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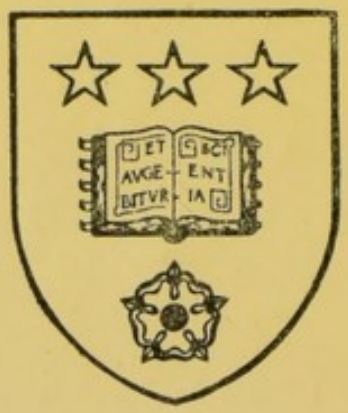
TEALE

ON

INTESTINAL FISTULA.



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AN ESSAY

ON

INTESTINAL FISTULA.

BY

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INTESTINAL FISTULA.

INTESTINAL FISTULA. Under the designation of *Intestinal Fistula* may be included all preternatural apertures whereby a communication is established between the interior of the intestines and the surface of the body. The term thus embraces the various maladies and abnormal conditions which have been named fecal fistula, artificial anus, accidental anus, and anal fistula. If the latter affection, which has already been separately considered, be excluded, intestinal fistula then becomes equivalent to "abnormal anus," of Dupuytren; and in this sense the term will be employed in the present article.

This affection may result from accidental injuries and diseases of the intestines, and from surgical operation. To all its varieties, the term *artificial anus* has, in this country, been indiscriminately extended, although it is strictly applicable to such fecal fistulæ only as are designedly established by the surgeon.

We propose to treat the different branches of the subject in the following order :—

I.—Intestinal Fistula consequent upon Gangrenous Hernia.

When a strangulated hernia is abandoned entirely to the resources of nature, a powerful and occasionally successful effort is made to relieve the obstruction of the intestines. The protruded part mortifies; and, if the powers of the constitution are equal to the task, the skin and the other investments ulcerate, the dead portion of intestine is cast off, and the feces escape. That nature unassisted is sometimes capable of accomplishing this process, the following case, admitted into Guy's Hospital[1], sufficiently proves. A female, aged sixty, for many years had been subject to femoral hernia, which became strangulated; pain in the abdomen, sickness, and vomiting, continued for two or three days, and then ceased; the tumour inflamed, and gradually increased in size until the ninth day, when, the integuments having ulcerated, the feces began to escape from the groin; in this condition she was admitted into the hospital. The experience of many surgeons can supply similar evidence. It is, nevertheless, rare to find the natural efforts capable of completing the process; and more frequently the patient sinks exhausted, unless relief is obtained from surgical interference.

When, however, the intestinal contents have been evacuated, either spontaneously or by art, through an abnormal opening in the abdominal walls, the natural powers are also frequently capable of restoring the continuity of the alimentary canal, and of ultimately closing the external opening.

The various means which thus conduce to the spontaneous relief of the serious consequences of obstruction and stricture in strangulated hernia, require now to be separately considered.

Spontaneous cure.—Highly important in the restorative operations of nature, is the provision whereby the separation of a gangrenous part of the body is generally preceded and accompanied by the adhesive process. This principle is beautifully exemplified in the subject now under consideration. When a hernial portion of intestine loses its vitality from strangulation, the living parts of the tube

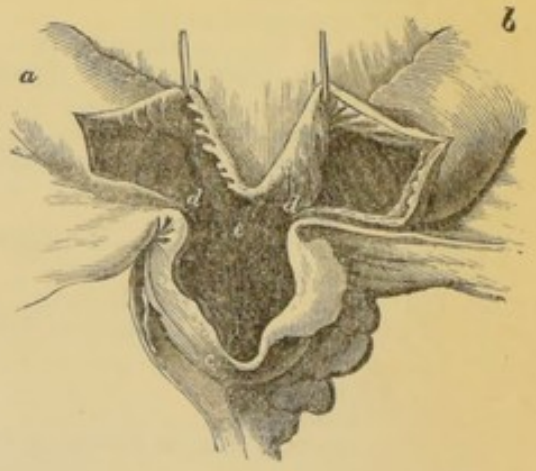
[1] Sir Astley Cooper, on the Anat. and Surg. Treatment of Abdominal Hernia. 2nd Edit. part ii. p. 18.

