

ascending colon and cæcum is an *antiperistalsis*. The movements occur in intermittent periods, which come on at intervals of about fifteen minutes. Each period of activity lasts for about five minutes, and is followed by a quiescent interval of about ten minutes. The waves recur during an active period at the rate of eleven waves in two minutes. During activity the ileo-cæcal valve is closed and the contents are hence churned up, intimately mixed, and exposed to absorption, without in any way interfering with the processes going on in the small intestine. When new portions of material enter the large intestine, a strong general contraction sets in along the cæcum and ascending colon so forcing some of the material already present onward. As soon as this has been effected the antiperistaltic movements described above commence. With the accumulation of material in the transverse colon, deep tonic constrictions appear one after another and carry the material into the descending colon, thus leaving the transverse and ascending portions free for the play of the antiperistaltic waves.

Cannon found the ileo-cæcal valve perfectly competent for material passing in the ordinary course of digestion from ileum to colon, regurgitation into the small intestine never being observed; but in the case of a nutrient enema exceeding a certain bulk, regurgitation did occur, under the pressure of the antiperistaltic waves, into the empty ileum. Such a regurgitated nutrient enema underwent segmentation in the small intestine exactly as in normal digestion.

Cannon further observed that strong emotion, caused by fear, distress, or rage, totally inhibited all the intestinal movements. The movements continue in a normal fashion while the animals are asleep.

Benjamin Moore.

The literature relating to intestinal movement is an extensive one, but a key to most of the researches on the subject will be found in the following papers in which earlier work on the subject is also reviewed: Bunch: Journ. of Physiol., 1897, vol. xxii., p. 357; *ibid.*, 1899, vol. xxiv., p. 72. Grützner: Arch. f. d. ges. Physiol., 1898, Bd. lxxi., S. 492. Bayliss and Starling: Journ. of Physiol., 1899, vol. xxiv., p. 99; *ibid.*, 1901, vol. xxvi., pp. 107-123. Starling: Schäfer's Textbook of Physiology, 1900, vol. II., pp. 326-335. Cannon: Amer. Journ. of Physiol., 1902, vol. vi., p. 251.

INTESTINAL OBSTRUCTION. (SURGICAL.)—In describing the treatment of this affection, acute and chronic obstruction will first be dealt with generally, and after describing in detail the various remedies and methods employed, the special treatment of the individual forms of obstruction will be considered.

ACUTE OBSTRUCTION.—The treatment of acute obstruction is a subject surrounded with difficulties, and one about which there was formerly a great variety of opinion. The men of the older generation relied entirely on the "rest, opium, and starvation" treatment, and held that operative measures are seldom, if ever, necessary; the modern surgeons, on the other hand, think that the treatment by "rest, opium, and starvation" is almost useless, and the employment of such treatment is a waste of valuable time if the diagnosis of acute obstruction is correct. The only sensible procedure is to open the abdomen and if possible find out the cause and, if possible, remove it.

The practitioner without much experience, looking into his text-book for guidance, might imagine, from the very exact description given of the symptoms peculiar to each form of intestinal obstruction, that the differential diagnosis is a simple matter, and that should he meet with a case, he would only have to employ a certain method of treatment for a certain form of obstruction, and so relieve his patient, if relief were possible. In actual practice, however, the diagnosis of the special form of obstruction we have before us is by no means easy, and in most cases the exact nature of the affection cannot be determined except by laparotomy, or on the post-mortem table. The sermons preached daily by the morbid anatomists are valuable checks to the sin of diagnostic dogmatism in abdominal affections.

There are, however, certain general principles to be followed in cases in which acute obstruction is evident.

In the early period of these cases purgatives should be strictly avoided; enemata may be administered, but purgatives never. Food should not be given to the patient by the mouth, as it is always rejected, but the strength should be maintained by nutritious enemata.

If, after washing out the lower bowel several times, the fluid injected returns unchanged, and at the same time the vomiting continues incessantly, no relief can be hoped for by any other means than laparotomy. Delay in these cases is most dangerous; we should not wait for the vomiting to be fecal (that is evidence of obstruction of some duration), but should open the abdomen at once, for the earlier the operation is performed the greater are the chances of success. In the fatal cases following operation this result is not, as a rule, caused by the laparotomy, but by its too late performance and the advanced condition of the grave changes in the bowel which result from the long-continued obstruction. This is especially apt to be so in those subacute cases due to intussusception, local inflammation, and hernia, in which, the symptoms not being very urgent, operation is delayed till too late (Wheelhouse). Wheelhouse¹ says the previous history of the patient is important. "If he has had peritonitis, perityphlitis, enteritis, or other inflammations where lymph may be poured out and bands afterward form, the indications for operation are more urgent."

In those cases which have all the symptoms of a strangulated hernia, and yet no hernia can be made out externally, it is reasonable to suppose that the case is one of internal strangulation, which can be relieved only by operation, as reduction by taxis is out of the question.

In subacute cases which have lasted five or six days, many patients, if operated on, die of exhaustion, and, according to Mr. Treves,² in cases of intussusception, after death a process of spontaneous cure, nearly complete, has been found, and apparently was arrested only by exhaustion owing to the patient's inability to take food.

