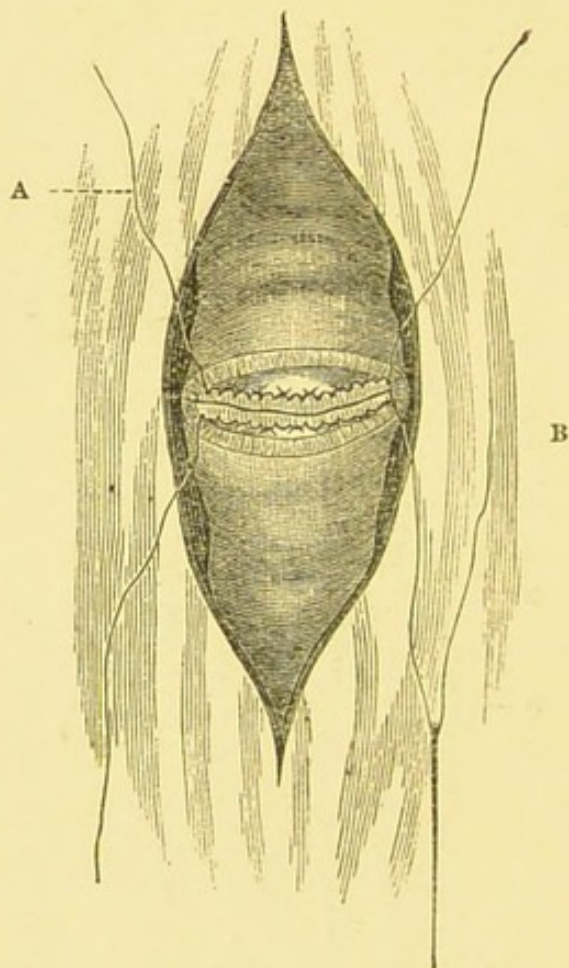


FIG. 75.—A, First thread left to unite with last to form loop. B, Abdominal wound with bowel at level of the skin. Half the circumference is united, and the resulting valvular ridge is seen with knots of suture on both sides.

thread is required later in finishing the last loop, and is useful all through the operation as a means whereby the bowel may be kept in position at the abdominal wound.) On the near side of the loop is another thread attached to the needle, and also passing through the same opening as that which holds the near limb of the loop. Reversing the needle and carrying it again through the

walls in the same direction as at first, another loop is made, which in its turn is knotted on the opposite side to the first knot (Fig. 74), and by a repetition of the same acts a series of loops is formed all around the lumen of the intestine, each individual loop surrounding its own moiety of both walls, passing through the same openings as its fellows on either side, but perfectly independent

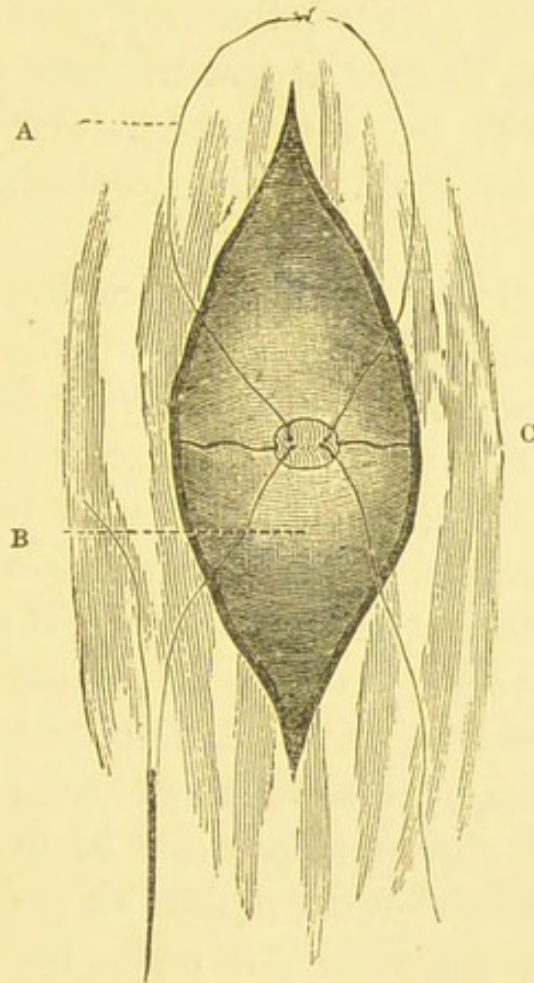


FIG. 76.—A, First thread united with last to form the last loop. B, Reunited intestine presenting at level of abdominal wall. C, Abdominal wound.

of them, lying transversely to the line of union, and parallel to the plane of the intestine, not so tightly tied as at once to strangulate the tissue enclosed, but certain, as it ulcerates out, to carry with it that portion of the valvular ring. The knots, and nearly the whole of the loops, are, moreover, inside the re-formed canal (Fig. 75).

No needle is used with a cutting edge. All the stitches

are made with a small round needle, which pierces, but does not cut the tissues.

The finest silk is used, as it is not desired that the material of which the threads are made should be absorbed, but that it should be cast off into the lumen of the canal; on the other hand, fine catgut is used for uniting the mesentery for the opposite reason.

As the stitching goes on the two ends of the bowel become turned in, so that at last the suture lies entirely within the intestine, being separated from the peritoneal cavity by a space equal to the thickness of the wall of the gut.

As each loop is tied it will be seen that if, instead of cutting off only the ends of the thread engaged in making that knot the needle is cut away entirely, one long thread will be left passing through the last opening made. When the last loop comes to be tied, this is done, and the loop is formed by tying one end of this thread to the corresponding end of the first, which, it will be remembered, was left on beginning the suture (Fig. 76). The loop thus formed is drawn up, and knotted securely on the opposite side, thus closing the bowel.

It will be seen that it is possible to finish the suture entirely in this way, leaving almost no point of the stitch in sight; but in practice it is often more satisfactory, after the last loop is tied, to introduce one Lembert suture, so as more evenly to close the final opening. This stitch is made with gut, as its use is merely temporary, and absorption of it is desired.

It was to overcome this difficulty that Jobert suggested invaginating the upper divided portion of bowel into the lower, and Senn modified this operation by lining the proximal portion of intestine with a band of india-rubber.

Senn's Operation.—This method, suggested by Senn and adopted in numerous experiments by myself, is really

a modification of Jobert's operation. In both operations, the proximal portion of the divided gut is invaginated into the distal end, and the sutures are passed through all the coats of the intestine, but Senn's operation differs from Jobert's in that he lines the upper end of the bowel with a soft pliable india-rubber band, which is cut the required length at the time of the operation, and formed into a ring by fastening the ends together with two catgut sutures. The rings that I have used have been formed by cutting a strip of thin sheet india-rubber, half an inch in width, and of the same length as the circumference of the intestine into which it is to be placed, and forming it into a ring by fastening the ends with a few stitches of catgut; this is pushed into the lumen of the proximal end of the gut, which it should fit accurately. The ring is to be fastened to the lower end of the proximal portion of the bowel by a continuous catgut suture, which prevents the bulging of the mucous membrane (Fig. 77). Two sutures of No. 1 chromicized catgut, about 18 to 24 inches long, and threaded at each end with an ordinary sewing needle, are next prepared, and the needle passed from within outwards, transfixing the upper portion of the rubber band and all the coats of the bowel. The posterior threads are passed one on either side of the mesentery, and the anterior needles at equal distances apart through the convex surfaces of the bowel.

The intestine above and below the seat of operation is either compressed between the thumb and fingers of an assistant, or by an india-rubber band passed round and lightly tied, or by one or other of the clamps made for this purpose.

The needles are next passed through the peritoneal and muscular coats of the lower portion of the intestine at corresponding points about one-third or half an inch from the cut edge. An assistant now makes gentle

traction upon all the threads, while the operator manipulates the two ends of the divided gut, so that the upper end becomes invaginated into the lower (Fig. 77). Care must be taken that the margins of the lower end are turned completely and evenly in, so that the serous surface of the intussusciens is in close contact to that of the intussusceptum. The operator, having satisfied himself that the upper portion of gut is completely invaginated, proceeds to tie the catgut sutures with sufficient firmness to prevent disinvagination.

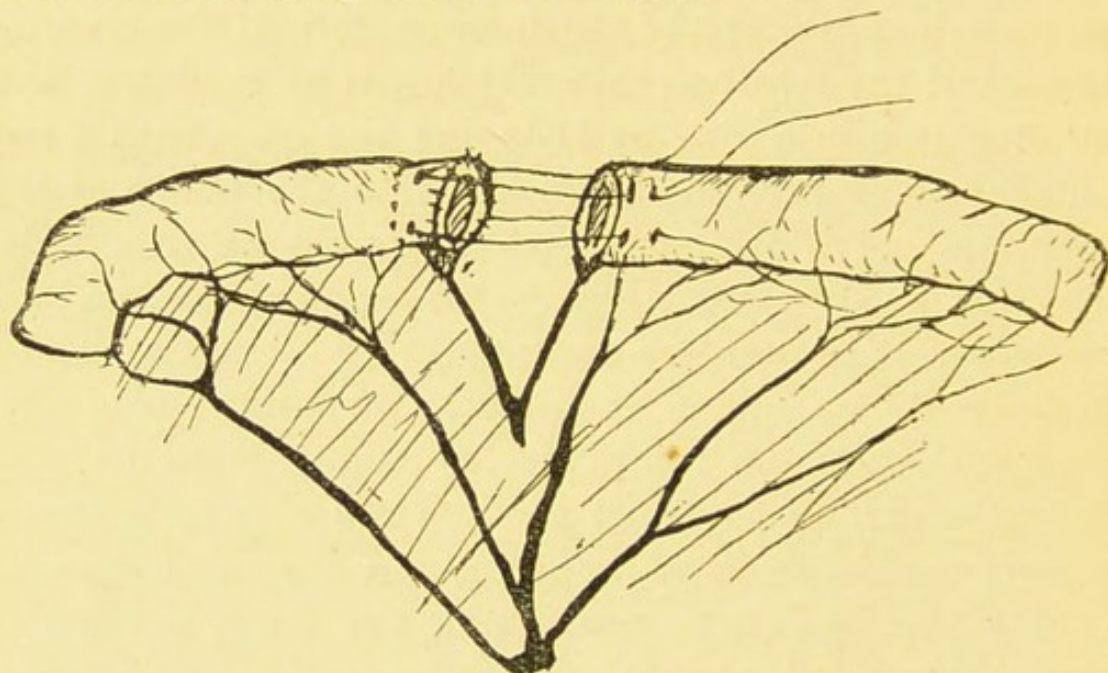


FIG. 77.—Senn's operation. Showing india-rubber band and sutures in position.

The divided mesentery is next fastened together with a few interrupted catgut sutures, and great care should be paid to the mesenteric attachment of the gut at the point of operation, as it is here that the greatest difficulty is experienced in the invagination; in my experience it is always well to place a couple of Czerny-Lembert sutures, one on either side of the mesenteric attachment. After a few days the rubber ring becomes detached, by the absorption of the catgut sutures, and passes per anum.

The success of this operation can be greatly increased,

I think, by applying either an omental flap or an omental graft around the seat of operation.

An omental flap, adopted by Senn and others, may be applied by cutting a strip of omentum about two inches wide and wrapping it round the gut, fastening it in place by a couple of stitches, one on either side of the point of union of the intestine, and passing through both surfaces of the flap and the mesentery, care being taken to ensure that the sutures are passed parallel to the mesenteric vessels. The cut edge of the omentum from which the flap has been excised, after all bleeding points have been secured, should be united by a continuous catgut suture. In the case of an omental graft, a piece of omentum

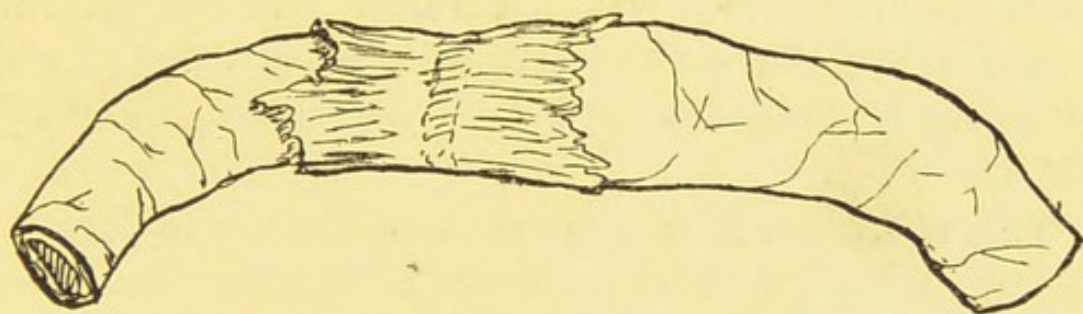


FIG. 78.—Senn's operation. Showing omentum flap, from sketch of one of the author's cases.

about two inches wide is entirely cut away of sufficient length to wrap easily round the bowel; this then, being washed in a weak solution of carbolic acid, is fastened round the seat of operation in the same manner as the flap, the cut omentum being united by a continuous catgut suture. Dr. Weir, of New York, suggests that a peritoneal graft might be formed out of the mesentery which has been cut away. In some of my specimens it is seen how well this method has answered (Fig. 78).

Of the seven experiments in which I followed this mode of performing circular enterorrhaphy, the two first died from peritonitis due to leakage at the mesenteric attachment three days after the operation. In one of these the

distal portion of intestine was invaginated into the proximal by accident. The third case died on the fourteenth day. In this case an omental flap was applied; at the post-mortem examination, union of the gut was found to be perfect, as also of the omental flap, but the upper end of the bowel was filled with small pieces of hay mixed with other food which the animal had eaten. This had formed a complete block. The india-rubber ring had disappeared, and, on removal of the accumulation, the lumen of the gut was found to be perfect.

The remaining four cases all recovered, although in the last one, in which the omental graft had been applied, the dog wasted considerably, and when killed two months after the operation it was discovered that the portion of bowel above the seat of operation in this dog was also enormously distended, and filled with pieces of hay and *débris*.

This operation is very much more difficult in dogs than in human beings. I have performed it a number of times on the dead body with perfect ease. In the following case—that of removal of a sarcomatous ovary in which a large portion of small intestine was involved, I was obliged to remove some twelve inches of intestine.

E. S., æt. 45, ovarian tumour. In this case I performed circular enterorrhaphy by Senn's method with perfect ease in a few minutes. This patient was in so exhausted a condition that it would have been impossible to have allowed time to suture the two ends by the Czerny-Lembert method. The patient did remarkably well for eight days, taking her food freely, and her bowels acting regularly, when she suddenly developed peritonitis, and died on the tenth day after operation. In this case there had been ulceration along one of the sutures. At the post-mortem examination it was found that the invagination was perfect, but a small pinhole existed in

the mesenteric side of the gut, due evidently to ulceration. The india-rubber ring was *in situ*; the chromic gut sutures fastening the lower edge of the upper end of the intestine to the rubber band were not absorbed, thus forming a valve. From this lesson one learns the desirability of using plain, not chromicized, catgut suture for stitching the ring to the margin of the bowel.

I have practised this operation with fair success in a few cases, also experimentally, but it is not by any means easy to perform even in a dog whose intestine is normal; how much more difficult must it be, then, in the case where the proximal portion of intestine is dilated and hypertrophied, and the distal portion of the intestine contracted! The case alluded to in Lecture II. would no doubt have been successful had I then had the experience I have now, and used chromicized catgut in the place of silk.

Dr. H. Widenham Maunsell's Operation.—Dr. H. Widenham Maunsell, late of Dunedin Hospital, New Zealand, has suggested another method of performing enterorrhaphy,* which he most kindly demonstrated to me, and the cases in which I performed this operation were very successful; yet I am bound to say his method did not recommend itself to me, as by it the extra incision into the intestine formed an increased risk, and when traction was put upon the threads considerable force was required and bruising was caused to the intestine before it was drawn through. He directs the operation to be performed as follows: The intestine being divided, the cut surfaces of both ends are to be brought together by two temporary sutures with long ends left intact (Fig. 79), one at the mesenteric attachment of the gut, and the other (exactly opposite) at the most distal portion of the bowel from the mesentery. These temporary ligatures are very

* *Intercolonial Med. Congress of Australasia Transactions*, 1889.

important, as they secure the proper relative position of the two cut ends of the gut, and facilitate their subsequent invagination through the opening to be described in the lower segment of the gut. This opening (Fig. 80)

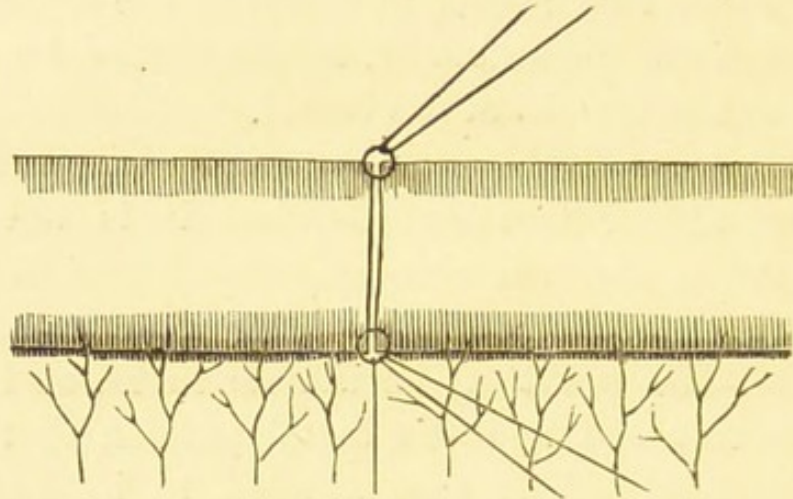


FIG. 79.—The divided ends secured by two temporary sutures.

should be made about an inch from the severed end of the lower bowel; its length depends on the size of the gut to be invaginated. In performing this part of the operation, the coats of the intestine should be pinched

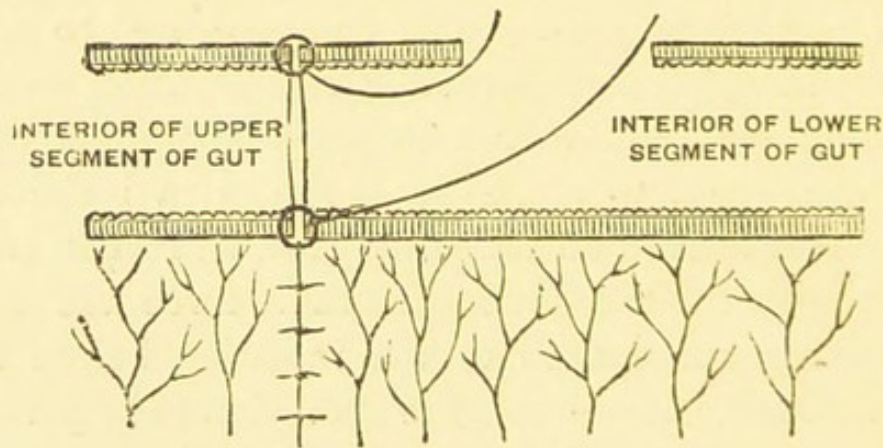


FIG. 80.—Opening made in convex surface of lower end of gut, and temporary sutures drawn through.

up between the finger and thumb, and transfixed with a tenotomy knife.