bordering upon the gangrenous portion, contract adhesions with the neck of the sac and neighbouring peritoneum. The edges of the opening in the intestine are thus united through the medium of the neck of the sac, to the aperture in the abdominal walls, and a barrier is thereby opposed to the effusion of the intestinal contents into the abdomen. Thus the sac, opened by ulceration or the knife, forms a canal, continuous with the interior of the intestine, which allows the transit of feculent and alimentary matters from the latter to the surface of the body. In process of time, these newly adherent parts become, as it were, cicatrized; and the serous membrane of the sac appears continuous, on the one hand with the skin, and on the other with the lining membrane of the intestine, assuming, in function at least, some of the characters of a mucous membrane. Hence, in the treatment of gangrenous hernia, it is of the utmost importance to avoid disturbing the adhesions which are in process of formation, and which tend so materially to secure the future safety of the patient.

If the gangrene involve only a small portion of the calibre of the intestine, the alimentary contents escape only in part through the sac, the remainder pursuing its natural course. When a larger portion of the tube, or an entire loop is removed, the whole of the contents usually, for some time, escape by the wound; but after a period, varying from a few days to several weeks, small quantities of feculent matter begin to pass by the anus; by degrees these natural discharges increase, and in the same ratio the evacuations from the wound diminish. It was formerly supposed that, when the intestinal contents were thus resuming their natural course, the two open extremities of the intestine became gradually turned towards each other, and at last were so opposed that the feculent matter passed directly from the superior into the inferior portion of the canal. The fallacy of this opinion has been ably exposed by Scarpa [1], who has shown that the apertures of the intestine which has been divided by gangrene, are "constantly placed in a parallel line to each other;" that the superior orifice is always kept in a state of dilatation by the passage of feculent matters; and that it is likewise pushed outwards, or towards the wound, whilst the lower aperture has a constant tendency to diminish in size, and to retire within the cavity of the abdomen. The contraction of the external wound exerts no influence whatever in producing a movement of approximation of the two orifices; on the contrary, Scarpa has proved, by the dissection of the following cases, that it is a totally different process whereby restoration of the canal is accomplished.

A man [2], twenty-two years of age, was brought into the hospital at Pavia with hernia of the tunica vaginalis of the left side. On opening the tumour, it was found to contain a small portion of omentum, and a long loop of gangrenous ileum, which was cut away after the stricture had been divided. The feces escaped from the wound, and the sloughs separated. On the fourteenth day the feces began to pass in part by the anus. On the twenty-fourth and twenty-fifth days, the patient, in consequence of irregularity in diet, was attacked by violent colic, which returned on the thirty-first day, when the wound dilated, and allowed of the discharge of a great quantity of feculent matter and several intestinal worms. On the forty-second day, the wound was nearly cicatrized, and there were only discharged from it a few drops of feculent matter. In nine months, after eating immoderately of cray-fish, imperfectly cleansed of their shells, he was again attacked with severe pains in the bowels, and in a short time died. On the body being opened, there appeared in the abdomen a copious effusion of fluid feculent matter, which had escaped from a perforation of the ileum, through which some shells of cray-fish were seen hanging into the abdomen. The diameter of the ileum, for a considerable extent towards the stomach, was three times greater than natural; the lower portion of this intestine was evidently contracted, and its orifice drawn more inwards than that of the upper portion. The two divided portions of intestine *met together at an acute angle* opposite to the abdominal ring. The angle of union was firm and compact, and still more so from the omentum being placed over the part and adherent to it. The corresponding portion of mesentery was also thicker and firmer than usual. After having removed the parts from the body, Scarpa found that the peritoneum in the neighbour-

Fig. 1.



Membranous funnel formed by the hernial sac.

a, Upper portion of intestine.
b, Lower portion of intestine.
c, Hernial sac.
d, d, Edges of the opening in the intestine adherent to the neck of the sac.
e, Projecting ridge.