In **CHRONIC OBSTRUCTION**, where there is reason to believe that a stricture exists in the intestines, due to internal or external causes, it is very important that proper food should be taken, so that nothing that is not perfectly fluid or in a pulsatious condition should enter the bowel. The swallowing of all indigestible substances, such as orange pips, plum or cherry stones, raisins, etc., should be strictly avoided. Should constipation be present, mild laxatives may be cautiously administered, or simple enemata, but *purgatives should on no account be given*. If the stricture be within reach, as, for instance, in the rectum, it may be dilated with bougies or incised. Excision of a cancerous stricture of the lower end of the rectum is an operation which has afforded very good results, and, if performed early, the life of the patient may be prolonged for years and his comfort not seriously interfered with. When almost complete obstruction occurs from narrowing of the lumen of the bowel by the increased growth of the stricture, then the question arises as to the advisability of establishing an artificial anus. If the growth can be felt through the rectum, inguinal colotomy should be performed, if it is deemed inadvisable to excise the growth. Cancerous strictures nearly always occur in the large bowel, and, if the stricture cannot be felt through the rectum and the age and appearance of the patient indicate malignant disease, an exploratory operation should be undertaken and an endeavor made to excise the growth, bringing the cut ends of the bowel together with sutures or Murphy's button.

If the stricture be in the small bowel the abdomen should be opened and an artificial anus established, or the affected portion of bowel should be resected and the divided ends sutured or united by Murphy's button.

In cases of chronic obstruction which have lasted for months and the cause cannot be exactly determined, an exploratory incision is the proper procedure, for by the establishment of an artificial anus life may be, in many cases, much prolonged. Often the growth may be excised and the cut ends of the bowel brought together; and

for the success of this procedure, the earlier the operation is undertaken the better, before the system has become debilitated, as the better the condition of the patient at the time of operation so much the greater is the chance of success. Patients, as a rule, refuse operation till the discomfort of the obstruction is so great and their condition so deteriorated that operation is performed only as a *dernier ressort*.

METHODS OF TREATMENT IN DETAIL.—*Rest, Starvation, and Opium.*—This treatment is of very old date, and many yet believe it to be the only treatment that should be pursued in cases of acute intestinal obstruction. It consists, in short, of entire abstinence from food, from physical exploration of the parts, enemata, etc., and the administration of opium or morphine. All are agreed as to the propriety of adopting this treatment in the very early stages of acute cases, but, as already mentioned, surgeons of the present generation are in favor of further treatment by operation.

Opium.—Many cases of obstruction are recorded as being cured by the free administration of opium; it is certainly very probable that not a few cases of commencing invagination have ended favorably by its administration. But we must not trust to opium, even when combined with rest and starvation. Opium has its dark as well as its bright side, and if given early in cases of obstruction it obscures the symptoms and so lessens the chance of making a diagnosis; the patient's condition, no doubt, improves, vomiting and pain may be less, the pulse better, and the skin moist; but at the same time the bowel may be in a gangrenous condition, and the patient dies only the easier from having been dosed with opium. Again, the lessening of the severity of the symptoms may so lull the suspicions of the medical attendant that operation is delayed and the patient deprived of his only chance of life. I repeat that opium is a valuable drug in the treatment of obstruction if used with discretion, and with a full knowledge of its effects; it is rarely curative, but always relieves pain and lessens the peristaltic action of the bowels.

Belladonna.—Dr. Brinton first introduced the use of this drug in the treatment of intestinal obstruction, because of its power to produce relaxation of the unstripped muscular fibres of the bowel. Many speak very highly of it used alone or in combination with opium, as it lessens the sickness and depression caused by opium given alone. It may be administered by the mouth, or atropine may be injected hypodermatically. It has been used externally on the abdomen in form of ointment or plaster. Belladonna is sometimes useful in cases of fecal accumulation, or in cases of paralysis of the bowel due to sepsis, but in cases of true obstruction it can be of but little service.

Enemata.—In cases of chronic obstruction of the bowels enemata are of considerable benefit; they are especially useful in those cases in which vomiting occurs. In cases of obstruction due to fecal accumulation enemata are particularly beneficial. Warm water is generally sufficient, by repeated injections, to clear out the large intestines, but in cases of impacted feces enemata of sweet oil, with one drachm of spirits of turpentine to the pint, give extremely satisfactory results.

Enemata have frequently proved useful in effecting the reduction of an intussusception; to be of service they must be administered early and copiously. Some recommend that they should be administered with the patient in the inverted position.

In cases of acute obstruction the benefit of enemata is not so clear; many medical men in these cases object to them altogether, because they are liable to increase the peristaltic action of the bowels.

In certain cases enemata are inadmissible and often injurious. They cannot possibly be of benefit in cases of intussusception in which the invaginated bowel has reached low down, in stricture of the rectum, or in cases of volvulus of the sigmoid flexure; in this latter affection enemata only increase the amount of twisting, and so do infinite harm.