The long temporary sutures which unite the severed ends of the bowel are now drawn through the longitudinal

slit made in the lower gut, and by drawing upon these and manipulating the lower segment of the intestine with the thumb and finger, the upper end is drawn through

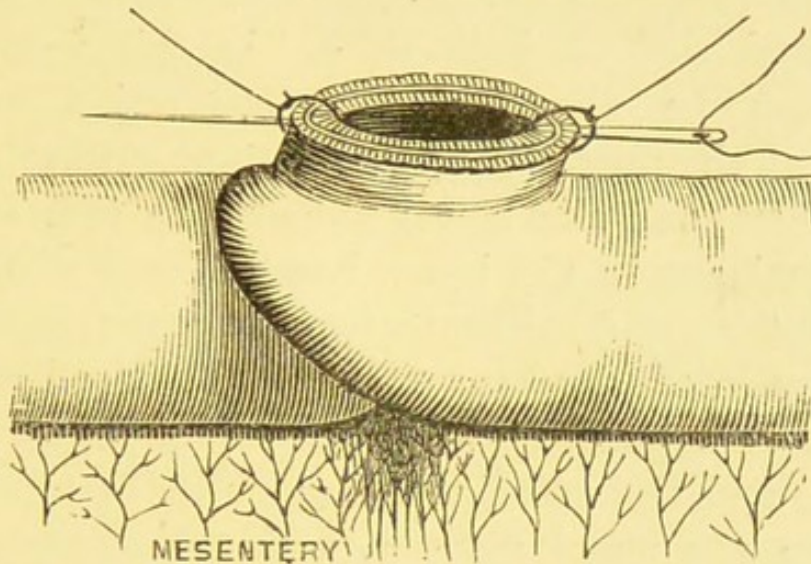


FIG. 81.—The upper segment, together with the divided end of lower segment, are here shown drawn through the slit in the lower portion of gut.

the slit in the lower portion of the intestine; at the same time the divided end of the lower segment is invaginated and brought out of the slit. We have then presenting

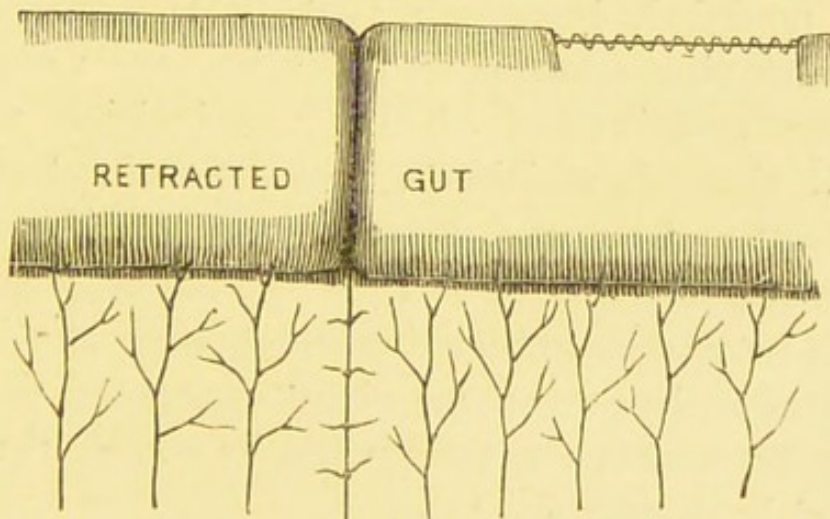


FIG. 82.—Operation complete.

through the lower slit (Fig. 81) the two divided ends of the intestine with the peritoneal surfaces in accurate juxtaposition all round. An assistant is then directed to

hold the ends of the temporary sutures, while the surgeon passes a straight needle armed with stout horse-hair through both sides of the bowel; the horsehair is then hooked up from the centre of the invaginated gut, divided and tied on both sides. In this way twenty sutures can be placed rapidly in position with ten passages of the needle. The temporary sutures are now cut off short, and the bowel pulled back (Fig. 82); the longitudinal slit in the lower bowel closed with a continuous suture, and the mesentery brought together with four or five interrupted sutures. Dr. Maunsell says this operation is applicable to any part of the large or small intestine, and the pyloric end of the stomach may be excised in the usual manner, and the duodenum and divided end of stomach invaginated through an opening in the centre of the anterior wall of the stomach, sewn up from the inside and then retracted to its normal position.

Mr. Paul (Liverpool), in an able paper, describes a novel method of performing circular enterorrhaphy.* It is practically a combination of Senn's and Maunsell's method modified, insomuch that in the place of the india-rubber ring adopted by Senn, he uses a decalcified bone tube, and instead of the long incision made by Maunsell, through which the two ends of intestine are brought out and sutured, he contents himself with passing a strong silk suture—which is securely fastened to the parts he wishes to invaginate—through the intestine about three inches down the distal segment of the bowel, whereby he exerts traction, while he draws the end of the bowel back over the tube.

Mr. Paul's Operation.—‘This consisted in supplying the bone tube with a traction thread to be passed through the wall of the distal segment of bowel, for an assistant to pull on whilst the operator manipulates the invagina-

* *Lancet*, vol. i., 1891, p. 1196.

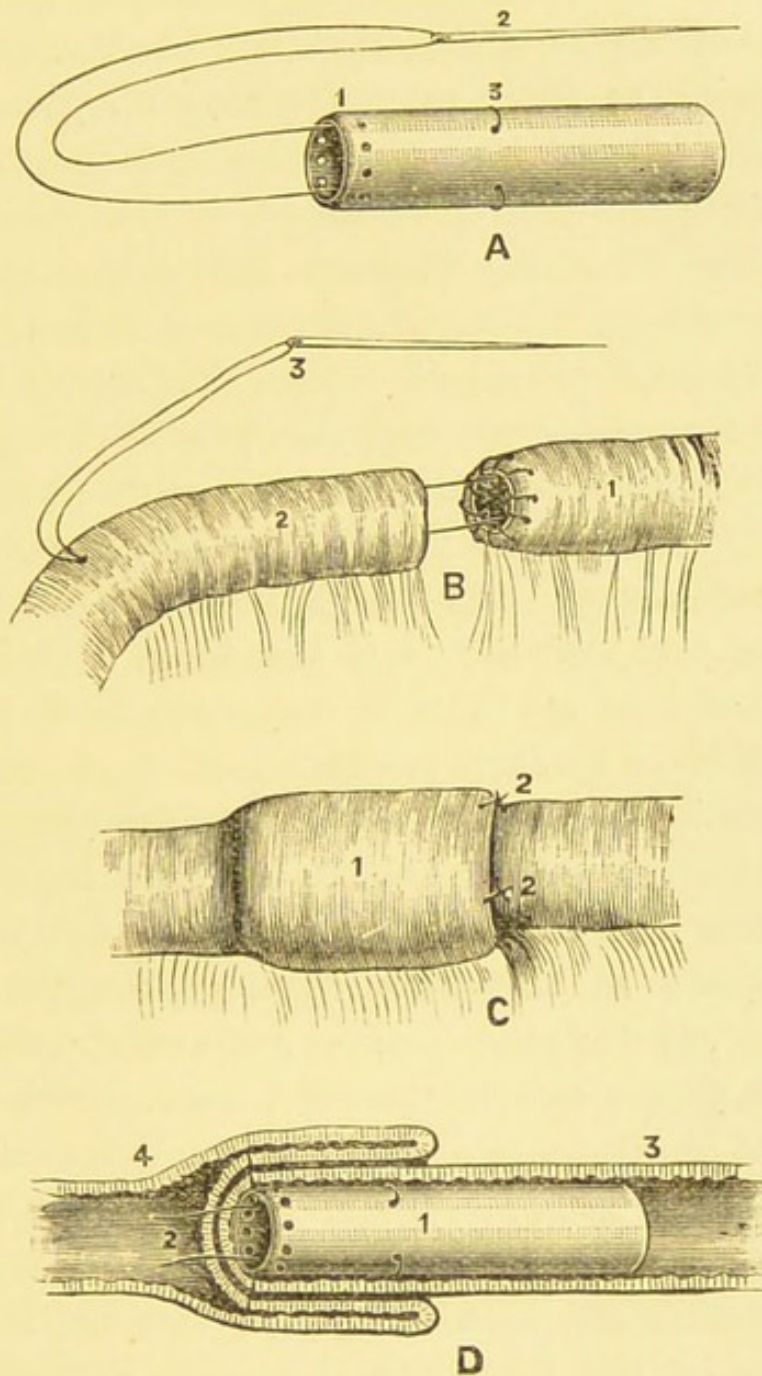


FIG. 83.

A, The decalcified bone tube : (1) the lower or distal end, perforated for sewing to the bowel ; (2), the traction thread armed with long sewing needle ; (3), its attachment to the tube. B, A stage in the operation : (1), the proximal end of the bowel, with the tube sewn in ; (2), the distal end, not yet sewn to the proximal end, but with the traction thread (3) passed. C, The operation completed : (1), the sheath or intussusciens of the invagination ; (2), the Lembert sutures, for retaining the parts in position. D, The parts dissected : (1), the tube *in situ* ; (2), the traction threads cut short ; (3), the proximal end of bowel entering the intussusception ; (4), the distal end, supplying the returning and ensheathing layers.

tion. He found the chromic gut sutures attached to the middle of the tube and their six needles very inconvenient, owing to their tendency to get entangled at a critical moment, and therefore discarded them, the tube now assuming the character shown in the engraving (A). The tube (Fig. 83, A) itself for small dogs should be about one inch long by three-eighths of an inch outside diameter and one-sixteenth of an inch thick. The lower end (1) is perforated for easily sewing the proximal end of the bowel to it, and the traction thread with its needle (2) is fixed well back on the tube (3) to make certain that it cannot break away. For the human bowel I have had made tubes one and a half inches long, with diameters varying from half an inch to three-quarters of an inch and one-eighth of an inch in thickness.

'The operation is now performed in the following manner: The bowel being ready to receive the tube, its full length is introduced into the proximal end, the cut margin of which is sewn to the tube through the perforations with a fine continuous chromic gut suture (Fig. 83, B). For this purpose a sewing needle is used, which, in passing, is made to dip more deeply into the mucous than the peritoneal coat. It is not sufficient to take the muscular and mucous coats only, as the attachment to the tube is then not sufficiently secure. When sewing the mesenteric border of the bowel to the tube, care should be taken to pick up the severed edges of the mesentery with the point of the needle, as this is the part most likely to give way, and the mesentery should not be allowed to drag in the least degree from the cut edge of the bowel. Next the needle of the traction thread is slipped along a director about three inches down the distal segment of the bowel and pushed through its wall (Fig. 83, B 3). Then the distal is sewn to the proximal end by a chromic gut suture all round, the needle piercing

the musculo-serous coats only, great care again being taken to fix the mesenteric edge securely. With the same thread the opening in the mesentery can be drawn together. Now an assistant takes the traction threads, and steadily resists the operator as he draws the distal end of the bowel back over the tube, thus invaginating the proximal end, and producing the appearance seen in the engraving (Fig. 83, c). The parts are retained in position by a few Lembert sutures, one on either side of the mesentery, and others as they appear necessary. Lastly, the traction thread is pulled tight and cut off short, the small opening caused by it requiring no further attention, and the operation is completed by cleansing the intestine and closing the abdomen in the usual way. The special part of the operation may be said to involve three stages: First, to introduce the bone tube into the upper or proximal end of the bowel, and sew it there; second, to pass the traction thread, and attach the distal and proximal ends together; third, to produce the invagination, retain it in position by a few Lembert sutures, and cut off the traction thread. With no unusual difficulty each stage ought only to occupy a few minutes. He operated in this way upon six more dogs, and they all did remarkably well. Three he killed at short intervals after the operation, to examine the condition of the bone tubes and the stages of repair. They were in excellent health at the time, it having been arranged beforehand how long each dog was to live after the operation. This was carried out in all but one, which should have been killed on the third instead of the fourth day. These dogs were allowed more food than the first two, bread-and-milk being given the day after operation, and nearly all passed a motion daily, showing that the tube offered little or no obstruction to the passage of food. They were not tied up, but left loose in the laboratory, jump-

ing and playing about appearing to do them no harm. Indeed, there was nothing in their manner to indicate that they had been submitted to an operation. Those killed were destroyed at the end of twelve hours, two days, and four days respectively. At the end of twelve hours he found the parts much as he left them, except that the irregularities were smoothed over with lymph and the peritoneal surfaces of the invagination were adherent. The bone tube had practically undergone no change. From the dogs that died in the experiments previously referred to, he learnt that the tube was present at thirty-six hours, but much softened. At forty-eight hours it is quite soft and probably collapsed, but the union strong. After this the tube disappears, and at first the lumen of the bowel partly closes with swollen mucous membrane, but it gradually enlarges again as the swelling goes down and the excess of tissue caused by the invagination atrophies.

‘Of the three dogs that lived some time, one was killed at the end of two months in perfect health. There was still a slight, thin diaphragm at the site of operation, but offering much less impediment, if any now, to the passage of the intestinal contents. One is still living in Manchester, the domestic pet of a friend of the porter, and is reported in its usual health just twelve months after the operation. The other is also living, and very fat and hearty three months after the operation.’

I have practised this operation, in conjunction with Dr. Morotti, with fair success, but was struck with the difficulty of invaginating the proximal into the distal portion of intestine, and the small opening made by the passage of the silk traction thread has its disadvantages. To overcome these, I, after various experiments, have devised the following simple method, which, I may say, in Dr. Morotti's and my own hands has quite fulfilled everything I could wish.

The Author's Operation.—It was when employing Senn's method of performing enterorrhaphy that the idea occurred to me that the operation might be made very much more simple, if both the divided ends of the intestine could be steadied by means of some form of tube. After numerous experiments with the fingers

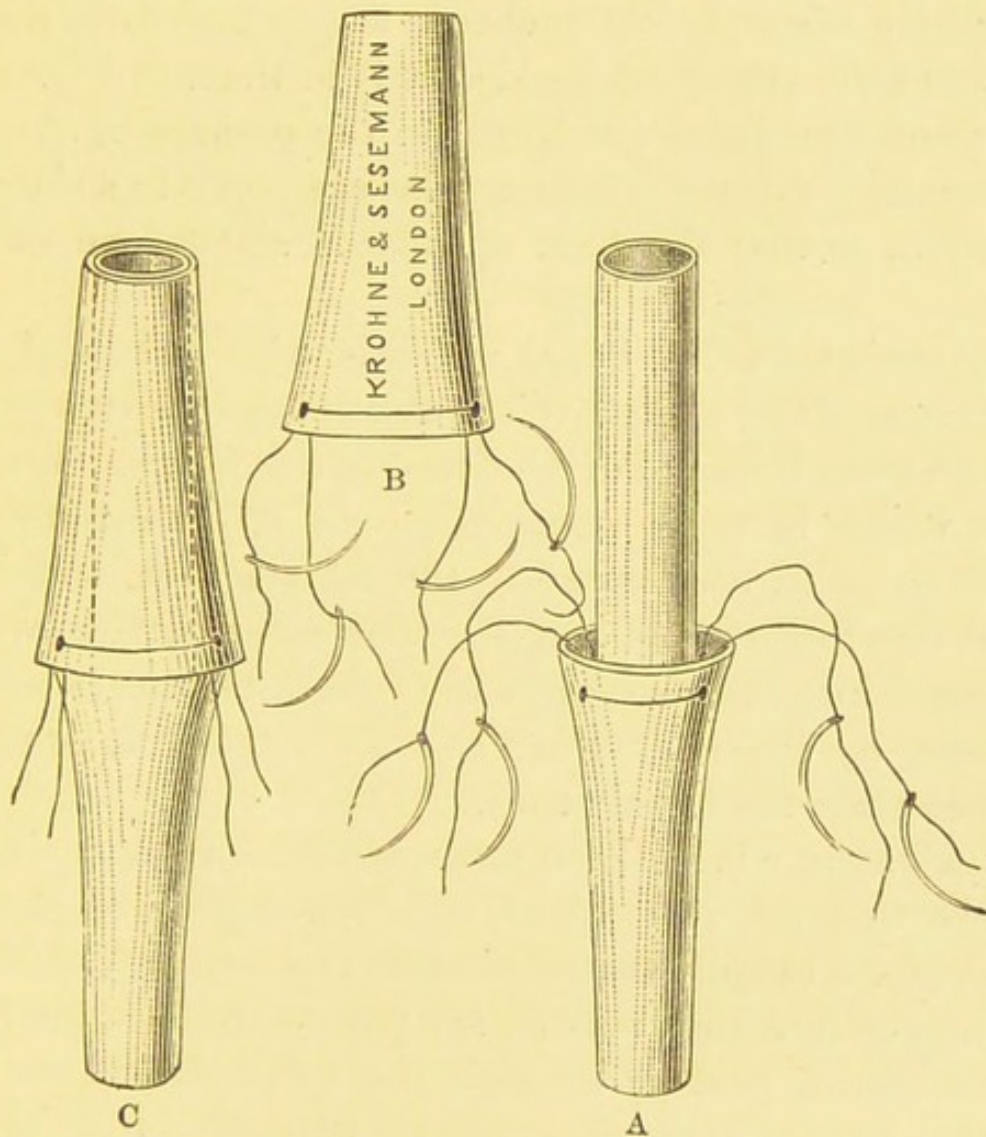


FIG. 84.—Author's tubes for performing enterorrhaphy. (A) Male tube. (B) Female tube. (C) The tubes united.

of a kid-glove, and on the cadaver, I found in the first place that a single tube did not fulfil all I wished, neither did a double tube of equal calibre throughout, as the same difficulty arose of sliding the distal portion over the proximal; moreover, the tubes being divided in the centre, I lost the fixity of the tube. Finally, I

arranged to have a double tube made after the pattern of the accompanying sketch (Fig. 84). I have for convenience designated the proximal tube the male, and the distal tube the female.