[1] Treatise on Hernia, translated by Wishart, p. 299.
[2] Op. citat. p. 300.

hood of the ring was adherent to the portion of the intestinal tube which had been unaffected by the gangrene, and that it extended like a *membranous funnel* from the cavity of the abdomen through the aponeurotic ring into the fistulous tube which opened externally at the groin. There could be no doubt that this membranous cavity extending through the inguinal canal, was the same which previously formed the hernial sac, since it was evidently a prolongation of the great membranous bag containing the viscera. On laying open the ileum near to the mesentery, a probe was introduced into the small aperture in the groin, as far as the membranous funnel, and from thence into the superior portion of intestine. Scarpa thereby ascertained the direct way which the feculent matter had taken when it was discharged from the wound. He then divided longitudinally the external fistulous canal and the membranous funnel, and saw distinctly that "the two orifices of the intestine had remained in a direction parallel to each other, and without being at all turned towards each other, and that a *ridge projected* between them which alone would have been sufficient to prevent the direct entrance of the feculent matter from the superior into the inferior orifice. Therefore, as in this patient there was no doubt that after the fourteenth day the feces had begun to resume their natural course, it was not difficult to comprehend that the alimentary matters had been poured from the superior orifice of the intestine, first into the membranous funnel formed by the remains of the neck of the hernial sac, then from this by a half circle into the inferior orifice of the intestine. And it was precisely within this half circle of the membranous funnel that the shells and claws of the crayfish had been accumulated, and, by obstructing the communication between the two orifices of the intestine, had occasioned the rupture of the ileum above the union of this intestine with the remains of the neck of the hernial sac."

He also [1] met with a similar arrangement of the parts in examining the body of a woman, who, for several years, had a fistulous opening in the groin, in consequence of a gangrenous femoral hernia. The protrusion appeared to have been small, implicating only a part of the cylinder of the intestine. In this instance the two orifices were united at an obtuse angle, and were, as in the former case, "surrounded by, and included in, a membranous funnel, formed by the peritoneum, or the remains of the hernial sac." Water injected down the upper portion of intestine, met with considerable resistance in its passage; and, precisely at the angle of union of the two portions of intestine, the injected fluid was observed to make a half circle within the femoral arch, and to distend the integuments at the groin before entering the lower orifice of the intestine. Scarpa observes, that nothing could be more evident, than that the great peritoneal sac, containing the abdominal viscera, extended under the femoral arch to form the membranous funnel, of which the base included the two orifices of the intestine, and the apex was lost in the narrow fistulous tube remaining in the bend of the thigh. On dividing longitudinally the fistulous tube and the membranous funnel, the two orifices of the intestine appeared, still more distinctly than before, to be united together laterally, at an obtuse angle, in such a manner that the inferior orifice was placed a little more behind, and lower than the superior. The ridge projecting between the two orifices was neither so complete nor so prominent as in the subject of the preceding observation, nor such as to intercept all direct communication between the superior and the inferior portions of the ileum. But this direct passage was so narrow, that even pure water forcibly injected, rather than dilate the contracted passage, descended from the superior orifice into the membranous funnel, then turned back round the femoral arch, and afterwards entered into the lower orifice of the ileum.

Mr. Travers [1] has also shown by experiment, that "the peritoneal surface is essential to the restoration of an intestine, of which a part has been disorganized by stricture."

From these observations it is evident, that the continuity of the intestinal canal is not restored by a direct union of the divided portions of intestine, but indirectly through the medium of the hernial sac; that the sac constitutes a funnel-shaped membrane, embracing the two openings of the intestine by its base, and prolonged by its apex through the aponeurotic opening of the abdominal wall into the fistulous canal in the integuments; and that the feculent and alimentary matters are first poured from the upper portion of the intestine into the membranous funnel, and thence into the lower orifice of the intestine; and that the two divided portions of intestine unite at an angle, which forms a valvular ridge or projection, and more or less completely obstructs the direct passage of the intestinal contents from the upper to the lower portion of the tube.

As the process of restoration advances, the divided portions of intestine, the angular projection, and the adherent neck of the sac, become gradually retracted within the abdomen, and the injured portion of intestine regains a certain degree of mobility. In one of the cases, examined by Scarpa [2] several years after the operation for hernia, the orifices of the intestine, with the neck of the sac adherent, were drawn several lines from the femoral arch; and Dupuytren [3] states that he has found the intestine loose in the abdominal cavity, and not directly adherent to the walls,

[1] Op. citat. p. 305.