Some surgeons recommend that copious enemata should be given, in every case of intestinal obstruction, before any other method is tried. Dr. Iloway,³ not content with the ordinary enema syringe or siphon apparatus, recommends the use of a force pump which can throw a continuous stream; if this fail, then he advocates laparotomy. In reading over the account of the discussion on intestinal obstruction at the Liverpool Medical Institution,⁴ the writer was much struck with some remarks of Dr. Barr, and thought that they applied to those cases of intestinal obstruction successfully treated by enemata. Dr. Barr said: "If you look upon all cases where you have got severe pain in the abdomen, constipation, and vomiting, with perhaps more or less shock, as cases of intestinal obstruction, then, no matter what line of palliative treatment you adopt, you ought to have a very good percentage of recoveries; but if you belong to a more exclusive school, and in your anxiety for accurate diagnosis eliminate all cases of colic, constipation, enteralgia, etc., then you will find you have a terrible disease left, which tends more frequently toward a fatal issue than to recovery."

If we were as certain of the correct diagnosis of the disease treated as of the successful result of the treatment in many of the reported cases, much confusion and difference of opinion as to the value of certain remedies in the treatment of intestinal obstruction would be avoided. Enemata have been used for diagnostic purposes. If during the injection the fluid can be heard gurgling in the cæcum, it is almost certain that the obstruction is in the small intestine; if it is stopped at some intermediate point, it is probable the obstruction is at that spot.⁵

Metallic Mercury.—This very old method of treatment is now never practised, though comparatively recently it has been advocated by Maignon, of Paris, and cases of intestinal obstruction successfully treated by this means are occasionally reported in the journals. The cases in which it is of use are those of old fecal accumulation; for other forms of intestinal obstruction it should never be employed; it cannot possibly do good, and may do much harm.

Shot.—Dr. Maydiou,⁶ of Paris, reports cases of ileus successfully treated by the administration of shot. He mixes seven ounces of shot with four ounces of olive oil, and gives two drachms of the mixture every half-hour. This treatment may do more harm than good, and is mentioned merely as a curiosity. It replaces the treatment by bullets of the physicians of the sixteenth century.

Washing Out the Stomach.—Kussmaul was the first to introduce washing out of the stomach for intestinal obstruction, and a number of successful cases are reported as the result of this mode of treatment. The good result is explained on the ground that evacuation of the distended bowel affords opportunity for the spontaneous reduction of a herniated or twisted loop of bowel. The temporary relief afforded is said to be very great, and the practice is so simple and harmless that it is worthy of a trial. Of course, the majority of cases of intestinal obstruction could not possibly be relieved by it.

Massage and electricity have been extensively practised in the treatment of intestinal obstruction and still have their advocates. It is now the opinion of most surgeons that in cases of acute obstruction, at any rate, they do more harm than good. The only cases of obstruction likely to benefit by them are those due to fecal accumulations. E. O. Day⁷ reports two cases of intussusception successfully treated by massage. He had seen ten cases of this affection, and the only recoveries were the two treated by manipulation and massage.

Puncture of Bowel with an Aspirator Needle or fine Trocar.—This method has its advocates, and cases are reported in which, after the bowel has been punctured and a large amount of gas and fluid feces evacuated, the obstruction has been relieved. As a rule the procedure is not a dangerous one, but occasionally, owing to paralysis of the coats of the bowel, the punctures do not close, feces escape, and a fatal peritonitis is the result. At best, puncture is a proceeding in which the element of

chance exists to a large extent; one can never tell whether the proper part is punctured, or whether the needle has not entered a portion of bowel bordering on gangrene. Mr. Treves⁸ has met with several instances in which perforation of the bowel, which had been previously threatening, took place immediately after the relief of the distended coil by puncture.

In some cases the needle has punctured the bowel below the obstruction, without, of course, relieving the patient.

Emptying the bowel above the obstruction may in certain cases relieve a portion of the gut which is in some abnormal opening or held lightly under a band, and may relieve obstruction due to kinking. In cases of stenosis in which there is temporary obstruction it may give relief, and also in those cases of chronic obstruction which suddenly become acute (Treves).

Puncture of the bowel is a favorite method of procedure with veterinary surgeons for the relief of distended bowel in cattle. A very large trocar is used, and no evil results ever follow, owing to the immunity cattle have from peritonitis.

Dr. Larguier, of Paris, speaks highly of the continuous use of a trocar. He introduces a trocar 5 to 6 mm. in diameter, and leaves it in the intestines two or three days. Sometimes fecal fistulae are formed (Treves). As this operation must necessarily be done at haphazard and is not free from danger, it cannot be recommended.

Laparotomy.—Surgeons are daily becoming more and more certain of the necessity of this operation in the majority of cases of obstruction; there is still some difference of opinion as to the cases in which it is suitable, and also as to the proper methods of its performance, but a larger experience will soon enable us to lay down definite rules for the guidance of surgeons. C. L. Gibson,⁹ of New York, has collected 646 cases (exclusive of hernia) of intestinal obstruction treated by laparotomy with a mortality of 47 per cent.