It will be observed that the female tube (Fig. 84, B), made of decalcified bone, is a simple hollow cylinder, measuring one and a half inches in length, and being nearly twice as wide at the outer end as it is in the inner. At the outer end four holes are bored for the passage of chromicized catgut sutures. These holes are bored in a slanting direction, so that the inner opening is at the end of the tube.

The male tube (Fig. 84, A), which is to be introduced into the proximal end of the divided intestine, is twice the length of the female tube and divided into two portions. One, the spur, which is to be entirely outside of the intestine, is made so as to fit accurately the female tube, and is of equal size in its whole length. The other portion, which is passed into the proximal end of the intestine, is, as will be seen by the engraving, slightly smaller in circumference than the female tube.

The way in which these tubes are fixed is most simple. Before they are introduced, two long threads of chromicized No. 1 catgut, armed at each end with an ordinary sewing, or intestine, needle, are passed through the holes—one thread passing through the two holes on one side of the female tube (Fig. 84, B), and the other thread through the holes on the opposite side. The male tube is threaded in a similar manner (Fig. 84, A).

The female tube being introduced into the distal end of the intestine, its threads are passed through all the coats of the intestine, close to the cut edges, one being passed on each side of the mesentery, and one at equal distances on the convex side of the intestine. This is given to an assistant to hold, while the male tube is in-

troduced into the proximal end of the intestine and its threads passed through the intestine in a similar manner. The spur projecting from the coats of the proximal end of the male tube is now slipped into the female tube, and the two held by an assistant, while the corresponding opposing threads of the two tubes are tied firmly and

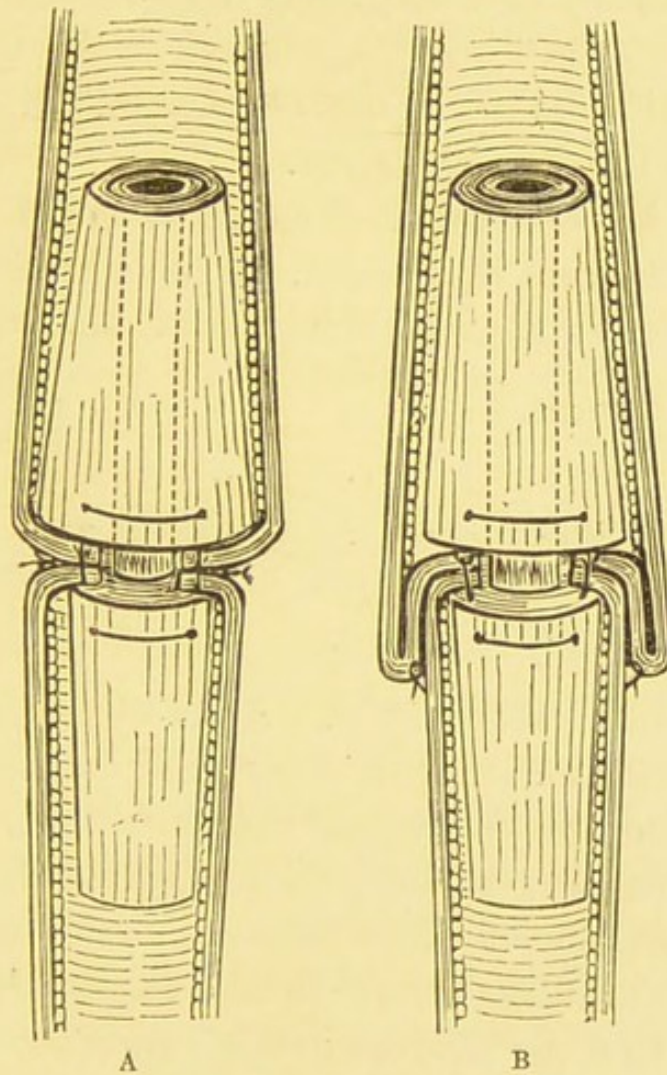


FIG. 85.—Author's method of performing enterorrhaphy. (A) Bone tube in place. (B) Operation completed.

cut. The intestine then presents the appearance of Fig. 85, A.

The surgeon now seizes the intestine over the proximal tube, and with the greatest ease slips the intestine covering the female tube over that on the male tube for the distance he requires. Four quilt sutures are then in-

troduced, through the serous and muscular coats of the opposing intestines, to secure it from slipping, care being taken that one suture is placed on each side of the mesentery and the other two at equal distances on the convex side of the bowel. If the mesentery has been divided by the excision of a wedge-shaped piece, this can be united by a continuous catgut suture lightly applied.

The operation is now complete, and the bowel is dropped back into the abdomen.

The tubes have been most carefully made for me by Messrs. Krohne and Sesemann. I have used them now a considerable number of times, and am well pleased with them.

Experiments conducted at the Laboratory of the Royal College of Physicians and Surgeons, kindly assisted by Dr. Morotti, of Milan.

CASE I.—June 22nd, 1891. A small dog was placed fully under the influence of ether, and an incision made through the middle line below the umbilicus. A loop of small intestine was withdrawn and divided. Into the cut ends I introduced the tubes, the male tube into the proximal end and the female tube into the distal end. I then passed the four sutures in each tube through all the coats of the intestine, and having inserted the projecting spur of the male tube into the female, I tied the corresponding opposing threads of the two tubes; I next attempted to invaginate the proximal portion of intestine into the distal, but owing to the tubes being rather large, I had some difficulty in doing so. I succeeded, however, and sutured the two serous surfaces together. The dog died two days after, and on examination I found the intestine gangrenous, owing to the tubes being too large.

CASE II.—June 25th. Fox-terrier dog thoroughly under ether. The tubes in this case I had had made smaller, and of the present pattern. I had no difficulty in inserting them, and when tied in position the distal portion of the intestine was slid over the proximal portion with the utmost ease. The dog had not a bad symptom, was cheerful and happy the next day, and was killed July 24th. The specimen saved was perfect, and is preserved.

CASE III.—July 2nd. Bull-terrier was operated on in the same way, and made an uninterrupted recovery. Specimen saved.

CASES IV., V. and VI. were all successful, the operation in every case being performed in less than twenty minutes.

Robinson's Operation, and the Author's modification.

While conducting my experiments, and on one occasion when trying Mr. Paul's method, I failed entirely to slip the one portion of intestine over the other as he suggests, and as there was considerable extrusion of mucous membrane I cut this off, and slid the serous and muscular coats of the intestine, denuded of its mucous membrane, over the proximal end, so that for about a quarter of an inch the denuded muscular coat was in close approximation to the peritoneal coat (Fig. 86). The dog at this time showed considerable exhaustion from the anæsthetic, so I determined to fix the parts with a few stitches and leave them. The dog made an uninterrupted recovery, and on killing him some time after, I found perfect union at the part I had denuded of mucous membrane, but below this point the proximal end of the intestine projected into the lower intestine, having all the appearance of a small intussusception. The serous membrane was reddened, and

evidently becoming changed in character to mucous membrane.

Since this my attention has been attracted by a paper written by Mr. Robinson,* of Toledo, in which he propounded the theory, which he put successfully into practice, that it matters not whether it be mucous membrane applied against any other membrane; so long as both membranes are well scarified, healing will result.

In dealing with the mucous membrane of the intestines it must not be forgotten, however, that we have to do with a glandular secreting surface. It will be necessary then to be most careful to shave off and scrape away all these glands before attempting to apply the abraded surface to the peritoneum, which, by the way, should also be scarified.

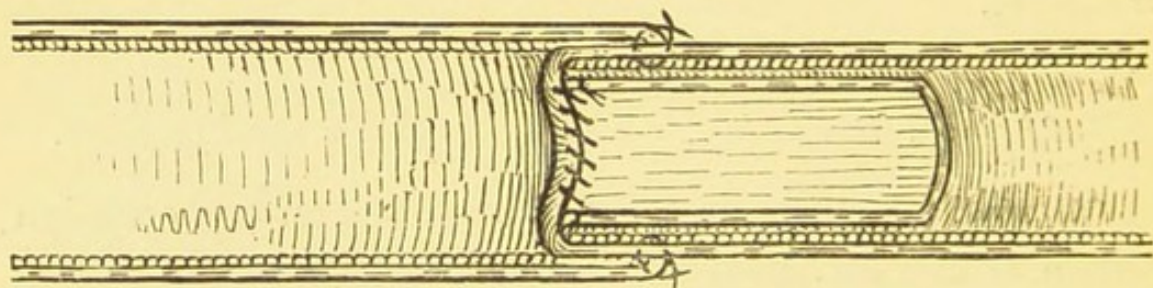


FIG. 86.—Euterorrhaphy by denuding mucous membrane.

Dr. Robinson directs that a rubber tube from three to six inches long and one-fourth of an inch in diameter should be stitched into the proximal end of the bowel, and an inch of the serous surface of this portion of gut scarified. The mucous membrane of the distal end of the bowel is to be dissected off for one half an inch with curved scissors, and then the freshened surface is to be well curetted so that all the intestinal glands are destroyed. Now the end of the proximal bowel is pushed into the lumen of the distal bowel, as one joint of a stove-pipe is pushed into another. The distal bowel is drawn over the proximal, and sutured in position.

* *Annal. Surgery*, Feb., 1891, p. 81.

Robinson in some of his experiments carefully folded a graft of omentum around the operated parts and fixed it with sutures.

In the experiments which I have conducted, being led to adopt this form of operation by the accidental circumstances above alluded to, and after a conversation with Dr. Sims Woodhead, and being assisted by Dr. Morotti, I used decalcified bone-tubes of various sizes, similar to those adopted by Mr. Paul.

I found it important that the tube should fit easily into the lumen of the gut; if it is too large, gangrene is apt to take place. Moreover, the intestine, after being divided, always contracts, and it is more difficult on this account to slip the distal over the proximal end if the tube is too large. I found in every instance the decalcified bone-tube lasted a sufficiently long time to allow of firm union taking place, after which time it became absorbed and gave no further cause of anxiety. In the case of the rubber tube adopted by Robinson, much anxiety must be felt by the surgeon as to its whereabouts until it has passed *per anum* with the fæces. Moreover, it must of necessity be a fruitful nucleus for an enterolith.

I found a tube two to three inches long was sufficient for all practical purposes, while a shorter one was apt to pass downwards into the lower bowel and form an intussusception.

This operation has been most successful in my hands in my experimental work.

In all the experiments it must not be overlooked that we were dealing with a perfectly healthy intestine, whereas, in practice, such operations are only required when there has been obstruction from some cause—ulceration or fæcal fistula.

In cases of obstruction, naturally the proximal portion

of the intestine will be very much dilated, and in such cases it will be necessary to narrow the proximal portion of intestine by puckering or excising a V-shaped piece, and here it must be remembered that every pucker or wound adds to the danger of the operation.

In other cases, the intestine may be much thinner and almost gangrenous, when again it will be seen how much the danger is increased, and how difficult to secure firm hold for the sutures. In all such cases the seat of operation should be anchored to the parietal wound, so that, in case of any untoward symptoms arising, the field of operation may be readily got at for examination.

In narrowing the calibre of the intestine by cutting a V-shaped piece out, the portion should be excised in the convex surface furthest from the mesentery, and the cut edges carefully united by a continuous chromic gut suture before proceeding to invaginate it into the distal portion of the intestine.

EXPERIMENTS.

CASE I.—Dog put under influence of ether, October 1st. A portion of intestine was withdrawn through the wound in paritu, and divided. A bone tube (decalcified), about two inches long, was introduced into the proximal end of the intestine, and a row of continuous sutures of catgut was introduced, so as to fix the divided end of the intestine to the lower part of the tube. The distal portion of intestine was then everted, and the mucous membrane cut away with scissors, care being taken afterwards to scrape away all the granular tissue by means of a Volckman spoon. This denuded surface was then slipped over the proximal end, in which the bone tube acted as a splint, and fastened with half-a-dozen quilt sutures. The dog never had a bad symptom, and was killed a

month afterwards, with a most satisfactory re-establishment of the intestinal canal. Specimen preserved.

CASES II. and III. were operated on in a similar manner, and made equally good recovery. The specimens are preserved.

Summary.—In drawing conclusions as to which of these various operations are the best to be adopted, we necessarily must be guided somewhat by the surroundings of the case. Undoubtedly, in all cases where it is not necessary to excise a portion of the intestine on account of disease, gangrene, or some other condition, it would be unwise to submit your patient to the extra risk of such excision, and in such cases lateral apposition by means of one or other of the approximation plates is the best form of operation to perform.

In cases where excision of a portion of the intestine is rendered necessary, if the coats of the bowel are much thinned, and the proximal portion dilated to an immoderate extent, I think the ends should be invaginated and closed, and the continuity of the canal restored by means of approximation discs.

If the portions of intestine above and below that to be excised are healthy and of the same calibre, then circular enterorrhaphy should be practised. Such an operation is specially applicable in cases of fæcal fistulæ, injuries, or wounds of the intestine. Of the different operations at our disposal, all the older methods of uniting the divided ends by Lembert or other sutures may be abandoned. The best of these undoubtedly is Bishop's operation, or that practised by Mr. Croft, but this is long and tedious, and must, I fear, sink into oblivion with the others.

Dr. Maunsell's operation is most ingenious, but I cannot advise its adoption, as I think few surgeons would care to cut the intestine about in the manner necessary

for the performance of his operation if it could be avoided. If, however, the surgeon has none of the necessary rings or tubes with him to perform one of the more recently advocated operations, then Maunsell's method might well be undertaken.

The operations suggested by Senn, Paul, and myself, are all modifications of that distinguished surgeon Jobert's operation, the difference existing between them being only that of a means to attain the same end. The method that should commend itself most to our attention should be that which can be performed with the minimum amount of risk to the patient combined with safety. It is obvious that the least risk is attained by the method by which the surgeon is enabled to attain his end with the least possible injury to the intestine and in the shortest time, provided always this can be done without endangering the safety of the union, *i.e.*, that the union can be made perfect.

I have given these three operations a fair trial, and can without hesitation say that by means of the tubes I have introduced I can perform the operation with the greatest ease, and I would therefore commend this operation to the notice of the profession.

The next easiest method is undoubtedly by denuding the distal end of the intestine, for the distance of about a half-inch, of its mucous membrane, and slipping it over the proximal end, into which a bone tube has been inserted.

This method, which was discovered by myself accidentally, had previously been noticed by Robinson, of Toledo, but he adopts an indiarubber tube in place of the decalcified bone tube, which I cannot think is free from risk, and may be a source of grave trouble.

In all cases in which the surgeon should find himself in the position of being called suddenly to operate, and have neither bone plates or tubes, he should at once adopt Halsted's operation.

EXCISION OF CÆCUM.

This operation may be necessary, and be successfully performed in certain cases of carcinoma of the cæcum.

Hitherto the removal of this portion of the intestine has been followed by disastrous results; but, with our advanced knowledge, I think these operations may be undertaken with a fair hope of success.

Professor Senn has reported two cases, one of which recovered, the other died.*

The patient should be prepared in the manner already described for other operations on the intestine, the large bowel being washed out by means of warm-water enemata.

The best incision I believe to be one extending from near the middle of Poupart's ligament to directly over the tumour through the *liniæ similunaris*. The length of the incision must be decided according to the size of the growth to be removed.

The abdomen being opened, the ileum and colon must be emptied by displacing their contents by means of manipulation, and an elastic ligature should be applied around the intestine to prevent the escape of fæces on its division.

The colon should be divided about two inches beyond the margin of the tumour, and the ileum cut across near its junction with the cæcum. All bleeding points should be tied with catgut ligatures.

If there are any enlarged glands, they should be enucleated. The cæcum is now readily removed. The meso-cæcum should be tied in small sections with catgut before removal of the diseased cæcum, as otherwise troublesome hæmorrhage may take place. Should any glands be seen to be enlarged in the mesentery, a further piece of small intestine may be cut away, care being taken to

* *Journal of Amer. Med. Association*, Jan. 14, 1890.

ligature the mesentery in segments. A flat sponge should be introduced into the wound to prevent the prolapse of the small intestines and guard the peritoneal cavity against infection in case fæcal extravasation should occur.

After all hæmorrhage has been carefully controlled, both resected ends are to be closed by invagination, and the ends fastened with a continuous chromicized catgut suture. The continuity of the canal is to be restored either by lateral apposition of the ileum and transverse colon or by implanting the divided end of the ileum into the colon, thus performing ileo-colostomy.

ILEO-COLOSTOMY.