[1] Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 358.

[2] Op. citat. p. 306.

[3] Dictionnaire de Médecine et de Chirurgie Pratiques; art. Anus Anormal, tom. iii. p. 139.

but connected to them by a fibro-cellular cord, which constituted the sole remnant of the adhesions formerly uniting them.

Various agents are supposed to assist in producing this retraction. The intestinal contents in passing over the projecting ridge act upon it, and gradually diminish its prominence, pushing it back with a force proportioned to the resistance which they experience to their escape through the narrow wound in the abdomen. The peristaltic movements, and the more extensive undulations of the entire canal, are supposed by M. Dupuytren [1] to contribute to the loosening and elongation of the adhesions, which connect the opened part of the intestine to the surface of the cavity. A third circumstance, even more powerful than the former, co-operates with them in producing these effects. The mesentery connected with the opened portion of intestine is stretched and thrown into folds between its lumbar attachment and the bowel. In many herniæ this extension of the mesentery is so considerable as to keep the body bent forwards; and in abnormal anus, this mesenteric cord is constantly drawing the intestine towards the cavity. The following case, observed by M. Wedemeyer [2], exhibits another agent which may occasionally tend to produce the same effect. A female had femoral hernia, followed by fecal discharge from the groin. After various means of cure had been tried in vain, the opening spontaneously closed during utero-gestation. As the uterus ascended in the abdomen, the escape of matters from the accidental opening diminished, and there was a corresponding increase of natural evacuations.

As the intestine becomes retracted within the abdomen, the adherent neck of the sac is drawn with it; and the funnel-shaped cavity which it now constitutes, and which separates the ridge from the opening in the walls, is extended. Thus the intestinal contents find, in front of the ridge, a space gradually becoming larger, through which they have a more easy passage from the upper to the lower part of the intestine; they are at the same time directed with less force towards the external opening, and thus allow the wound of the integuments to contract and ultimately to close.

The following table exhibits eleven recorded cases, taken indiscriminately, in which the feculent discharge following gangrenous hernia spontaneously ceased. In eight of these cases, the time when the cessation occurred is specified, and is found to vary from thirteen to seventy days; or, on the average, to be thirty-nine days. Some further lapse of time was requisite for the perfect cicatrization of the wound.

The quantity of intestine destroyed is not in all the cases noted; but in some of them the gangrene must have implicated a few inches of the tube; and in the instance related by Scarpa a long loop of intestine was lost.

[1] Op. citat. p. 137.

[2] Dict. de Méd. et de Chir. Prat. t. iii. p. 133.

Table exhibiting eleven cases in which the feculent discharge following gangrenous hernia spontaneously ceased.

REFERENCE.	EXTENT OF INTESTINE DESTROYED.	DURATION OF FECULENT DISCHARGE.
PETIT. Tract. des Méd. & Chir. p. 299.	Incision 1 inch in the mortified intestine.	In 13 days feces ceased to pass by the wound.
GOOCH. Works, vol. ii. p. 197.	Incision 2 or 3 inches long in the mortified intestine.	In 10 weeks feces ceased to pass by the wound.
TRAVERS Inquiry, &c. p. 317.	Free opening made in the mortified gut.	Feces generally took their natural course in 6 weeks, and in 11 weeks the wound was healed.
SCARPA. Wishart's Tr. p. 301.	Long loop of sphacelated ileum cut away.	On the 42d day the wound was nearly cicatrized.
PETIT. Traité des Méd. Chir. p. 317.	Intestine and scrotum gangrenous. Free incision.	Feces ceased to pass by the wound on the 28th day.
PETIT. Traité des Méd. Chir. p. 321.	Intestine freely opened by gangrene.	On 19th day feces ceased to pass by the wound, which was nearly healed on the 22d day.
LOUIS. Mém. de l' Acad. de Chir. t. iii. p. 199.	Intestine and integuments extremely gangrenous.	Fecal discharge from the wound ceased in 1 month.
POUSARDIN. Mém. de l' Acad. de Chir. t. iii. p. 203.	Intestine gangrenous; integuments opened by ulceration.	Fecal discharge ceased in 6 weeks.
POUSARDIN. Mém. de l' Acad. de Chir. t. iii. p. 203.	Intestine gangrenous; sac filled with feculent matter.	Fecal discharge ceased in 2 months and a half.
LANZONI. Mém. de l' Acad. de Chir. t. iii. p. 204.	Small loop of intestine gangrenous.	Wound cicatrized in 20 days.
COOPER. 2d edit. p. 572.	Incision 1½ inch long in gangrenous intestine.	Wound healed in 11 weeks.