The incision should be made in the median line below the umbilicus, and should be long enough to allow the whole hand to enter the abdomen. Having opened the peritoneal cavity, after all hemorrhage has been arrested the hand should be introduced through the wound, and the right iliac fossa first examined. If the obstruction be not found in cæcum or ileum, collapsed coils of intestine should be searched for. These are generally found hanging in the pelvis. If found, they can be passed through the fingers till the constriction is reached. Mr. Treves¹⁰ advises that a large, warm, carbolyzed sponge should be placed in the pelvic cavity, as by this means much manipulation is saved. The intestines should, if possible, be prevented from extruding by means of warm flat sponges or aseptic gauze pads wrung out of hot water. The extrusion of intestines, if much distended, as they are almost sure to be, gives rise to considerable trouble, and if they cannot be kept within the peritoneal cavity, it would be well to incise the most distended portion and allow the gas and contents to escape. The incision should afterward be closed by a Czerny-Lembert suture. If the obstruction cannot be made out by the introduction of the hand, it would be proper to allow the bowel to extrude and to make a systematic search. The extruded bowel should, of course, be protected by warm aseptic gauze towels. Mr. Greig Smith¹¹ says the most dilated portion of the bowel rises to the surface, and there is a great probability that the obstruction will be found near this point. The hernial orifices should be examined, also the foramen of Winslow, the sigmoid pouch, duodenojejunalis fossa, etc., the diaphragm must not be overlooked, openings in the mesentery searched for, the presence of a tumor or intussusception as a cause must be kept in mind; also Meckel's diverticulum or the possibility of a properitoneal or retroperitoneal hernia.

When the obstructed point is found, the intestine should be carefully examined; if of good color it should be returned, but if gangrenous it should be excised and the cut ends immediately sutured, or an artificial anus established. If the obstruction be due to constricting

bands, these should be divided between the two catgut ligatures. Should an intussusception exist, it may be reduced by gentle traction if the case be a recent one; but if the parts be tightly glued together by effused lymph, so as to render reduction impossible, the affected portion of bowel should be resected and sutured, or an artificial anus should be established. Occasionally in these cases the obstruction is found to be due to cancerous or other stricture, or to a peritonitis; if the former condition exists and excision is impossible, an artificial anus should be established above the constriction; if the latter is the cause of the trouble, the peritoneal cavity should be washed out with a normal saline solution.

It is possible, nay probable, that the cause of the obstruction may not be found, for it is by no means easy thoroughly to search the abdominal cavity (even if the whole hand is introduced) when the bowels are greatly distended; in such a case it is the duty of the surgeon to establish an artificial anus in the most distended portion of bowel, and to await results.¹² In cases operated on late, the value of decinormal saline solution injected subcutaneously, or the intravenous introduction of the solution cannot be overestimated. Even rectal injections are of benefit, and filling up the abdomen after operation with hot saline solution and leaving it there is a most useful antidote to shock.

Polaillon¹³ advises lateral laparotomy in preference to the median incision in cases of intestinal obstruction; with this incision, he holds that the distended intestines are less likely to extrude, and that the wound is more easily closed. The lateral incision should be made in the inguino-iliac region, parallel to the fibres of the external abdominal oblique muscle. Here the lips of the wound close easily, and the diaphragm is less liable to force the distended bowel through the wound. This incision is all very well if the point of obstruction is diagnosed and is on one side or the other, but in the majority of cases we are quite in the dark as to the site of the obstruction, and for a systematic exploration of the abdominal cavity no incision is so convenient and useful as the median.

Enterectomy is called for in certain cases of intestinal obstruction; for instance, those due to simple and malignant strictures of the small intestine, neoplasms, irreducible intussusception, and also in those cases in which on opening the abdomen the bowel is found to be in a gangrenous condition. It has been most frequently performed for the latter condition. After the affected portion of bowel has been resected, the question then arises as to the propriety of immediately uniting the divided ends of the bowel by suture, or of establishing an artificial anus by fixing them to the abdominal wound. The latter method, in cases of intestinal obstruction in which the condition of the patient is by no means good, is probably the better one. The immediate suture of the bowel prolongs an already severe operation, and so lessens the patient's chance of recovery.

If desired, when the patient recovers, and regains his strength, the artificial anus may be closed by a second operation. For the manner of performing resection the reader is referred to the article on *Intestinal Surgery*.

Enterotomy.—This operation for the relief of obstruction was first performed by Nélaton, and consists in opening the small bowel in the right loin, by an incision, a little above the crest of the ilium, parallel with Poupart's ligament. It has been performed many times with success, and is more suitable to the more chronic forms of obstruction when, owing to the disease being high up in the large intestine, left inguinal colotomy is unsuitable. The portion of bowel opened is generally the lower end of the ileum. It is also performed in those cases of intestinal obstruction in which, after the abdomen is opened, the affected portion of bowel cannot be resected. In cases of recovery the patients complain bitterly of the situation of the fecal fistula, as no apparatus seems to be able to keep in the discharges.

For the treatment of obstruction due to hernia, the reader is referred to that subject, also the treatment of diaphragmatic hernia (of which Gibson has collected

thirty-four cases), and gangrenous hernia must be looked for under the head of *Hernia*.