Ileo-colostomy may be performed either by implanting the divided end of the ileum into some portion of the colon or by lateral apposition by means of bone plates. The operation is indicated either for irreducible ileo-colic invagination without perforation or gangrene, for cicatricial stenosis of the ileo-cæcal region, or for carcinoma of the cæcum with or without excision of the diseased portion of bowel.

I have practised ileo-colostomy by implantation of the ileum into the cæcum in several cases, and am so satisfied with the result that I should always employ it in preference to lateral apposition unless the coats of the bowel are so weakened that there may be a difficulty in introducing the suture, in which case I should prefer the latter operation. The details of its performance differ slightly when the cæcum is to be excised from when it is to be left *in situ*. In the former case, the divided end of the colon is invaginated and fixed; in the latter, the distal end of the ileum is invaginated and fixed, the colon not being divided.

ILEO-COLOSTOMY BY LATERAL APPPOSITION.

If the cæcum is to be excised, the surgeon proceeds to do so as already described. If, however, it is decided to restore the continuity of the canal by performing ileo-colostomy, the surgeon must decide if he will adopt the method by implantation, or by lateral apposition by means of approximation plates.

In all operations on the ileo-cæcal region the incision should be made directly over the part to be operated on. The best incision is one which extends from an inch above Poupart's ligament to a point half way between the anterior superior spinous process of the ileum and the umbilicus.

After all bleeding points are clamped and the peritoneal cavity opened, the part to be operated on is to be brought out through the wound, and a flat sponge or chamois leather soaked in some antiseptic solution packed into the wound to prevent prolapse of the intestines. The intestines above and below the part to be divided are next clamped by passing an elastic cord lightly round, and fixing with pressure forceps.

If it be decided to restore the continuity of the canal by lateral apposition by means of bone plates, an incision about one inch to one and a half is to be made into the ileum on its convex surface opposite the attachment of the mesentery and near the divided end, if the cæcum has been resected, and two inches from the obstruction if the condition does not require or justify excision of the disease. The incision must be large enough to readily admit the insertion of the bone-plates without using force. Any hæmorrhage that may ensue can usually be arrested by pressure forceps without ligature. The best way to make the opening into the bowel is to pinch up a piece of

intestine between the thumb and finger, on each side of the middle line opposite the mesentery, and divide it with a pair of sharp scissors. In many cases it will be

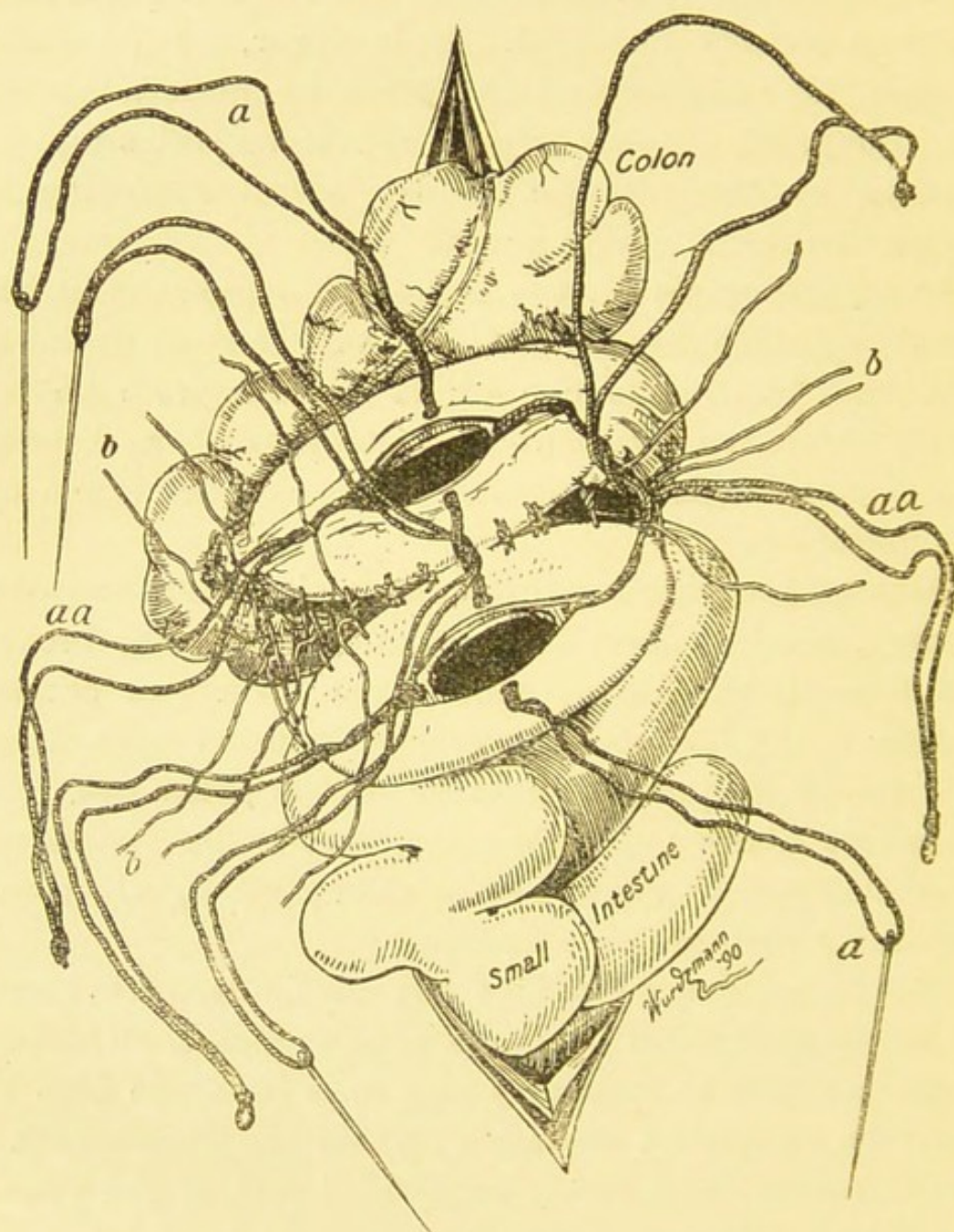


FIG. 87.—Ileo-colostomy without resection of cæcum. Showing plates in position, one in the ileum, the other the colon.

a, lateral or transfixion sutures passed through the margin of the wound ; *aa*, end ligatures hanging out of the wound ; *b*, posterior row of superficial or Lembert sutures. (Senn.)

wise to run a continuous catgut suture round the opening ; this has the advantages of arresting any hæmorrhage

which may exist, and preventing the closing of the wound or extrusion of the mucous membrane.

A bone-plate is now inserted into the lumen of the intestine by insinuating it in edgeways. The lateral catgut sutures are next passed through all the coats of the intestine equidistant from the angles of the visceral wound, and close to its margin.

A longitudinal incision is next made in the colon, opposite to the meso-colon, well above the disease, and a bone-plate is introduced into its lumen, passing the lateral suture attached to the plate through all the coats of the gut close to the edges of the incision.

The plates being now in position in each bowel, an assistant holds them in accurate apposition, tilting the upper edges slightly outwards to allow of the tying of the lower lateral ligature (Fig. 87); this being done, the plates are held firmly together, while the surgeon ties the end ligatures. In tying these it will be necessary to draw the ligature down between the plates. Finally the upper lateral ligature is tied.

I am then in the habit of inserting three or four quilt sutures along the upper border and ends of the plates. I have never found it necessary to place any suture along the lower border.

Senn, in his description of this operation, directs that a row of sutures should be placed along the lower border (Fig. 87) parallel to the plates before tying any of the ligatures connecting the bone-plates, and that another row of sutures should be inserted along the upper border (Fig. 89); he also directs that the peritoneal surfaces should be scarified; both of these proceedings I consider quite unnecessary. He also uses silk for all his sutures, whereas I use chromic gut for the lateral sutures (Fig. 87).

The peritoneum, from the manipulation it undergoes,

does not require any more scarification ; moreover, as is well known in cases of gastrostomy and sigmoidostomy, lymph is thrown out by the peritoneum in large quantities in a very short time.

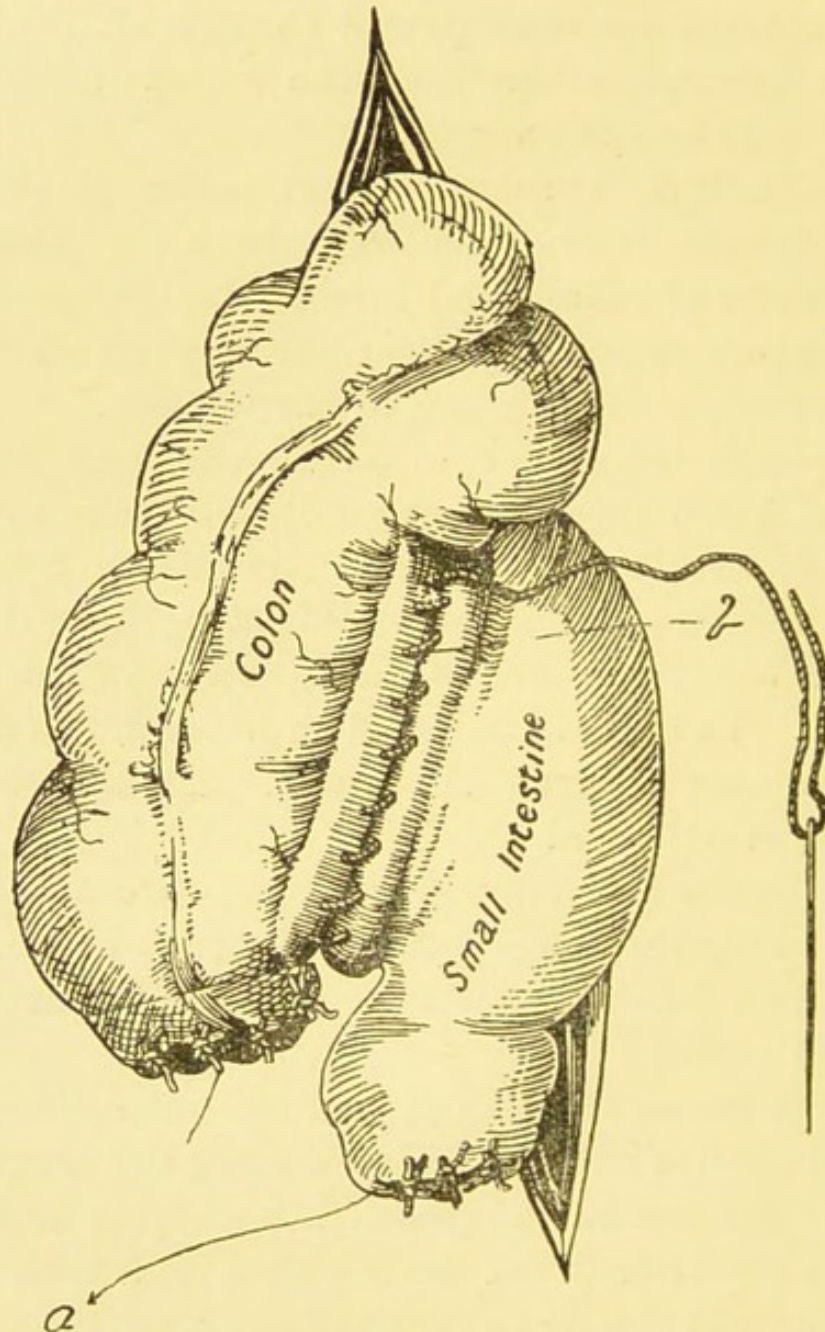


FIG. 88.—Ileo-colostomy as seen after resection of the cæcum.

a, closed ends of the colon and ileum directed downwards ; *b*, serous surfaces over the anterior margins of the plates united by a number of stitches of the continued suture. (Senn.)

ILEO-COLOSTOMY BY IMPLANTATION.

I have practised this operation in numerous cases in

my experimental research with unvarying success, not having lost one dog from this operation. I have also practised the same operation twice in the course of my practice successfully, once in a case of carcinoma of the

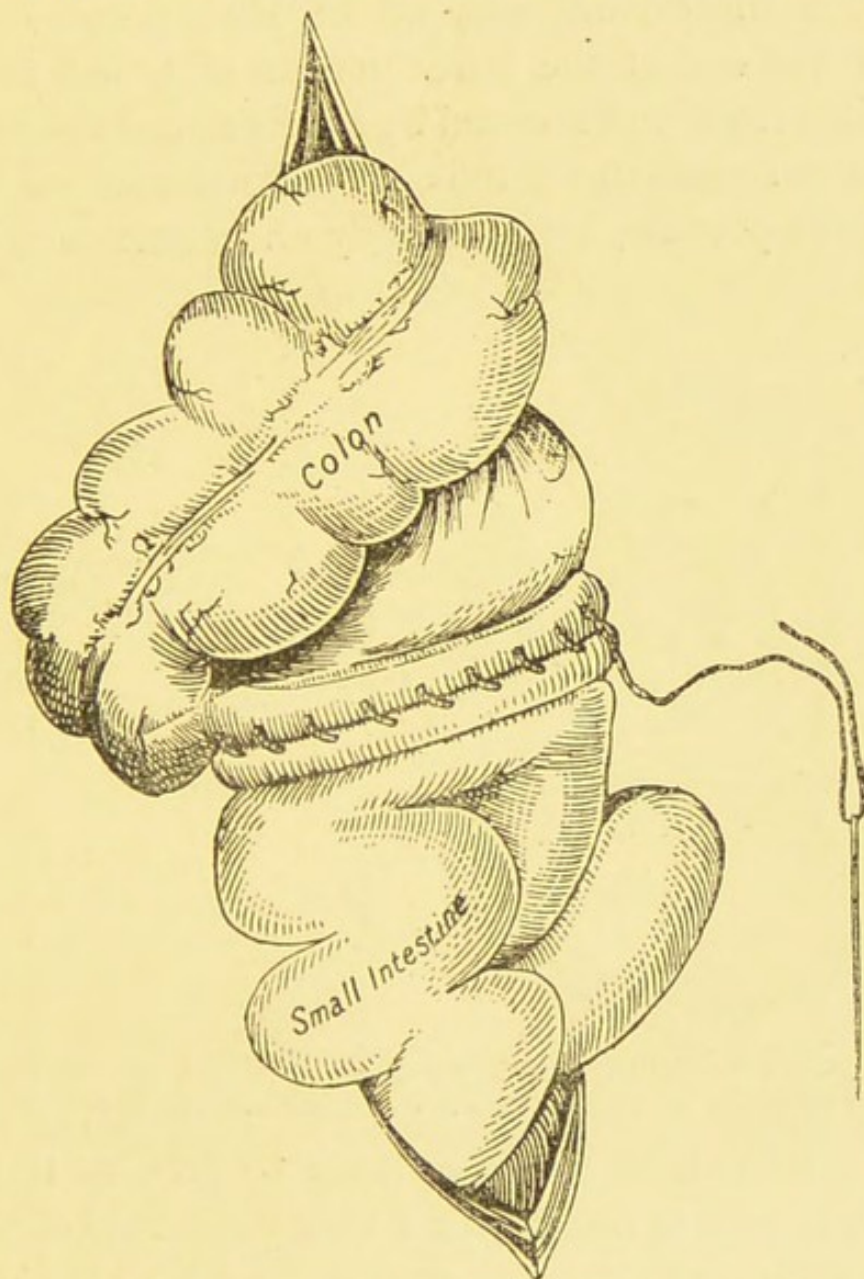


FIG. 89.—Ileo-colostomy completed as seen without resection of the cæcum. (Senn.)

cæcum, and once in a case of fæcal fistula opening into the vagina. Once, in the case of Mr. Reeve's, for a fæcal fistula of the sigmoid flexure, in which he kindly allowed me to assist him, he implanted the ileum into the upper part of the rectum.

This operation may be accomplished either by approximation-plates, the same as described for jejuno-ileostomy, or by the following method :

The ileum being divided a short distance from its junction with the cæcum, and all bleeding-points ligatured, the divided end of the lower portion of bowel is invaginated into itself and secured by a continuous catgut suture passing through the serous and muscular coats only. The upper portion, being held by an assistant or secured

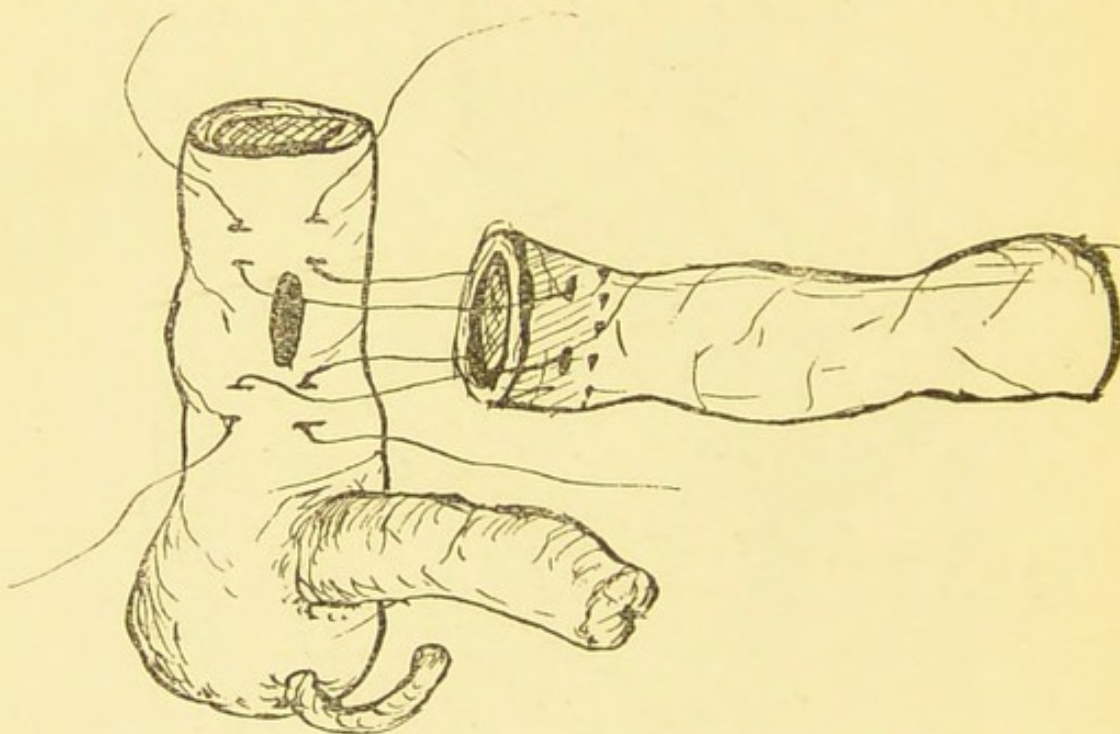


FIG. 90.—Ileo-colostomy. Showing the method of implanting the ileum into the ascending colon when the cæcum is not excised.

by an india-rubber ring or clamp to prevent the escape of its contents, is lined with a thin india-rubber ring and two long sutures armed at each end with a needle passed in a similar manner to that described for circular enterorrhaphy. Next, a slit an inch in length, or sufficiently long to allow the portion of intestine to be implanted, is made on the convex surfaces of the ascending colon (Fig. 90). The needles of the sutures connected with the small bowel are next passed through the peritoneal and muscular coats of the colon at either end of the

opening and the small bowel inserted into the slit; the two sutures are next firmly tied to prevent the bowel slipping out, and it is as well to introduce two lateral Lembert or quilt sutures, one on each side, between the small gut and colon. The operation, which is now completed, can be very quickly accomplished.