In operating for strangulated hernia, the surgeon occasionally observes the intestine to be congested or inflamed, but in such a degree as not to preclude the hope of its resuming a healthy condition. He returns the bowel into the abdomen, and, in a few days, feculent matter appears at the wound. After a time the discharge of feces generally ceases, and the wound cicatrizes. The subjoined table exhibits seven cases of this description. In six the discharge appeared at the wound at periods varying from the third to the fifteenth day, or, on the average, on the eighth day; and in one instance it did not occur until the forty-second day. In four the discharge continued only from three to twenty-one days; in one seventy-seven days; and in the case where the discharge first appeared

on the forty-second day death occurred ten days afterwards. The duration of the discharge in these cases is, as might be expected, considerably less than in those of the former table, in which the destruction of intestine was more considerable.

Cases of fecal fistula subsequent to the return of the intestine into the abdomen.

REFERENCE.	TIME WHEN THE FECAL DISCHARGE COMMENCED.	DURATION OF FECAL DISCHARGE.
Sir A. Cooper 2d edit. pt. i. p. 47.	10th day after operation.	Wound healed in 11 weeks.
Cooper. ditto.	15th day after operation.	Feculent discharge ceased in three weeks.
Cooper. ditto.	5th day.	Feces escaped only during 3 days.
Key. Memoir, p. 112.	3d day.	Discharge of feces continued 5 days.
Key. ditto.	4th day.	In 16 days the wound had closed.
Lawrence. 5th edit. p. 328.	42d day.	Death 10 days after.
Le Dran. Lawrence, p. 350.	11th day.	Patient recovered.

Failure of Spontaneous Cure.—The restorative operations described above may be interrupted in different stages of their progress, by imperfection, or disturbance of the adhesive process—by insufficient retraction of the valvular projection—or by premature closure of the external wound.

The adhesive process may fail from defective deposition of organizable lymph; it may be disturbed by the officious hand of the surgeon; and Dupuytren has known the newly-formed adhesions [1] to be destroyed by the dragging of the mesentery being excessive. The injurious consequences of failure or disturbance of the adhesive stage, are fatal feculent effusions into the peritoneum.

The retraction of the divided portion of the intestine, and of the intermediate projecting valve, is sometimes insufficient to allow of the continuity of the intestinal tube being restored. This incomplete retraction may result from defective operation of those causes which have been shown to obviate or overcome the resistance afforded by the projecting valve. Thus, the pressure of the intestinal contents against the valve may be defective, from the large size of the external aperture permitting their unopposed escape. The retractive influence of the mesentery may be deficient, from the long and relaxed condition of this structure; or it may be counteracted by the injudicious employment of ligatures, for the purpose of confining the divided extremities of intestine to the neighbourhood of the wound. The ligature is in this case not only injurious from opposing the retraction of the mesentery, but also from dragging it outwards, and thereby increasing the prominence of the projecting ridge. It may also be the cause of subsequent mischief, by producing more extensive adhesions than are necessary for the mere prevention of feculent effusion. From incomplete retraction of the projecting ridge, the tendency to permanent fecal fistula is greatly increased.