TREATMENT OF SPECIAL FORMS OF OBSTRUCTION.—**Treatment of Internal Strangulation.**—If the obstruction be complete and the symptoms very acute, the immediate performance of laparotomy is called for. Whatever be the cause of the strangulation, laparotomy is our only hope of effecting a cure. Occasionally, but very occasionally, the patient may recover owing to the bursting of a constricting band or the spontaneous reduction of a herniated loop of bowel, but we should not wait for the chance of a cure being effected by nature. The immediate danger is too great, and the hope of a natural cure too slight, to justify us in postponing opening the abdomen and relieving the obstruction. There is no reason why these cases should be treated in any way differently from those of strangulated hernia when reduction by taxis has failed. Some go even further than this, and recommend that where this form of obstruction is suspected the patient should not be allowed to die without an exploratory laparotomy.¹⁴ There is far more danger in operative interference being delayed until the period when it may be of no avail, than that a hasty and unnecessary operation should be done (Pilcher¹⁵). Opium may be given to relieve pain and lessen peristaltic action, but it is useless to trust to it as a curative measure. Enemata may prolong life, but cannot cure the disease. Its apparent improvement, due to the administration of sedatives, etc., should not deceive the surgeon or encourage him to postpone operative measures.

Volvulus.—This occurs most frequently in the sigmoid flexure. Rest, starvation, and opium may delay the fatal issue, but will never relieve the volvulus. Enemata are injurious, as they tend to increase the twist by distending the bowel. Laparotomy is the only method of treatment that affords any reasonable hope of success, and, to be of benefit, it should be performed early. When the operation is performed, and the volvulus found, its reduction is by no means a simple matter, even after the distended bowel has been relieved by puncture or incision. If reduction is impossible, an artificial anus should be established or the bowel resected. Volvulus was seen in 121 cases of the 646 collected by Gibson, and of these 66 per cent. ended fatally after operation. In 79 cases the bowel was untwisted and only 29 per cent. were fatal; 81 per cent. ended fatally after resection or artificial anus.

Bands.—Of the 646 cases of intestinal obstruction operated on, and tabulated by Gibson, 186 were due to bands; of these 76 were fatal (41 per cent.); most of these bands occurred in connection with the small intestines. In 126 the bands were cut or removed, and the mortality was 26 per cent. Owing to gangrene, resection had to be done in 17 cases, with a mortality of 52 per cent. This gave a better result than artificial anus, in which in 18 cases the mortality was 94 per cent. It is well to remember that there may be more than one band; failure to search for a second band has been the cause of more than one death.

Intussusception (Acute).—There is no doubt that occasionally intussusception, if recognized early, before adhesions have formed, may be treated successfully without operation. It is unnecessary to state that purgatives are harmful, and that expectant treatment, when every moment increases the severity of the affection, is of no avail. Mr. Jonathan Hutchinson has said¹⁶: "I have not found any case recorded in which spontaneous return of a well-recognized intussusception occurred, and those in which art succeeded are comparatively rare." If we are certain that the case is one of acute intussusception then immediate operation is called for. Insufflation of air or the injection of water have long been advocated as early treatments, and many yet believe in them; for some time, however, the modern surgeon has considered these measures mere loss of time, and prefers immediate laparotomy. The methods of insufflation and of administering enemata are given below.

Mr. Clement Lucas¹⁷ advises the following method of inflation: "An ordinary bellows is connected with a gum-elastic enema tube by means of a piece of rubber tubing

which is firmly wired at the end; around the end of the enema tube lint should be wrapped so as to make a conical air-tight base; the tube is inserted about three inches into the rectum, and the anus closed by a conical plug of lint. Further to guard against the escape of air, an assistant should press the buttocks of the patient close together; an anæsthetic should be administered." Mr. Lucas advises that inflation should be performed with the patient in the inverted position.

There are different methods of administering enemata: the ordinary enema syringe will do very well, but the fountain or siphon syringe is much better. The return of water is prevented by an assistant, who presses the buttocks of the patient firmly together. The water should be warm, and should be injected slowly and continuously. The difficulty of retaining the injected fluid may be obviated by the employment of Lund's elastic ring and handle.¹⁸ This instrument was devised by Mr. Lund to prevent the return of air in insufflation, and so is suitable to cases in which either air or water is injected.

Should the surgeon be fortunate enough to effect reduction by these means, the after-treatment is simple: milk diet, with small doses of opium to relieve pain and give rest to the parts.

Laparotomy by median section is the preferable operation. If, on opening the abdomen, reduction prove impossible owing to the firmness of the adhesions, the affected portion of bowel should be resected and the divided ends immediately sutured and returned into the abdomen, or stitched to the abdominal wound, and an artificial anus established. Dr. Charles L. Gibson,¹⁹ of New York, has collected 187 cases in which an operation was done for intussusception, with a mortality of 51 per cent.; 81 cases were in children under one year, and of these 85 died and 43 recovered. The invagination was reduced in 126 cases, with 46 deaths and 80 recoveries. Resection was performed in 32 cases, of which 26 were fatal. Artificial anus was made in 5 cases, of which all were fatal. Resection and artificial anus in 19 cases, with 14 deaths. Twenty-three cases were gangrenous and only one of these patients recovered. The results of early operations in these cases of intussusception are fairly satisfactory.