Should the surgeon excise the cæcum, then the divided end of the proximal portion of the ascending colon must be inverted and fixed by continuous sutures and the ileum implanted into the colon about two inches beyond (Fig. 92).

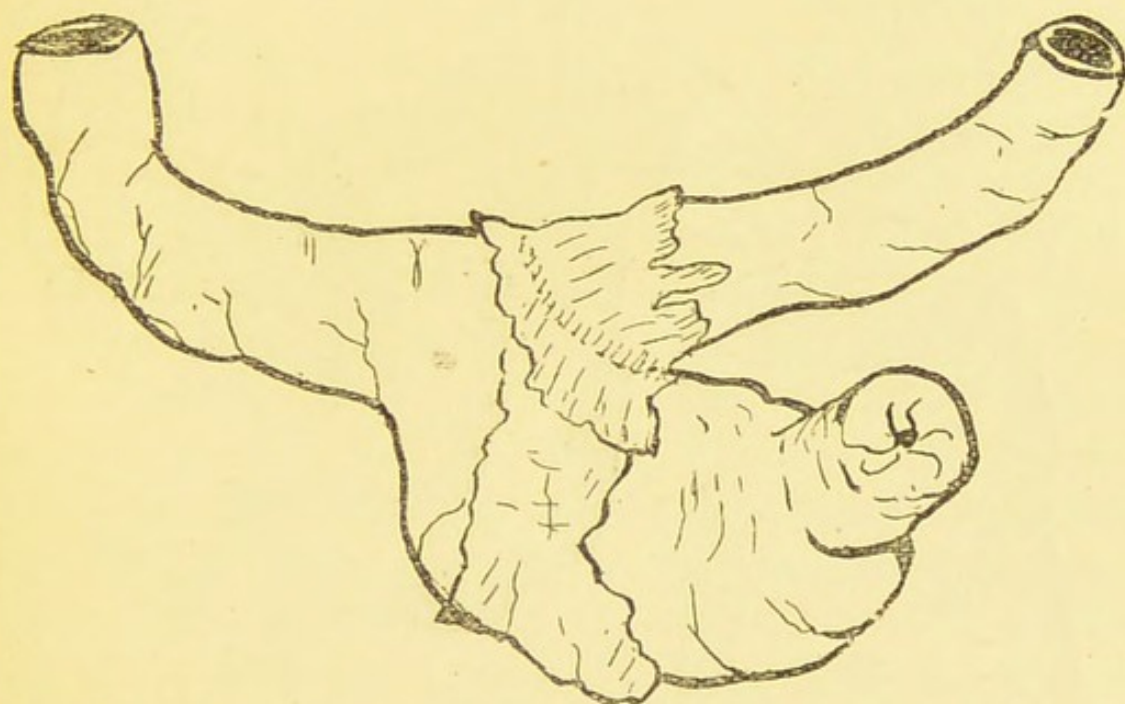


FIG. 91.—Ileo-colostomy. From a specimen removed some time after recovery.

The result of the three experiments of this operation that I have made were all successful; the dogs made excellent recoveries and showed no sign of illness. The specimens showed that the results (Fig. 91) were everything that could be desired.

So much for the method of performing the different operations. I will now pass to an analysis of the operations as performed by Dr. Senn and compare them with my own experience.

ANCHORING OF THE SEAT OF ANASTOMOSIS.

Senn considers that it is important to anchor the point of anastomosis to the parietal wound. I have not

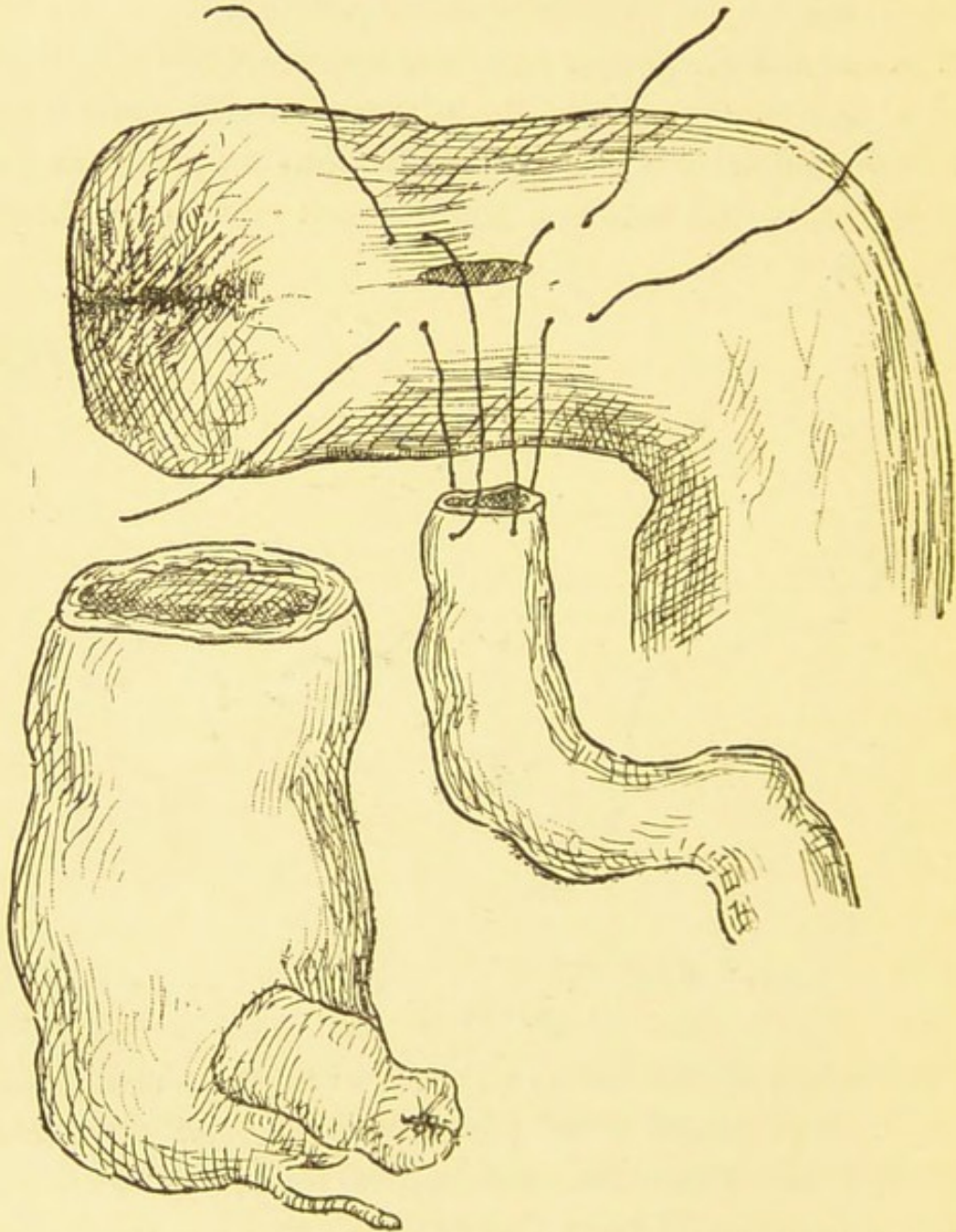


FIG. 92.—Ileo-colostomy. The cæcum being excised and the ileum implanted into the transverse colon.

in any of my cases practised it; but undoubtedly if the intestinal walls are thinned, and there is any misgiving in the surgeon's mind as to its stability, I should always re-

commend it to be done. And, undoubtedly, if the cæcum has been excised, anchoring possesses the advantages of retaining the part in the most favourable anatomical and physical condition for restoration of the normal fæcal circulation, and will at the same time keep the parts operated upon in the neighbourhood of the wound, should any symptoms of perforation or obstruction arise.

The anchoring can readily be done by passing a suture through the mesentery in the direction of the bloodvessels opposite the seat of anastomosis, bringing this out through the parietal wound, and fixing it with a piece of plaster to the parietes.

Drainage should always be employed in cases of resection of the cæcum, as in nearly all such cases the retro-peritoneal space has been exposed. I consider the best drainage can be secured by passing a full-sized glass tube into the most dependent point in the peritoneal cavity, so as to carry away any secretions which may be thrown out by the wound; into this tube a few narrow strips of gauze should be introduced; sublimate or iodoform gauze should be passed quite to the bottom of the tube and should be brought out from the external opening of the tube into a pad of sublimate gauze packed round and covering it, the whole being well dusted with iodoform.

The wound should be protected by a piece of thin india-rubber sheeting, through a small opening in which the tube is passed. This sheeting should be sufficiently large to wrap over the gauze into which the capillary drainage is taking place. By adopting this plan all fear of infection of the wound by the discharge will be avoided.

The dressing should be changed every two or three hours at first, and each time the tube should be emptied by means of a glass syringe with an india-rubber tube

affixed, which passes well to the bottom of the drainage-tube.

In the course of five to six days, if all goes well, the drainage-tube may be removed. If, however, pus forms, it must be kept *in situ*, and it will be well when emptying it to syringe it out with a weak solution of iodine or some antiseptic solution.

RESULTS OF EXPERIMENTS.

To sum up the result of the different operations above described, and performed by different surgeons, it will be found to be as follows, namely :

Gastró-enterostomy by approximation-plates : 6 cases, 1 death ; death-rate = 16·6 per cent.

Jejuno-ileostomy by approximation-plates : 13 cases, 1 death ; death-rate = 7·69 per cent.

Jejuno-ileostomy by Czerny-Lembert sutures : 7 cases, 5 deaths ; death-rate = 71·5 per cent.

Enterorrhaphy by invagination without omental flaps : 4 cases, 3 deaths, death-rate = 75·0 per cent. With omental flaps : 12 cases, 3 deaths, death-rate = 24·99 per cent.

Ileo-colostomy by implantation : 9 cases, 2 deaths ; death-rate = 22·2 per cent.

Lateral apposition by Czerny-Lembert sutures : 7 cases, 2 deaths, death-rate = 28 per cent. ; by apposition with approximation-plates : 3 cases, 1 death, death-rate = 33 per cent.

And again, by omitting the cases in which the Czerny-Lembert suture was adopted, we have 47 cases operated on either by approximation-discs or invagination, with 11 deaths, or at the rate of 23·4 per cent.

Now, let us for one moment compare these results

with those cases which are published, and with statistics collected of similar operations performed on the human being. The largest number of cases has been collected by Reichel, who, in the *Deutsche Zeitschrift für Chirurgie*, 1883, p. 230, furnishes the result of 121 cases of resection of the bowel in which the ends were united by Czerny-Lembert sutures; of these, 58 recovered, 58 died, and 5 recovered with fæcal fistulæ, the death-rate being at the rate of 48 per cent. Ill has reported 47 cases, with 25 deaths, being at the rate of 53·1 per cent.; while Weir, of New York, has furnished statistics of 33 completed cases of resection of cancerous intestine, with a mortality of 51·5 per cent.

Sir W. MacCormac, in his oration delivered at the Medical Society in May, 1887, on Abdominal Section, gives particulars of 13 cases of abdominal section performed for supposed traumatic rupture of the intestines and other abdominal viscera; all these cases died, some from injury to other viscera besides the bowel, some from shock.

Dr. B. Farquhar Curtis, of New York, in a paper read to the New York Medical Society at Albany in February, 1888, in connection with a discussion on acute intestinal obstruction, has arranged a table of 308 cases to show the result of the various methods of treatment adopted by the surgeon, or forced upon him by the exigencies of the case with especial reference to this factor. From a study of this table it will be seen that the obstruction was removed and an artificial anus formed in 15 cases, with a mortality of 10, or at the rate of 66·6 per cent. In 45 cases the portion of intestine was resected and the ends sutured; 39 of these cases died, showing a mortality of 86·6 per cent. The obstruction in these 60 cases was caused by either intussusception, volvulus, adhesion, bands or internal incarceration in 42 instances.

Dr. Curtis, in referring to the 45 cases in which an attempt was made to suture the wound in the intestines whether it involved the entire circumference of the wound or not, says that the mortality reached the extreme point of 86·6 per cent.; only 10 per cent. of the deaths were from sepsis due to the operation, while more than the usual number—50 per cent.—were due to the condition of the patient, and 23 per cent. were due to the duration of the operation and to shock.

This is surely a strong argument for making the operation occupy as short a time as possible, and I submit that the methods which I have described are those which will in the future, by enabling the surgeon to perform these operations in a quarter or third of the time occupied by the system at present practised, be the means of saving many valuable lives, and will reduce the mortality to that which is now obtained in ovariectomy and hysterectomy. In most extreme cases many surgeons are contented to perform enterostomy and create a fæcal fistula or artificial anus. But I contend by performing one of the several operations I have described of ileocolostomy, jejuno-ileostomy, or enterorrhaphy, any one of which can be accomplished in quite as short a time as that required for the formation of an artificial anus, the surgeon performs a radical operation in the place of a palliative one, and the risk to the patient is not so great, for I have already shown that in the cases in which an artificial anus was formed—reported by Dr. Curtis—the mortality amounted to 66·6 per cent., and then the patient was left either with a permanent fæcal fistula, or would have at some future time to submit to a further operation for its closure.

Now, if we compare the mortality as shown by these statistics with that obtained by Senn's operation, as performed by him and confirmed by myself, it will be found

that, excepting the 7 cases of jejuno-ileostomy performed by Senn by the Lembert suture, 48 operations were performed, with 12 deaths, or a mortality of 25 per cent.; but, again, if the 14 cases are omitted in which the operation was performed, but afterwards abandoned for a safer one, the mortality is reduced to 17·6 per cent.

If, then, these figures can be accepted as correct, by adopting one of the methods of operating I have described, the mortality from these operations should be reduced from 86·6 to 20 per cent.; and I have no doubt that with further experience and practice the death-rate will be reduced very much lower. But it will be argued that these operations were performed on healthy animals, and not on human beings exhausted by disease or pain, and that therefore no accurate inference can be drawn from the figures I have quoted. But it must be remembered that Senn has performed the operation of enterorrhaphy by the Czerny-Lembert system on seven healthy animals, five of which died, giving a mortality of 71·5 per cent., or a death-rate within a fraction of what the same operation is credited with on the human subject.

It has not been suggested that Senn's is a more dangerous operation than the Czerny-Lembert method, and it is admitted that in Senn's method the two serous surfaces of the divided intestine are at least as well united as in the Czerny-Lembert, and as the operation by Senn can be performed in from forty minutes to one hour, and the other requires from an hour and a half to two hours, it follows there must be an advantage to the patient in the saving of time alone, and this advantage increases in proportion to the weakness of the patient.

The result of my own research has convinced me that the serous surfaces are better united by lateral anastomoses than by the Czerny-Lembert method of suturing the two ends of the divided intestine.

CONCLUSIONS.

It will be convenient here to briefly consider *in what forms of obstruction of the intestinal tract these operations are applicable*. I think I may say that there is no form of obstruction in which either one or the other of the operations I have described may not be practised with every hope of success when relief cannot be obtained by ordinary manipulation.

GASTRO-ENTEROSTOMY.

This operation may be practised for an obstruction arising at either the pylorus, the duodenum, or upper part of the jejunum. The principal form of obstruction in which this operation is to be recommended is undoubtedly malignant disease or stricture of the pylorus. In both these forms of disease the patients, as a rule, are much emaciated and exhausted before they apply for relief; it is, then, of great importance that any operation should be conducted so as to cause as little shock as possible, and in this case such an end can only be attained by making the operation as short as possible; and this can be done by the operation of gastro-enterostomy, by uniting the stomach and jejunum together by means of approximation plates. The same may be also said with regard to the operation when required for obstruction arising in the duodenum.

It is true that in some forms of fibrous stricture of the pylorus Loreta's operation of opening the stomach and forcibly dilating the stricture has been practised apparently with success, but I would submit that this operation is quite as formidable as that of gastro-enterostomy as practised with approximation discs, and the permanent

nature of the relief is not, in my opinion, so reliable by the former operation as by the latter.

JEJUNO-ILEOSTOMY AND ENTERORRHAPHY BY INVAGINATION.

These are operations both of which are applicable to cases of obstruction which necessitate the excision of a portion of small intestine, either for gangrene of the gut, direct strangulation (for example, hernia, volvulus), fæcal fistula, or contraction of some portion of the intestine due either to simple stricture or an epitheliomatous growth. Until quite lately, in nearly all such cases the surgeon has been contented to remove the diseased portion of bowel and establish a fæcal fistula, waiting until a future day for the performance of enterorrhaphy by means of Czerny-Lembert sutures, thus exposing the patient to the risk of two operations; and, as I have already shown, each operation is attended with an extremely high mortality.