Premature closure of the external wound may produce intestinal obstruction, feculent effusion into the peritoneum, or infiltration of feces in the integuments, followed by abscesses and sinuses. It is, therefore, important that the surgeon should not be too solicitous to close the external wound, by pressure or other means, until he has reason to believe that the contents of the alimentary canal have acquired an easy transit from the upper to the lower part of the intestine. From premature contraction of the external wound symptoms may be produced not unlike those which attend strangulated hernia [1]. The patient from this cause may be attacked with acute pain in the situation of the fistula, tension of the abdomen, vomiting, hiccup, and general prostration of strength; and if relief be not obtained, rupture of the intestine, feculent effusion, and death may follow.

II.—Intestinal Fistula from Abscess.

Various hard substances introduced into the intestines, are capable of exciting irritation in the coats of the bowel, and of giving rise to abscess. The ulcerative process, whereby the matter gradually makes its way towards the surface, is usually preceded and accompanied by a process of adhesion. The peritoneal coat of the intestine, before being opened by ulceration, is thus agglutinated to the abdominal walls, and effusion of feculent matter into the bag of the peritoneum is prevented.

These abscesses are generally indolent in their course. They are usually preceded by a dull fixed pain in some part of the abdomen, attacks of colic, and various disturbed conditions of the digestive functions. The seat of pain becomes firm and unyielding; at length a well-defined tumour may be felt; the integuments assume a dull red colour; obscure fluctuation is perceptible; and the abscess, opening upon the surface of the body, discharges pus, feculent matter, and occasionally the extraneous body, which originally excited the mischief. In this manner fecal fistula is ultimately established.

The following cases will serve to illustrate the usual course of this affection:—

A boy [2], aged thirteen years, was admitted into St. Thomas's hospital, with an irreducible scrotal hernia, which was continually discharging feculent matter through a small opening in the scrotum. He remembered having accidentally swallowed a pin, and that five

[1] Dict. de Méd. et de Chir. Pr. t. iii. p. 137.

[1] See Scarpa, Op. citat. p. 342.

[2] Cooper, part i. p. 25.

weeks afterwards his hernia began to swell, and to become painful. An abscess formed, which soon burst, and the point of a pin appeared projecting from the orifice. The pin was extracted, but the fistulous opening remained. Attempts were made to unite it, by paring the edges of the wound, and encouraging adhesion, but without success.

A woman, fifty-eight years of age, was treated by M. Bougon[1] for an inflammatory tumour of the right iliac region, which had existed fifteen days. The swelling broke, and discharged fetid pus, air, mucus, and feces; subsequently a portion of bone, supposed to have belonged to the head of a fish, was discharged. On the forty-third day the opening had spontaneously closed. See FOREIGN BODIES.

A scrofulous girl was admitted into the hospital La Pitié, under the care of M. Velpeau, on account of a fecal discharge from the navel, following an inflammatory swelling at the part which had been opened. She died of phthisis about ten weeks after the occurrence of the discharge from the wound. During the whole of this period she had evacuations by the natural passage, and some discharge from the wound; a sinus near an inch in length was found to communicate with the intestine, and no obstruction existed in the canal.

M. Velpeau[2] also relates the case of a youth of seventeen, who had for several months been under the care of M. Louis for symptoms of intestinal ulceration. An abscess formed, which was followed by a fistulous ulcer below the navel, from which feculent matter was discharged. "The discharge of feces by the natural passage had never been completely interrupted. The health in other respects was good. M. Velpeau opened a long sinus which led to the right iliac fossa, and was thus enabled to introduce the finger into the bowel, which he concluded to be the cœcum or ascending colon." Fluid injected as clyster, as well as articles of food, soon appeared at the abnormal opening; but when the aperture was closed by a compress, the motions were passed naturally. Repeated efforts were made to close the opening by suture, simple and twisted, and thrice by autoplasty, but without success. A valve, felt at the opening, was destroyed by the enterotome of Dupuytren, without any better result.