Widerhofer and Herz,²⁰ of Vienna, report each a series of 10 cases of laparotomy for invagination, with 3 recoveries in each series, or a mortality of 70 per cent.

Weinlechner advocates median laparotomy within twenty-four hours in children and forty-eight in adults.

Other methods of treatment are advocated for acute intussusception. Kussmaul recommends the free washing out of the stomach. Busch²¹ has practised massage three times without success. When low down, reduction by bougies has been well spoken of by some, but this treatment is dangerous and cannot be recommended.

Weinlechner,²¹ when the invagination is low down in the sigmoid flexure or in the rectum, has five times ligatured the invaginated portion by introducing a rubber tube and passing a ligature over it. Others,²² when the invagination was low down, have cut off the invaginated portion, and then returned the bowel.

L. W. Hotchkiss (*Annals of Surgery*, November, 1901) has drawn attention to the fact that acute obstruction may occur after the operation for appendicitis; it must not be forgotten that acute obstruction may be one of the sequelæ and persistent vomiting the invariable symptom. This vomiting of course may be caused by sepsis, and if in any doubt it would be well to open the abdomen in the middle line and examine. These cases are more frequent than is generally supposed, and the only hope is early operation. Obstruction may come on a few days or weeks, or even a year, after the operation. I have seen and operated on cases at all these periods, and success has followed early operation.

Intussusception (Chronic).—Chronic intussusception is attended by a great mortality. Medicinal treatment is of little avail; opium and laxatives give temporary relief, and reduction has in rare cases been effected by inflation and enemata. The only means by which relief can be

hoped for when the foregoing measures have failed is abdominal section. If, when the abdomen is opened, the reduction cannot be accomplished, the whole mass ought to be excised and an artificial anus established.

In some cases in which the intussusception is low down and chronic, it may be temporarily relieved by the performance of a right inguinal colotomy.

Foreign Bodies.—The cases of obstruction caused by foreign bodies are not common. Gall stones are most frequently the foreign bodies found. Free doses of opium should be given, followed by aperients, and, when complete obstruction exists, laparotomy should be performed, the intestine incised, and the bowel returned with a Czerny-Lembert suture and the bowel returned. Gibson has collected 40 cases of gall stones which were operated upon because of the obstruction produced; of these 21 were fatal (57 per cent.). Lange²² reports a case of obstruction caused by impacted gall stones and general peritonitis. Laparotomy was performed, but the patient died in eight hours. Dr. H. F. Beam²⁴ relates a case of intestinal obstruction caused by a calculus in the ileum the size of a walnut; it could be felt through the abdominal walls. An incision was made over the spot and the calculus removed. The patient made a rapid recovery. In incising the intestine to remove a gall stone it is better not to incise directly over the stone, for at this point the intestine may be injured by pressure of the stone.

P. J. Wising,²⁵ in recognized cases of ileus from gall stone, recommends first the employment of purgatives; if these fail, then copious enemata of water. Simple enemata, he holds, are perfectly harmless, but those of an irritating character should be avoided. Opiates should be given, and the strength of the patient sustained by nutrient enemata. He does not advise early laparotomy, but says that, when everything else fails, it should be undertaken.

Faecal Accumulation.—Obstruction due to faecal accumulation is of occasional occurrence. The point of obstruction is generally in the rectum, which is filled with a hard, immovable mass, above which the bowel is much distended with semi-fluid faeces. The best means of relief are afforded by copious enemata of warm water administered in the knee-and-elbow position. Continuous irrigation by the siphon syringe is very efficacious, and, if employed for half an hour at a time, the hardest mass softens and gradually becomes disintegrated. The stream of water should be directed against the obstructing mass by means of a rectal tube. Before enemata are commenced it is often advisable to inject a few ounces of olive oil. Some physicians recommend copious injections of sweet oil with spirits of turpentine in the proportion of one drachm to the pint of oil. Metallic mercury was a favorite remedy with the old physicians, and has been strongly advocated by Matignon, of Paris. Occasionally, when low down, the faecal mass may be removed by scoop or spoon.

Colotomy has been performed in cases of obstruction due to faecal accumulation. In most of these cases, however, there has been a mistake in diagnosis. It can be only rarely required in faecal obstruction, and should not be resorted to till all other means of relief have failed.

Stricture.—The treatment of obstruction due to stricture is considered under Chronic Obstruction.

Francis J. Shepherd.