Of late years, however, surgeons have in several cases excised the diseased portion of intestine, and, if circumstances allowed, at once sutured the two ends together, either by the Lembert method or Jobert's, or some one of the other numerous plans that have been devised for this purpose by different surgeons.

From the success attained by the methods of operating I have described, I venture to think that there is no case in which the continuity of the bowel may not be restored, with a fair chance of success, if seen and operated upon sufficiently early, by lateral apposition of the two surfaces of the intestine, by means of approximation discs, or by circular enterorrhaphy, performed after one of the plans I have described. I would further here say that, in my opinion, there are very few cases

in which the surgeon is justified in forming a fæcal fistula, excepting in those cases in which the patient is in too exhausted a condition to undergo the radical operation, and in these, before definitely forming a fæcal fistula, drainage of the bowel should be had resource to, with a view of performing an operation for restoring the continuity of the canal later.

With respect to the choice of operations in special cases, I should say, from my experience, that of re-establishing the continuity of the bowel by means of lateral apposition and approximation discs is the best, for in all cases of obstruction of the intestine which have lasted for any length of time the upper portion above the seat of obstruction will be found to be so much dilated, and that portion below the stricture so contracted that it would be most difficult, and, in many cases, impossible, to perform enterorrhaphy by invaginating the upper into the lower portion of intestine, whereas the approximation of the convex surfaces of the two ends would be comparatively easy to accomplish.

Again, in cases of obstruction the result of adhesion or matting together of the intestine, in which the adhesions cannot be broken down without injury to the coats of the bowel, there would usually be no difficulty in bringing the portion of the intestine above the seat of obstruction into apposition with that below, and securing them in position by means of approximation plates, without the necessity of excising the portion of intestine so bound down, or matted together, thus materially diminishing the risk to the patient.

Again, it has been shown that the mortality after the operation by lateral apposition is very much less—namely, only at the rate of 7.69 per cent., as against 24.99 per cent. after invagination. This, then, is strong evidence of the superiority of the one operation over the other.

And, lastly, from the rapidity with which this operation can be performed, occupying as it does considerably less time than would be taken in stitching the open ends of the divided intestine to the abdominal walls to establish a fæcal fistula, it must in the future occupy the most prominent position in all operations for the relief of intestinal obstruction of the small intestine.

ILEO-COLOSTOMY.

This is perhaps the most interesting of all the operations I have described, and it is likely to play a very important part in future surgery for the relief of irreducible intussusception of the ileum into the cæcum and of malignant disease of the colon. Hitherto the only operative measure which has been adopted for the relief of the obstruction in such cases, if resection be not performed, has been enterostomy, and the establishment of an artificial anus; but this operation, performed under these circumstances, has been found to offer less chance of recovery than enterostomy for simple stricture of the smaller intestine. As Treves has pointed out in his work on intestinal obstruction, when referring to this operation for relief of intussusception, 'not only is the obstruction relieved, but a portion of gut is left in the abdominal cavity that may cause fatal mischief. The unreduced intussusception may, in spite of the artificial anus above it, become gangrenous, or its walls may ulcerate, or the inflammation existing in its tissues may lead to fatal peritonitis. It is only by an excision of the involved segment that these evils can be obviated.' In thirteen cases of enterostomy, or enterectomy, for intussusception, collected by Mr. M'Ardle, Dublin, ten died, four from gangrene, three from septic peritonitis, and two from exhaustion.

Now, by performing ileo-colostomy by implantation, these difficulties may be overcome, the continuity of the bowel be re-established, and a faecal fistula avoided. Moreover, in many cases it would not be difficult to remove, through the opening in the colon, the invaginated portion of small intestine.

As we have seen, the mortality of the operation of ileo-colostomy is exceedingly small, and might be had recourse to in all cases where colectomy has to be performed, as it is equally easy to implant a portion of small intestine into the sigmoid flexure, or, indeed, into the rectum, as it is to implant it into the ascending colon.

The conclusions to be drawn from that are :

1. Gastro-enterostomy and jejuno-ileostomy should be performed by lateral apposition, with decalcified bone-plates, or by circular enterorrhaphy.

2. When enterorrhaphy is performed, it should be by invagination of the upper into the lower portion of the gut, and the continuity of the peritoneal surfaces of the ends of the bowel to be united should be procured, where the mesentery is detached, by stitching the peritoneum together over the denuded surface of intestine with fine catgut sutures before the bowel is invaginated.

3. In cases of complete division of the bowel for obstruction, circular enterorrhaphy is not to be recommended, but the ends of the divided bowel should be closed by invagination, and the continuity of the canal established by means of lateral apposition and approximation discs.

4. An opening should be established between the bowel above and below the seat of obstruction by lateral apposition and approximation discs in all cases where it is deemed inadvisable to remove the obstructed portion of intestine, and in such cases a second opening should be established between the most dependent part

of the obstructed loop of intestine and a portion of intestine contiguous to it.

5. An artificial anus should never be formed unless it is found to be absolutely impracticable to re-establish the continuity of the intestinal canal by one of the operations named.

6. Ileo-colostomy or ileo-rectostomy, either by means of approximation discs or implantation, should be performed in cases of ileo-cæcal invagination which cannot be reduced by gentle traction, and in cases of malignant disease of the colon.

7. Omental grafts some two inches wide, or omental flaps, should be adopted in all cases of circular enterorrhaphy, as experience has shown that these grafts retain their vitality, and become adherent in a few hours.

During my recent experiments at the Laboratory of the Royal College of Physicians and Surgeons I have operated on 13 dogs :

- 1 Gastro-enterostomy with bone-plates. Successful.
- 1 Ileo-ileostomy with bone-plates. Successful.
- 6 Enterorrhaphy with my tubes. 1 died; 5 successful.
- 3 Enterorrhaphy by denuding the distal end of intestine of its mucous membrane and drawing it over the peritoneal surface of the proximal end. 3 successful.
- 2 Cases of intussusception by excising the intussusceptum. 2 successful.

COLOTOMY.

Colotomy, or the forming an artificial anus by opening the sigmoid flexure or colon, is indicated for (*a*) congenital malformation which cannot be relieved by perineal incision; (*b*) for the relief of distress attending recto-vesical fistula; (*c*) for obstruction, the result of pressure of tumour, cancer of the bowel, non-malignant strictures, which are of such extent as to preclude perineal operations; (*d*) as a means of treating extensive ulceration of the rectum by providing physiological rest to the parts.

The large intestine may be opened either in the iliac or lumbar regions, the surgeon being guided in his selection of the field of operation by the nature and seat of obstruction. When this will admit of sigmoidostomy being performed, I have always advocated this operation. In my work on 'Cancer of the Alimentary Tract,' published 1886, I said:

Both these operations, *i.e.*, sigmoidostomy and lumbar colotomy, are the source of the greatest possible comfort to the patient, as they prevent the passage of the fæces and acrid secretions over the diseased part, and thus the progress of the disease is often retarded.

Of the two operations, I personally prefer the forming of an artificial anus in the iliac region—sigmoidostomy—for the following reasons:

1. It is very much more handy for the patient; he can attend to himself and keep the parts thoroughly cleansed without seeking aid from others.

2. A pad in the form of a well-fitting truss can be very easily applied, and so the escape of fæces be prevented.

3. There is no greater risk to the patient in this operation than there is in lumbar colotomy.

4. The operation is much easier and can be more quickly performed than lumbar colotomy.

This operation for opening the sigmoid flexure in the left loin was proposed by Littré in the year 1710, and the operation had always been known by his name, but it was not actually performed until the year 1776, when a surgeon named Pillore, of Rouen, first made an artificial anus in the adult for the relief of retention of fæces. He did not, however, follow Littré's suggestion of opening the sigmoid flexure, but made an artificial anus in the right iliac region by opening the cæcum.

In 1797 Fine, of Geneva, opened the transverse colon, and formed an artificial anus in the umbilical region in a case of cancer of the rectum.

SIGMOIDOSTOMY.

Sigmoidostomy, which is a modification of Littré's operation, was recently directed to be performed on the method suggested by Mr. Howse for the performance of gastrostomy, *i.e.*, to divide the operation into two parts. In the first part the gut should be brought out of the wound, and the visceral and parietal peritoneum carefully approximated by a number of fine carbolized silk sutures; this is then to be well dusted with iodoform, and dressed with dry gauze. On the fifth or sixth day the bowel may be opened without any fear of peritonitis being set up by the escape of the fæces into the peritoneal cavity or the cellular tissues around the wound.

Mr. Davies Colley reported three cases of left lumbar colotomy in which he had adopted a similar plan, and claimed for it that the risk of peritonitis, or of suppuration in the planes of the connective tissues, was very much diminished by delaying the opening of the gut

until the deeper part of the wound had had time to be sealed by reparative lymph.

The chief difficulty he found was to secure the protruding bowel in such a way as to avoid extravasation of its contents or strangulation of its walls. This he satisfactorily effected by means of a clamp consisting of two steel bars, upon which were placed rounded ivory studs about half an inch apart. Upon approximating the steel bars by means of screws near their extremities, the two pairs of ivory studs could be made to hold the coats of the bowel at two points. At the first dressing the screws could be relaxed, or the clamp might altogether be removed.

Operations may be performed on either the right or the left side. In the right the cæcum may be opened, and on the left the sigmoid flexure. Undoubtedly the latter operation is only suitable in diseases of the middle and lower part of the rectum; if the disease extends above this, either right or left lumbar colotomy should be performed, or the cæcum opened, and an artificial anus made in the right iliac region.

As I have pointed out before, the intestine above the seat of cancer is very liable to become ulcerated, and sometimes these ulcers extend for a considerable distance up the bowel; it is all-important, therefore, to open the gut as far from the disease as practicable.

The method of performing the operation is as follows: The patient being fully under the influence of an anæsthetic, and placed in a recumbent position, the surgeon makes an incision from two and a half to three inches in length, parallel to Poupart's ligament, about two fingers' breadth inside the anterior superior spine of the ileum. Having divided the skin, superficial tissues, and muscles, the peritoneum is brought into view; all bleeding points are to be secured with the

pressure forceps, and before opening the peritoneum any arteries that may be divided should be ligatured. Having thus arrested the hæmorrhage, a piece of the peritoneum should be pinched up by the dissecting forceps and the cavity opened, and the peritoneum divided the whole length of the wound. In performing these steps of the operation the only artery likely to be divided is the circumflex iliac, but, as a rule, this escapes injury.

The abdominal cavity being opened, the surgeon now introduces his index and middle fingers into the wound, and searches for the sigmoid flexure on the left, or the cæcum on the right side; the former is usually readily found just where it passes into the cavity of the pelvis.

The large gut is easily distinguished by its characteristic longitudinal bands. When opening the right flank in search of the cæcum, the difficulty is usually not nearly so great, although occasionally, as Mr. Treves has pointed out, the cæcum is much displaced.

In all cases of sigmoidostomy the best method is to draw a complete loop of intestine out of the wound, and after a lapse of four or five days, when the deeper parts are thoroughly and firmly fixed by reparative lymph, to remove the loop of intestine, and thus insure a more perfect and complete artificial anus, and prevent the possibility of any of the fæces being conveyed into the lower portion of the gut, and doing away with the benefit which the operation was, to a great extent, intended to relieve, viz., to prevent the passage of the acrid secretions over the diseased surface. It must, however, be remembered that in many cases the delay necessary for the performance of this form of operation in two stages is impossible, as the patient requires immediate relief from most urgent symptoms of obstruction of the bowels; in these cases, then, the old teaching of at once opening the bowel must be resorted to.

ALLINGHAM'S OPERATION.

Mr. Herbert Allingham, in a paper read at the Medical Society,* has suggested that a large loop of the sigmoid flexure should be withdrawn through the wound, and a double suture passed through the abdominal parietes on one side, then through the meso-colon and the abdominal parietes on the opposite side, and then tied firmly. Thus a large loop, in some cases several inches, is secured on the outside of the abdomen. He directs that the parietal peritoneum should, in the first place, be stitched to the skin the whole extent of the wound, and the visceral peritoneum of the gut stitched to the parietal peritoneum by a number of sutures, and finally the parietal wound is to be closed by a couple or three stitches on each side of the spur of intestine. The loop of intestine is then dressed with iodoform gauze, and a large pad of wool applied and secured by a many-tailed bandage. This is not to be disturbed for four or five days, at which time the dressing may be removed and the loop of intestine cut off flush with the parietes. Mr. Allingham, before removing the spur of intestine, clamps the whole with an instrument armed with sharp teeth, which he leaves on for twelve hours, after which the loop of intestine is readily removed without hæmorrhage, and the part, being cleansed, is redressed. The appearance of the wound is very like the end of a double-barrelled gun, one opening representing the upper and the other opening the lower portion of intestine. If there should be any accumulation of fæces in the lower segment, it should be removed and the bowel washed out.

* *Medical Soc. Report*, 1889.

The advantages claimed for this method of operating are :

1. The bowel is not opened until firm union has taken place between the visceral and parietal peritoneum. There can be no risk, therefore, of the peritoneal cavity being contaminated by the escaping fæces.

2. By drawing a large loop of intestine out, there is not so much fear of procidentia of the mucous membrane, which is often so distressing to the patient.

3. The lower portion of intestine being patent, it is easy to irrigate the rectum by means of some antiseptic solution and keep it sweet and clean.

Messrs. Allingham, Reeves, Cripps, and myself have practised this operation with success, and I consider this an important advance on all previous suggestions for inguinal colotomy or sigmoidostomy.

Operation as practised by the Author when leaving a loop of intestine out of the wound.

In practising this operation I have introduced one or two not unimportant innovations. In the first place, I do not waste time by stitching the parietal peritoneum to the skin; I content myself with seizing the parietal peritoneum in three or four places on each side of the incision with pressure forceps, and pulling it well out of the wound. Then, in passing the double ligature through the parietes and meso-colon, I protect the skin on each side by passing the sutures through a perforated bone bar on each side (Fig. 93). This prevents the sutures from cutting into the skin, which I found in practice they did, and saves the patient much pain in consequence, further, the sutures, if of chromicized catgut or silkworm gut, which they should be, may be left in as long as is deemed requisite, whereas, if

the bone bars are not used, the sutures must be removed at the same time as the loop of intestine is removed, with the result, in some instances, examples of which have been reported, that the intestine has retracted back into the abdomen, causing disastrous results. By performing the operation with bone-bars as described, moreover, the whole length of the wound is brought into accurate apposition, and I have never found it necessary to suture the visceral peritoneum of the gut to the parietal peritoneum, or to introduce more than one deep suture at

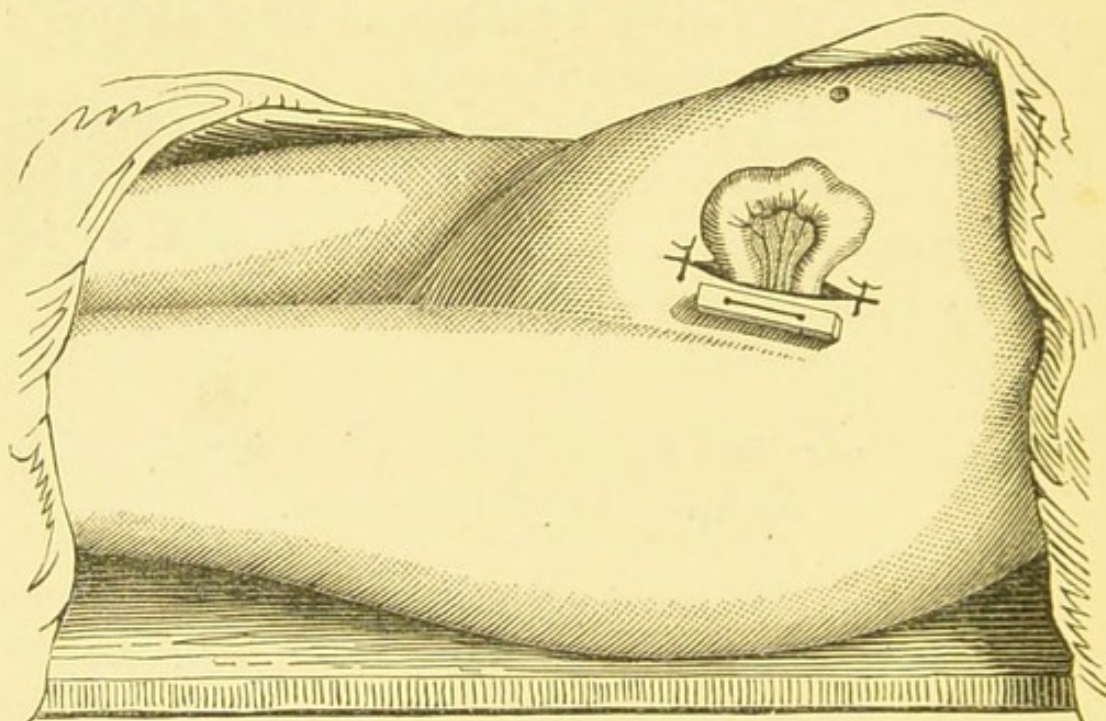


FIG. 93.—Sigmoidostomy. The Author's method of securing the loop of intestine in position by two bone bars.

each end of the incision, and this is often quite unnecessary.

It has been argued by Allingham and Cripps that if the visceral and parietal peritoneum are not united by a number of sutures, there is fear of a piece of omentum, or even of a knuckle of small intestine, being forced out of the opening between the intestine and the edge of the wound. This is one reason why I use the bone bars, since when they are tied firmly the two edges of the wound are so

accurately approximated that it is, I believe, absolutely impossible for anything to be forced out of it.