¹ British Medical Journal, April 18th, 1885.
² Intestinal Obstruction, p. 420.
³ American Journal of the Medical Sciences, January, 1886.
⁴ Lancet, December 13th, 1884, p. 1065.
⁵ J. K. Fowler: London Lancet, June 30th, 1883.
⁶ Bull. de Thérapie, May 15th, 1870.
⁷ London Lancet, vol. ii., 1885, p. 570.
⁸ Intestinal Obstruction, p. 449.
⁹ Annals of Surgery, vol. xxii., 1900.
¹⁰ British Med. Jour., August 24th, 1885.
¹¹ *Ibid.*
¹² See case of Mr. Lawson, London Lancet, vol. i., 1879, p. 87.
¹³ Gaz. Méd. de Paris, April 25th, 1886.
¹⁴ John Syer Bristowe, in Reynolds' System of Medicine, vol. iii., p. 89.
¹⁵ New York Medical Journal, February 20th, 1886.
¹⁶ Medico-Chirurgical Transactions, vol. lvii.
¹⁷ London Lancet, January 16th, 1886.
¹⁸ *Ibid.*, 1869, vol. ii., p. 609.

¹⁹ *Loc. cit.*
²⁰ Quoted in La Semaine Médicale, April 7th, 1886.
²¹ La Semaine Médicale, April 7th, 1886.
²² Fuller in New York Medical Record, October 14th, 1882.
²³ Medical News, January 16th, 1886.
²⁴ New York Medical Record, October 17th, 1885.
²⁵ Nord. Med. Ark., Bd. xvii., No. 18 (quoted in Centralblatt f. Chir., No. 20, 1886).

INTESTINAL SURGERY.—This field of surgical work differs slightly from others in certain essentials affecting natural repair of serous surfaces—and in the understanding of a few mechanical aids which are necessary to successful healing of intraperitoneal wounds.

The peritoneal cavity is so susceptible to contamination and so quick to yield fatal results if soiled, that it was considered a forbidden field of invasion prior to the present generation of surgeons. Through accumulated and vast experience, however, it has now become possible to deal with it with perfect safety if established principles are recognized.

First in importance is recognition of the fact that no solution should be used in the peritoneal cavity but boiled water, to which a little salt has been added (3 iss. to O ij.—“decinormal salt solution”). This is entirely non-irritating to a healthy peritoneum and, for an infected one, is mechanically cleansing as well as destructive to the life of colon bacilli. Considerable quantities of it may, under certain circumstances, be left in the cavity with advantage, and in any event with safety.

The second underlying principle—which applies here as elsewhere—is, that nothing but aseptic gauze pads are to be used for sponging, and that aseptic ligatures, instruments, and hands (preferably covered by rubber gloves, boiled and dry-sterilized and free from punctures) can be relied on to insure safe work.

The third principle covers the understanding of repair by lymph exudate, the process being peculiar to this field, and of the mechanical aids which the surgeon may employ to bring it about. Under the latter are included the use of suture material and various ingenious mechanisms.

The student will understand that under favorable circumstances a firm lymph or gluey exudate, which is a natural means for repair, is promptly thrown out and spread around and upon any wound of the peritoneum, either visceral or parietal. It often begins to appear, firm and available to hold surfaces together, within two hours. The usual time, however, when it may be expected to afford efficient support, is after at least six hours have elapsed. In some cases a still longer period—one or even two days—may be required. Such a protracted delay depends on the poor disease-resisting power of the patient (feeble leucocytosis?), or, in certain cases, on the solvent action of bacteria in excess.

The presence of mechanical substances, or of chemical irritants, provokes a quicker formation of an exudate. Thus, the suture thread is, if it is aseptic, speedily buried in firm lymph—the first step in nature's effort to incarcerate it as a foreign body.

If, however, an impure suture material is used, one will see the parts speedily fall asunder owing to the solvent action of bacterial secretions.

The best suture material, it is universally conceded, is fine silk, sterilized by boiling, and black by preference, so that each stitch may more easily catch the eye of the operator.

The best needle is the ordinary round one, though with care an operator may use any variety. For much of the careful work necessary, it is better to have also a sharp-pointed needle, curved one-third of a circle, which, while having cutting edges, has a flat surface on the convexity (like an eye needle), and is not more likely than a round one to wound small veins and produce subserous hematomata. The spear-pointed, or Hagedorn, needle often causes troublesome bleeding.

Thus, with simple expedients and a recognition of the few simple principles enumerated, one may accomplish all that skill can do in effecting the repair of peritoneal wounds.

A knowledge of certain stitches is essential to the technique of intestinal surgery. There are four varieties which deserve to be remembered, as they are competent to fulfil all the requirements of perfect work. These four methods, which are to be carried out on the peritoneal surface, are known as (1) the Lembert interrupted, (2) the Halsted interrupted, (3) the Lembert continuous, (4) the Cushing continuous.

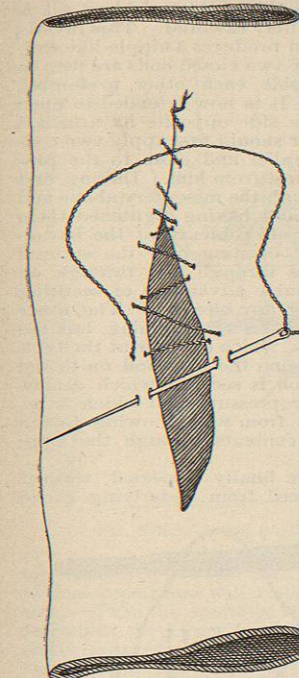


Fig. 2916.—Continuous Suture. (Lembert.)

When the edges of mucous membrane are to be united, a through-and-through stitch is now conceded to be the best. It was long regarded as essential that this stitch should penetrate only the mucous and submucous coats so as not to contaminate the peritoneal. Hence we hear of the Czerny-Lembert combined suture. But it was demonstrated many years ago by Gross and others that the stitch which penetrates all through each cut edge of united bowel secures them with inevitable firmness because it holds the fibrous layers of both, and no peritoneal contamination results because the bacteria follow the thread from one mucous surface through and out of the other, hence draining the puncture both ways.

It would be idle to say that many operators do not use other varieties of stitching—such as are depicted in all older works on surgery—but it is gratifying to find that those of largest experience are now agreed in using with confidence those just described. What one must have is absolute reliability coupled with simplicity.

The demonstration by Halsted that there is a tough subserous fibrous layer which resists the point of the needle more than any other layer in the intestinal wall, and which can be picked up and pierced reliably by the threaded needle, is a discovery of decided practical value in the treatment of intestinal wounds.

It is certainly true that if the needle unites only the peritoneal coats the stitch will inevitably tear away and leakage occur. If one stitch gives, the entire work is vitiated. A little experience soon enables the operator to penetrate and raise the right thickness of intestinal wall on the needle, though he must ever be alert to the fact that the bowel wall is extremely thin in some places and thick in others. Nevertheless, I believe it would be less perilous to the patient if the puncture went into the mucous coat than if only a feeble hold on the peritoneal layer allowed separation of the edges, because a very slow and insignificant contamination working along the thread toward the cavity of the peritoneum would probably be taken care of by a quick exudation of reparative lymph, whereas an escape of gas and fluid through the gap of a loosened suture might be confidently expected to excite a peritonitis.

There are few surgeons probably who would be satisfied to unite most wounds of the bowel with a single row of sutures. Hence, whether a through-and-through stitch of the bowel edge is employed, or one which pene-

trates only through the peritoneal coat, the operator usually reinforces it by a second row of stitches placed as close as possible to the first, thus not inverting so much as to narrow the lumen of the bowel. This second row of stitches are of either the interrupted or the continuous variety, and of either the Lembert, or the Halsted, or the Cushing type. My own preference is for the Halsted type, because I believe it to be more firm and enduring and because it requires half as many knots as the Lembert for a given line of repair.

The author is very strongly impressed, after much experience, with the value of the circular purse-string suture applied to the peritoneal surface and inverting such part as it is desired to close. A small punctured wound, for example, or, better still, the cut-off end of intestine—if it be desired to close it absolutely, as when lateral anastomosis is intended—can be best and quickest closed by a running stitch about the opening, applied to the peritoneal coat and tightened as the edge is inverted. The writer first used such a purse-string suture in 1884 in experiments upon animals, and he has since uniformly resorted to it in securing tubes in the alimentary canal for drainage or irrigation, or in closing small defects.

Before speaking of the various conditions under which intestinal surgery is demanded, we may well consider the various devices, more intricate than stitching, which are available and which have stood the test of active surgery during fifteen years past.

Thus, Jobert and Senn fastened a flat ring inside the end of the upper segment of the bowel by a few stitches inserted at its edge, and then, pushing this into the lower, inverted the latter so that two serous surfaces came together. When these were secured by a row of stitches uniting the two and keeping their surfaces in contact (throughout a width of one inch), the upper part discharged into the lower without leakage while union was taking place. Eventually the artificial ring was shed and discharged into the bowel.

This is a practical means of repair but lacks the neatness of other methods, owing to the necessary dragging in of some of the mesentery of the inverted bowel, thus affording chance of leakage unless most carefully guarded against. Moreover, it is contended that an intussusception thus initiated has a risk of progressing.

In the lateral implantation of small intestine into colon the procedure forms a satisfactory mode of repair.

Somewhat after the same idea is the much admired method of Maunsell, by which the two ends of bowel of the same calibre are united. In this method four silk

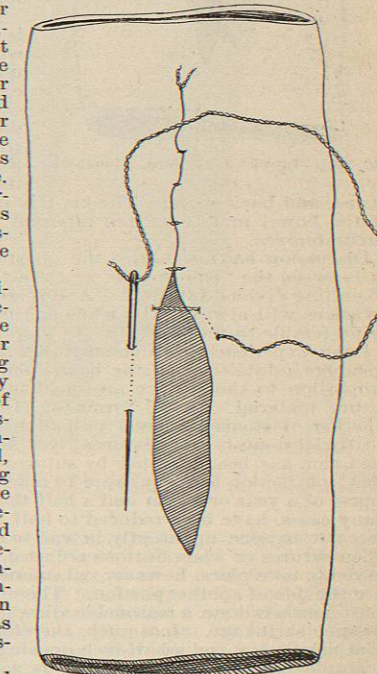


Fig. 2917.—Continuous Suture. (Cushing.)