*Operation as practised by the Author when dividing the
bowel at the time of operation.*

In case the surgeon desires to divide the intestine at once, so as to have only one opening into the bowel, I have adopted the following modification of the above operation, which in some cases I certainly think has much to recommend it. I showed cases on whom I had operated in this manner, and specimens illustrating how firmly the invaginated end closes in a few days, at the Medical Society in 1889.

The abdomen being opened by an incision about two inches in length, and situated about two finger's breadth to the inner side of the superior anterior spine of the ileum, and made at right angles to a line drawn from this point to the umbilicus, so that it is bisected by the line, a small flat sponge with a long string attached to it is passed into the cavity to keep the small intestines and omentum from protruding; the index finger of the left hand is then passed backwards along the brim of the pelvis until it reaches the sacro-iliac synchondrosis, when the descending colon will usually be felt dipping into the pelvis; the finger is then passed over the colon, and a portion of the sigmoid flexure hooked up into the wound, and a loop some inches long withdrawn through the opening. A band of indiarubber is now to be passed through the meso-colon, and fastened tolerably firmly round the intestine as high up as possible, to prevent the passage of its contents when the intestine is divided. The wound is next packed with small sponges, to each of which a long string should be attached, and the loop of intestine is surrounded

with cloths soaked in warm and carbolized water. The intestine is now cut across with scissors about three inches from its upper end, and the contents, if any, evacuated; in some cases it will be desirable to wash the gut out with warm carbolized water. All bleeding points being secured, the divided end of the lower segment is to be invaginated into itself and the end closed as advocated by Madelung by a continuous catgut suture passing through its serous and muscular coats. The meso-colon may now be torn downwards for an inch or more if necessary, and the torn edges stitched over with fine catgut suture. The lower portion of the flexure is then allowed to drop back into the abdominal cavity. The divided end of the upper portion of intestine is next invaginated and the invaginated intestine secured in place by means of a continuous catgut suture; the indiarubber band is then to be removed. All sponges and wool-packing can now be removed, the parts thoroughly washed, and the parietal wound closed with silkworm gut sutures, care being taken that the suture just above the intestine passes through the serous and muscular coats of the gut, and the suture below passes through the meso-colon. Two fine silk sutures are to be passed through the muscular and serous coats of the intestine and the abdominal parietes on each side, so as to thoroughly secure the sigmoid flexure from slipping.

Finally, the spur of intestine, about three inches long, which is left protruding from the wound, is packed carefully round with thymol gauze, the whole covered with a thick pad of cotton-wool and a many-tailed flannel bandage lightly applied. The dressings should not be disturbed for three or four days, unless symptoms occur necessitating their removal. On the fourth or fifth day the spur may be cut away on a level with the skin, all bleeding points secured, and the wound dressed with

iodoform or boracic ointment. One great trouble to be feared in Allingham's operation, and the one I am describing, is the tendency to retraction of the intestine when the loop or spur is cut off. I therefore content myself with opening the spur on the fourth or fifth day, and delay its total removal until some days later. This has the further advantage of enabling the wound to be kept quite free from contamination from the escaping fæces.

That this operation of closing and dropping back the one end is not devoid of risk is shown by the remarks of Dr. Landow,* of Göttingen. He describes an abnormal condition of the sigmoid flexure, which is regarded as one of practical interest, as the possibility of its occurrence in any case of inguinal colotomy would contraindicate the practice advocated by Madelung of stitching up the lower opening after complete division of the gut, and allowing the lower and detached segment to fall into the pelvis. In two cases of inguinal colotomy recently observed in the Göttingen clinic, where the usual practice is to divide the gut and to stitch the two open ends to the external wound, it was noticed that the discharge of fæcal matter always took place from the lower and not from the upper opening, although at the time of the operation the lower portion of the gut was traced downwards towards the bladder and the upper portion in the reverse direction. In one of these cases, which terminated fatally, it was found at the necropsy that the sigmoid flexure, which was very long and freely movable, passed upwards and outwards as far as the splenic flexure of the cæcum and then curved downwards and towards the middle line, reaching the rectum after a long and tortuous course. The division of the gut having been made in the ascending portion, what was supposed to

* *Centralblatt für Chirurgie*, No. 30, 1891.

have been the distal opening was that nearest the cæcum, whilst the supposed upper opening corresponded with the divided end of the inferior segment of the elongated and contorted sigmoid flexure.

I cannot help thinking, however, if the surgeon would be careful to trace the flexure from its origin at the descending colon, that this accident could not happen. It is important, however, to bear in mind this possible source of danger, and in case there is any doubt as to the position of the parts, it would be better merely to withdraw a loop of intestine, leaving its division until a future day.

Operation as practised by the Author when opening the bowel at the time of operation.

In those cases in which it is important to open the intestine at the time of the operation I pursue the same steps as just described up to the point when the bowel is divided, but instead of closing the proximal end, I withdraw it well through the wound and attach an india-rubber tube about four feet long, the calibre of which is half an inch to an inch in diameter, into one end of which I fix a glass tube, the entrance to which is slightly curved outward like the open end of an ordinary test tube. This is to be introduced into the intestine. I next pass a continuous purse-string suture round the open end of the intestine, pass the glass tube into it, and pull the string round the intestine fairly tight, and tie it.

The wound is dressed in the ordinary way, the tube being conducted through an opening in the dressing and conveyed into a vessel, containing a solution of carbolic acid, under the bed (Fig. 94). To prevent dragging at the wound the tube is fastened by a safety pin to the outside dressing.

By adopting this method the dressings over the wound need not be disturbed for four or five days, unless symptoms should arise which render such a course necessary.

The spur of intestine may be cut off whenever the surgeon deems fit—possibly at the end of five days to a week.

Mr. Paul has described a very similar modification in the *British Medical Journal*.*

In his operation an incision is made in the left inguinal region, through which the sigmoid flexure is

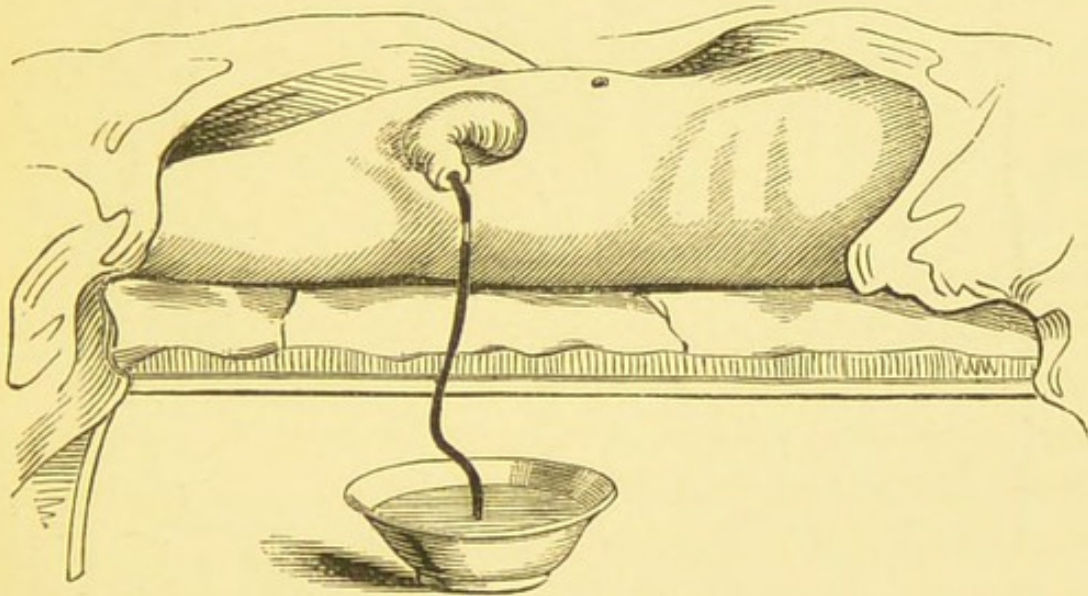


FIG. 94.—Sigmoidostomy. Author's method of draining upper segment when dividing the intestine at the time of the operation.

withdrawn. With the usual precautions the bowel is divided in the middle, the distal end invaginated, as in Senn's operations, and returned into the abdominal cavity. Into the upper or proximal end a glass tube of an inch in diameter was tied, its fore end being attached to a rubber tube to convey the fæcal discharge away from the wound (Fig. 95). This piece of bowel is sewn to the edges of the wound by green catgut sutures passing through its musculo-serous coats, and the rest of the wound closed

* *Brit. Med. Journ.*, July 18, 1891, p. 118.

with the same. About two inches of bowel projected beyond the wound, which was then dressed with iodoform and salicylic wool. The patient did remarkably well. Each day more or less motion passed through the tube, while the wound remained aseptic. After three days the projecting piece of bowel was cut away, good union having taken place, and in a short time a very satisfactory artificial anus resulted.

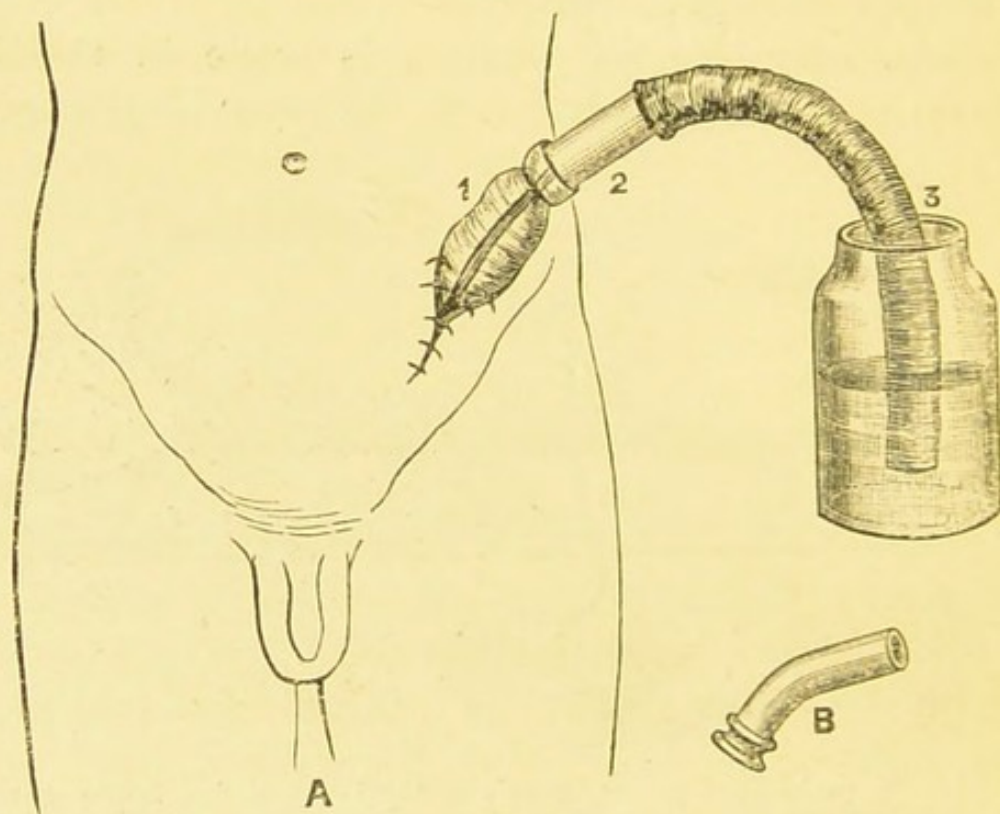


FIG. 95.

A, diagram illustrating a method of performing inguinal colotomy ; 1, the upper end of the divided sigmoid flexure brought out of the wound ; 2, a glass tube tied into the bowel ; 3, rubber tube for conveying fæces away from the wound ; B, improved form of glass tube. (Paul.)

The rubber tube in the diagram was found to be inconveniently heavy, and was changed for a bag of jaconet filled with absorbent wool, which is preferable, except for the first copious discharge of fæces in obstruction.

Mr. Reeves and Mr. F. Marsh, Birmingham, have drawn

attention to another method of performing this operation; to M. Madyl, Vienna, however, is due the credit of originating the method, and to M. Reclus, Paris, the credit of simplifying it. Madyl's first operation dates Feb. 4th, 1884, and his method was referred to by Albert in the *Lehrbuch der Chirurgie*, 3rd edition, vol. iii., p. 145, 1885, and was described by Madyl himself in the *Centralblatt für Chirurgie*, 1888, No. 24, p. 433.

Mr. Marsh has well described this operation in the *British Medical Journal*,* and the following are briefly the salient points in his method:

The sigmoid flexure is drawn out until the meso-colon is seen; a rigid rod is then pushed through this, and rests on the abdominal walls; the sides of the bowel are then sutured to each other below the rod. If it is necessary to complete the operation at once, the bowel is sutured to the edges of the wound, and a transverse opening made. If there is no necessity to complete in one stage, the bowel is not sutured to the edges of the wound, but simply left for from four to six days, and then opened with the thermo-cautery. On the fourteenth day, all the superfluous bowel above the rod is removed with the thermo-cautery, and the edges of the mucous membrane are sutured to the skin.

M. Reclus,† describes his modification of this method. He simply passes a rigid aseptic rod through the meso-colon, omits all sutures, opens the bowel about the fourth day, and about the tenth day removes superfluous bowel, all with the thermo-cautery.

On July 21, 1890, Mr. Marsh first employed this method of Reclus, and exhibited the patient to several visitors at the annual meeting of the British Medical Association,

* *Brit. Med. Journ.*, Feb. 6th, 1892.

† *Bulletins et Mémoires de la Société de Chirurgie de Paris*, February, 1890.

Ed

held in August, 1890, in Birmingham. So simple was the procedure, and so satisfactory the result, that he has since adopted it in all suitable cases, with, however, one or two slight modifications in the *technique* of the operation.

1. The incision through the abdominal wall should be about two instead of the usual two and a half inches, and the peritoneal opening should be of the same length, so that the bowel may have as wide a surface as possible for attachment, and that there may be no need to suture the upper and lower angles of the wound; not a suture should be used.

2. The sigmoid colon having been found, and a loop drawn out, it should be passed on through the fingers until the upper end is taut enough just to allow the loop to rest easily in the wound; the rod should be so passed through the meso-colon that it lies across the wound considerably nearer the lower than the upper angle, in order that subsequently the upper opening may be larger than the lower. The rod he now uses is made of glass (a suggestion made to him by Mr. Greig Smith, who saw his first case), four inches long, round, with the ends made square to prevent rotation and slipping.

3. The bowel may be opened in a few hours in urgent cases, or left three or four days without causing any discomfort in those cases where, practically, no obstruction exists. He generally makes a transverse opening about the third day, and at the end of a week removes superfluous bowel with the thermo-cautery, and burns through the remaining circumference of the bowel over the glass rod, so that the rod may be lifted out. A double-barrel opening is thus left, the openings diverging rather than converging, so that it is impossible for any fæces to pass onwards. For opening the bowel he has used both scissors and the cautery, and prefers the latter. With the former the

resulting hæmorrhage is occasionally very troublesome, whilst with the latter there is practically none, and if the skin around is protected with collodion no pain is felt by the patient during the process, unless the meso-colon is touched, and very little even then.

With regard to the objection that the intestines may be forced through the wound by vomiting, etc., prior to adhesion taking place, no such accident had occurred to Madyl, Verneuil, or Reclus, up to the date of the latter's paper, nor does he think it likely to happen if the smaller incision be adopted, and ordinary care exercised in applying the dressings and binder.

The method is not applicable to every case—no one method is. The old inguinal (Littre's) is preferable, if the opening is to fulfil a temporary purpose; Madelung's, if the colotomy is performed as preliminary to an extensive excision of the rectum; possibly the lumbar if the patient is emaciated and the colon greatly distended.

In some cases it is impracticable: the meso-colon may be too short, from induration or other causes, to admit of a loop being drawn out—Verneuil relates one such case; or the colon may be too distended; but Mr. Mayo Robson's method of emptying the bowel will probably prove a means of overcoming this difficulty.

In a short paper* on this subject, he has suggested the puncturing of the bowel already stitched to the side with a large trocar and cannula, and then fixing a tube in the cannula and thus running the liquid fæces into an antiseptic solution placed by the side of the patient, and so preventing fouling of the peritoneum or wound.

In the majority of cases, however, sigmoidostomy is applicable, and especially so in those where a prolonged operation, or even an anæsthetic, would be a serious matter. The time occupied is so short, if the colon is in

* *Brit. Med. Journ.*, Jan. 9th, 1892.

its normal situation, that local anæsthesia could very well be employed.

The diminution of risk to the patient is the great advantage, and as that must be the chief consideration in what is often more or less an operation of election, the method will, Mr. Marsh believes, largely replace the more complicated ones now in vogue.

In conclusion, he suggests that the term 'iliac colotomy' should be retained in preference to the more correct, but formidable-looking, 'sigmoidostomy.'

Since writing the above he finds that other surgeons in the provinces have for some time practised, and evidently believe in, this method of Reclus. In the fourth edition of his *Abdominal Surgery*, Mr. Greig Smith gives a full account of the operation, and this is how he speaks of it in comparison with other methods of transperitoneal colotomy (p. 484):

'The operation of election is, in my opinion, that of Reclus. It is by far the simplest, provides a perfect spur, and leaves an anus surrounded by muscular fibres. Where it is out of court, it is difficult to see what other method of cœlio-colotomy can compete with it; then it would be best to perform lumbo-colotomy.'

After Treatment.—After the loop of bowel has been removed, and the artificial anus established, I find the best course to adopt to prevent the irritation of the skin, which results from the acid discharges, is to adopt the free use of iodoform ointment and vaseline. The bowels should be kept moderately open by saline aperients; and if, as so frequently happens, the colon is loaded with scybalæ, it should be washed out with enemata, and in some instances it will be found necessary to break them up before they can be removed.

Choice of Operations.

In all cases where the obstruction is limited to the rectum, sigmoidostomy is, in my opinion, by far the better operation to perform, and it is the operation which has gained most favour with surgeons who have made this subject their careful study.

There are surgeons, however—Mr. Bryant among their leaders—who consider the lumbar operation preferable, and I cannot do better than refer to Mr. Bryant's *Bradshaw Lecture* on this subject.*

LEFT LUMBAR COLOTOMY.

Operation.—The patient being placed under the influence of an anæsthetic, and lying upon his right side, with a pillow or sand-bag under the right flank, between the ribs and crest of the ileum, so as to render the left loin tense and prominent, a spot a good half-inch posterior to the centre of the crest of the ileum, measured between the two superior spinous processes, is to be marked. A slightly oblique incision should be made from the last rib towards the anterior superior spinous process of the ileum; and the centre of this cut, which should be quite four inches in length, must be opposite the mark upon the crest. The structures must be carefully divided upon a director, and all bleeding points at once caught with the pressure forceps. I think it desirable that the fascia lumborum should be recognised, and, if possible, the edge of the quadratus lumborum muscle clearly exposed. If this is seen, a blunt-pointed bistoury may be passed beneath it, and the muscle freely divided. When this is done the colon will generally be found covered with fat.

* *Lancet*, vol. ii., 1889, p. 1211.

It is most important that all the deep structures should be divided to the full extent of the wound, otherwise the surgeon will find himself digging at the apex of a triangle, and will have great difficulty in recognising anything at the bottom of the wound. The dissection must now be carried very carefully through the fine layers of areolo-adipose tissue which lie immediately upon the intestine. When the patient is fat, this is loaded with adipose tissue. When thin, it is semi-transparent and membranous, closely resembling peritoneum.

After dividing these, the colon will usually readily present itself, and may at once be recognised by its greenish colour and distended appearance. The operation may then be completed by passing a tenaculum, or a needle armed with silk, into the most projecting part of the gut, and by this means drawing it to the surface of the wound in order to prevent it dropping or shrinking back when opened.

Mr. Bryant has shown that the colon when thus exposed is capable of being withdrawn through the wound for some four or five inches. In most instances when this can be done I would strongly advise that a knuckle or loop should be drawn quite clear out of the wound, and fastened as suggested by Mr. Davies Colley, so as to allow the gut to become thoroughly adherent to the wound before the artificial anus is made, at the expiration of some four or five days.

Should, however, the symptoms be so urgent as to demand immediate relief, I would still draw some two or three inches of the intestine through the opening as suggested by Madelung, and having thoroughly protected the wound with sponges, divide the colon across its whole diameter, then wash out the lower segment, stitch up the opened ends, and return it into the cavity, and

then proceed carefully and accurately to stitch the open end of the upper segment to the edges of the wound with numerous silk interrupted sutures. The parts should then be dressed with a large pad of marine lint, and the patient returned to bed.

In some cases the colon is very difficult to find, especially in cancer of the rectum, the gut being but little distended with either fæces or gas. In such cases, often the colon recedes behind the quadratus lumborum muscles, and the folds of peritoneum nearly surround and invest it. This difficulty may be overcome to an extent by throwing into the rectum a large bland enema, or pumping in air.

The operation for opening the ascending colon on the right side must be conducted upon exactly the same lines as those laid down for left lumbar colotomy.

PROTECTOMY.

The operation of excision of the rectum was first practised by Faget on June 30th, 1739; but, so far as we know, was not repeated until 1830, when Lisfranc revived it, and his first three cases were successful; but in his subsequent six, only two recovered perfectly: in one the result was uncertain, and three succumbed in periods varying from twenty-four hours to twenty-five days. After the operation, Velpeau, in six similar excisions, had three recoveries and three deaths; while Rizzoli is reported to have performed the operation four times with uniformly good results. Nélaton had several deaths after the operation, but Czerny is credited with only one death in twenty operations (nine without recurrence) during the last nine years.

Arnd, of Bern,* gives the results of thirty-five opera-

* *Deutsch. Zeitschrift für Chir.*, Bd. xxxii., Hft. i.

tions performed for the radical removal of rectal cancer by Kocher since 1872. In most of these cases the posterior median incision was made, with or without resection of the coccyx. In one-half of the fatal cases—ten in number—death was caused by the operation. Of the remaining twenty-five patients, nine were living and free from recurrence of the disease after intervals of not less than four years, and seven others died after periods of varying duration of complete relief. A table of 220 cases of extirpation of rectal cancer, collected by Arnd from the practice of König, Kraske, and other German surgeons, shows a mortality due to the operation itself of 12·17 per cent., and a radical cure in 24·5 per cent. of all the patients.

According to Arnd's statistics, the most frequent causes of death from this operation are suppurative peritonitis and cellulitis, followed by acute sepsis without any morbid change in the peritoneum. Both these fatal conditions are due to infection by faecal matter. This faecal infection may, it is held, be avoided by preliminary colotomy, and by efforts to disinfect the intestinal contents by the internal administration of antiseptics, such as naphthol, salicylate of magnesia, thymol, and bismuth.

After stitching the divided rectum to the external wound, or the careful application of circular intestinal suture, the threads often give way, and thus the efforts to prevent faecal contamination of the raw surfaces fail. Plugging with iodoform gauze—a practice strongly recommended by Von Bergmann—is likely, Kocher thinks, to set up symptoms of general poisoning. The excessive local use of antiseptics is held to be especially dangerous in operations for excision of the rectum, as such agents, by their influence on the action of the heart, are likely to intensify the collapse caused in many instances by prolonged and profuse hæmorrhage, which cannot be avoided.

Wounding of the peritoneum during the operation is not to be regarded as a very serious complication. Of sixty-nine cases in which this mishap occurred, nine only were fatal.

Arnd shows by an analysis of his tables that radical cure is more likely to occur after free removal of the diseased structures, as in so-called amputation of the rectum, than after resection or excision, and it is thought advisable that any portion of apparently healthy gut

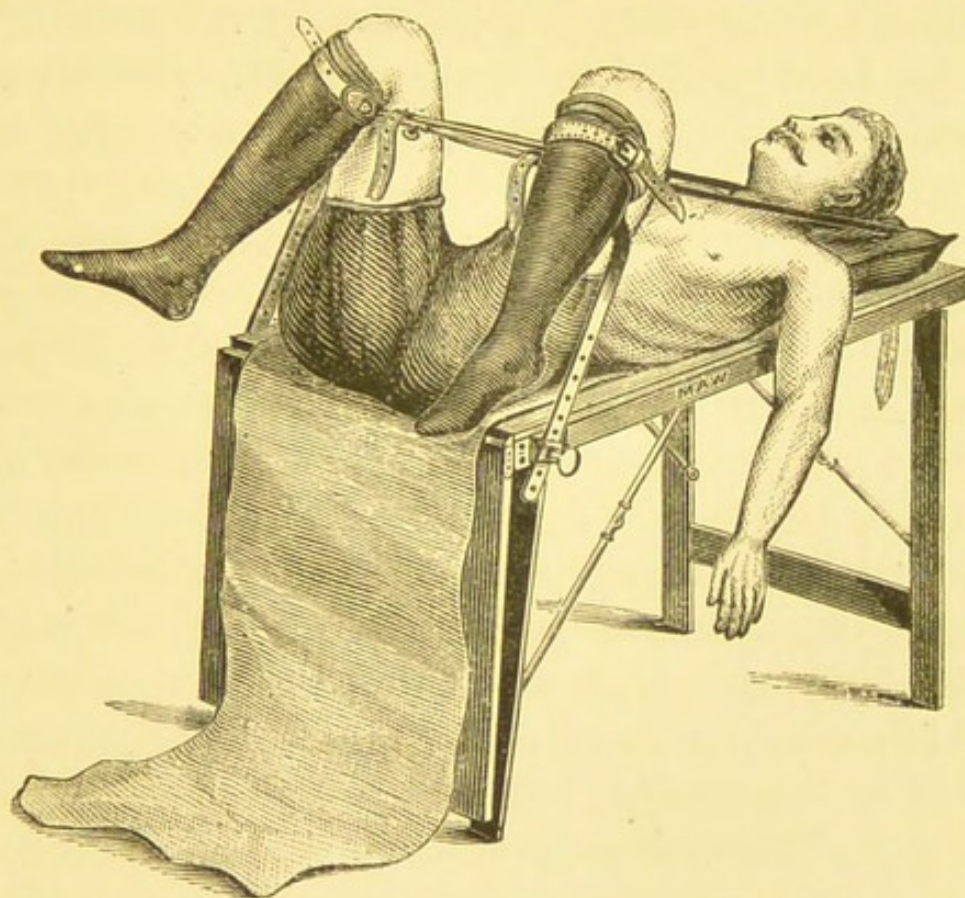


FIG. 96.

intervening between the cancer above and the margin of the anus below should also be removed.

The length of the portion of bowel that may safely be removed with any chance of benefiting the patient is a question open to controversy. There are several cases recorded where five or more inches have been removed, and it is reported that one surgeon excised the first and second parts of the rectum, a part of the urethra, the

prostate, and base of the bladder, and that the patient recovered. I do not, however, think any surgeon of the present day would venture to repeat this very heroic treatment.

The mode of operating proposed by different surgeons varies very slightly. I will content myself here with describing what I consider the best method. The patient being placed in lithotomy position (Fig. 96) and under an anæsthetic, a sharp-pointed curved bistoury should be passed into the rectum, protected by the forefinger of the left hand, and then, depressing the point, push it through the tissues and skin, bringing the point out in the middle line behind, just in front of the tip of the coccyx. The same incision may be made equally well by dividing the skin in the middle line, both in front and posteriorly. The incision should extend backwards as far as the tip of the coccyx, which in some cases may be removed if more room is required. The incision should be carried forward for at least an inch; a circular sweep should then be made round each side of the anus; this, however, should only be carried through the skin and superficial tissues, after which the knife should be put on one side, and the parts separated by the finger and the handle of the scalpel, or some such blunt instrument, with an occasional snip with a pair of blunt-pointed scissors. A good plan, as it appears to me, is one that has been suggested by Professor Macleod. He says: 'It is a great help to insert four strong whipcord loops with a curved needle, one at each corner as it were (two above and two below), passing from the incision into the interior of the bowel and out at the anus. By knotting the free ends of each of these four ligatures four loops are made, which give one great power in the subsequent separation of the gut, and when all are united in the left hand and drawn upon, the bowel can be well stretched and

steadied, and so the later steps of the operation much facilitated.'

The separation of the gut posteriorly is very easy, as the finger readily breaks down the cellular bed, but anteriorly the gut is very much more intimately attached, and when adhesion exists the blunt-pointed scissors must be had recourse to; when doing this part of the operation, a catheter should always be passed into the bladder in the male, and the finger introduced into the vagina in the female; by this means the parts are steadied, well defined, and the surgeon is enabled to dissect the diseased tissues away without fear of wounding either the urethra in the one case, or the vagina in the other. There is usually in this way very little difficulty in separating the bowel to a point well above the disease. Up to this point there is usually very little hæmorrhage; if there should be, the application of the clamp forceps will always enable the surgeon to proceed without hindrance. Further, if it is remembered that the main artery lies in the posterior wall of the bowel, it must be manifest that no serious bleeding can take place until the gut is divided transversely. During the latter part of the operation great assistance may be rendered by an assistant keeping the detached portion of gut upon the stretch by means of the strings in any direction the surgeon may require. The only fear of hæmorrhage being troublesome is when the bowel is adherent tolerably high up posteriorly, as the main blood-vessels divide at a point about four inches from the rectum; but here, if the posterior incision has been made freely, there should be no difficulty in securing the bleeding points. Dupuytren recommends, in operations which involve carrying the dissection very high, that the bladder should be filled so as to raise the rectovesical pouch.

In separating the diseased portion of the bowel from

the healthy parts the *écraseur* or thermo-cautery may be used; if the *écraseur* is used the bowel should be divided longitudinally into two parts, so as to avoid the temporary closure by the action of the chain; but this is not at all necessary, as the hæmorrhage is usually insignificant, and in any case it is easy, if the parts are divided with scissors by successive snips, to catch up the vessels directly they are cut, and ligature them. The wound should be swabbed out with a solution of chloride of zinc, and if there be any oozing, a sponge soaked in boiling water and pressed on the part will quickly stop it; in any case, a sponge placed in the wound and pressed firmly home, while the patient's legs are brought down and tied together, will invariably stop all bleeding. The patient should be put to bed, and his buttocks somewhat raised upon a pillow. No dressing of any sort should be used, excepting, perhaps, a large pad of marine lint to catch any discharge, either fæcal or otherwise.

It sometimes happens that the disease is localized to a portion of the rectum situated two inches or two and a half inches above the anus, a strip of perfectly healthy mucous membrane existing between the tumour and the anus. In these cases the surgeon should endeavour to preserve the anus and sphincter muscles; this is done by forcibly dilating the anus, and then making a deep incision in the middle line posteriorly to the tip of the coccyx, the incision being prolonged up the bowel to the lower margin of the disease. A corresponding incision may be made anteriorly if required.

The bowel should then be divided transversely throughout its entire circumference below the tumour; all bleeding points at once caught up with the pressure forceps, and tied. I should advise that a strong silk or whipcord suture should be passed through the bowel for the sake

of traction, as described for the removal of the whole rectum. The after steps of the operation and treatment are identically the same as for complete excision.

When the tumour involves only a portion of the circumference of the bowel there will be no occasion to remove the complete ring of the rectum. The operation is commenced in the same manner as the last-named operation, and then, starting from the upper end of the incision, the diseased part is to be separated from the surrounding tissues by tearing with the finger or handle of the knife, and an occasional snip with blunt-pointed scissors, until the whole diseased mass is detached, care being taken to prolong the incision into the healthy tissues around the disease for at least an eighth to a quarter of an inch. If the portion removed be small, the edges may be brought together with sutures placed longitudinally; if large, an attempt should be made to approximate the edges, the sutures being passed through the entire thickness of the gut. The ligatures may be left to slough out. After all these operations the wounds heal with remarkable quickness, and there is a great tendency for the cicatricial tissue to contract so as to allow of but a very small passage. In all these cases a hollow cylindrical tube should be passed well through the wounded parts into the healthy bowel. In the early stages a tallow candle gently passed will often prevent this contraction from occurring. It is remarkable after these operations how little deficiency there is in the parts, and in the functions of the sphincter. Some very excellent rectal bougies have been lately introduced by Mr. Wales, of Canada; they are made of very soft pliable rubber, and are admirably adapted for the purpose of either dilating stricture of the rectum or for use after excision, as a patient might easily pass them without fear of injury. The rectum should be syringed out twice or thrice a day

with some antiseptic solution, and the patient otherwise treated as in the former cases.

After Treatment.—The treatment of the cases after operation should be carried out on the same lines as those already described for colotomy.

The patient should have small doses of opium, and the parts be kept thoroughly well irrigated with Condyl's

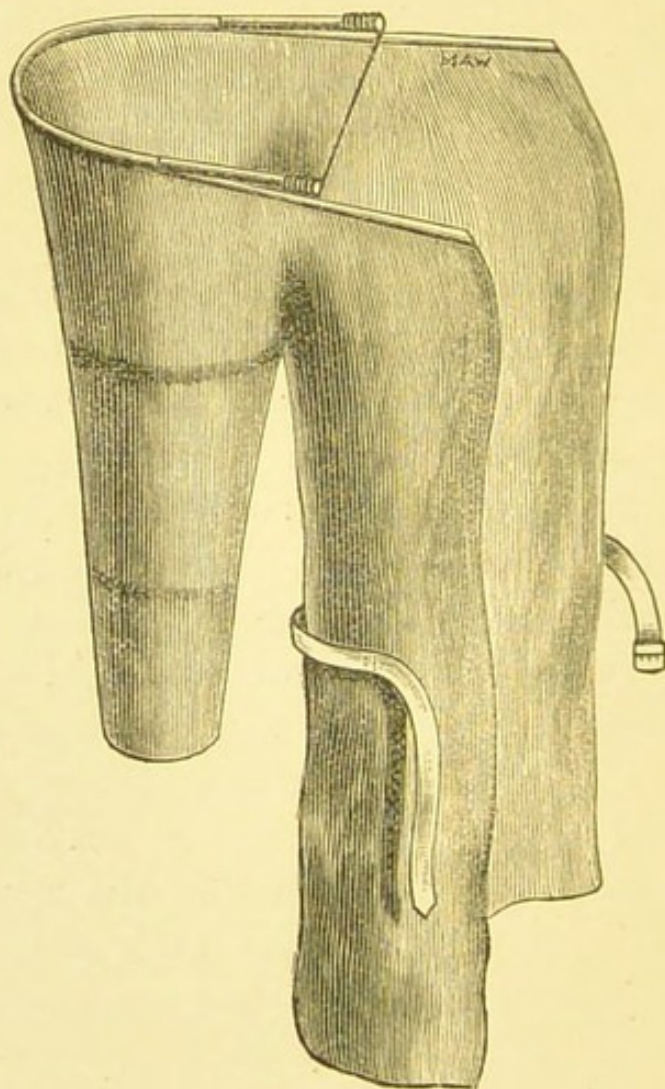


FIG. 97.

fluid or weak solution of carbolic acid, and the wound itself dusted over with iodoform after each dressing. Food only which is nourishing and easily assimilated, *i.e.*, peptonized beef-tea, oatmeal gruel, milk, eggs, and the like, should be given. The bowels should not be allowed to act for four or five days or a week. If

there is any difficulty in micturition, the urine should be drawn off with a soft gum-elastic catheter.

In the performance of these and all other operations on the perineum, I invariably make use of a waterproof funnel (Fig. 97). This funnel, which has been made for me by Messrs. Maw, Son, and Thompson, is so constructed that a waterproof sheet is passed under the patient and fastened by a buckle round the waist. The funnel then drops over the end of the tube, and is conducted into a vessel under the table. By this means the surgeon can sit with comfort close to the patient, and there is no risk of his clothes becoming soiled; at the same time he can use any amount of irrigation to keep the wound clean.

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THE END.