On comparing intestinal fistula from abscess with the same affection following gangrenous hernia, it appears that these affections resemble each other in the accompanying adhesive process, whereby feculent effusion into the peritoneum is generally prevented; but fistula from abscess differs from the other variety of the affection in the absence of the membranous funnel, which has been shown to perform so important a part in restoring the continuity of the intestinal canal, when more or less of this tube has been destroyed by gangrene. In fistula following abscess, this provision is not required; for the loss of substance in the intestinal walls is seldom so great as materially to interfere with the dimensions of the canal. Hence the obstruction from the projecting valve, and the subsequent necessity for retraction of the intestine and the valve, to which process the membranous funnel was subservient, does not usually exist. Notwithstanding this comparative immunity from obstruction of the canal, a cure, either spontaneous or artificial, does not appear to be so generally accomplished in this variety of fecal fistula, as in that which results from gangrenous hernia.

[1] Journal Hebdomadaire, Juillet, 1836.

[2] Journal Hebdomadaire, Juillet, 1836, quoted by Mr. Lawrence in his Treatise on Ruptures, p. 427, 5th edit.

III.—Intestinal Fistula following penetrating Wounds of the Abdomen.

Wounds penetrating the abdominal walls, and implicating the intestines, are occasionally, but not generally, followed by escape of feces. The circumstances under which the wounded intestine discharges its contents by an abnormal aperture, are so variable, that it will tend much to the elucidation of the subject, if we separately consider fecal fistula as a consequence of

(i.) *Incised*[1] *wounds of the abdomen.*
  a. Without protrusion of the bowel.
  b. With protrusion of the bowel.
(ii.) *Gunshot wounds.*

Fecal Fistula from incised Wounds unattended with Protrusion of the Bowel.—It has been shown by Mr. Travers that feculent effusion into the peritoneum is a very rare consequence of punctured and incised wounds of the abdomen; and so also an external discharge of the intestinal contents is not the usual, but only the occasional, result of such injuries.

Internal effusion is prevented by the pressure which the respiratory muscles exercise upon the abdominal viscera, aided by the mechanical closure of the wound in the intestine, from eversion of its mucous membrane, and contraction of its muscular fibres. These agents are effectual, unless the wound be large, and the intestine loaded, or there be an interposed fluid in the peritoneum[2]. The same causes also prevent the escape of alimentary matters from the external wound, unless the opening in the intestine remain in direct apposition with the breach in the abdominal walls, when the intestinal contents usually escape, without insinuating themselves into the divided peritoneum. When, however, fecal discharge occurs, the adhesive process in a few hours agglutinates the edges of the intestinal and parietal wounds; the peritoneal cavity is closed; and the intestinal contents

[1] "Incised" is here employed to designate wounds inflicted by cutting instruments, as distinguished from those produced by fire-arms. It therefore applies to such wounds as are technically denominated "punctured," as well as to those usually denominated "incised."

[2] See Travers' Inquiry, p. 136.

continue to escape more or less freely by the external opening. From this feculent discharge much temporary relief is obtained ; and in consequence thereof, the inflammation and tension of the abdomen are usually less severe than when the wounds of the intestine have been unattended by an external discharge of fecal matter. After a few days, under favourable circumstances, the inflammatory symptoms gradually subside ; the wound granulates ; in proportion as the intestine resumes its natural functions the abnormal discharge diminishes ; and, in most instances, when life has not been destroyed during the early inflammatory stage, the wound in a few weeks is permanently closed.

The following table exhibits the leading peculiarities of five cases of incised wounds of the abdomen, unattended with protrusion of the intestine, but followed by fecal discharge.

Cases of incised wounds of the abdomen, attended with fecal discharge, but without protrusion of the bowel.

Stalp. Vander-wiel. Cent. ii. Obs. 25.	Colon wounded with a knife; fecal discharge.	In 3 weeks the wound was healed.
Frouman-tin. Mém. de l' Acad. de Chir. t. i.	Sword wound below the navel; fecal discharge from the colon on the 8th day.	By the 19th day a perfect cure was accomplished.
Ronaldson. Duncan's Med. Comment. vol. vii. 1780.	Stabbed with a knife; colon wounded; fecal discharge.	Completely cured in five weeks.
Fournier. Journal de Chir. t. iii. 1792.	Deeply wounded between the last ribs by a knife; feculent discharge.	The wound was firmly cicatrized on the 50th day.
Louis. Mém. de l' Acad. de Chir. t. iii.	Abdomen transfixed in single combat; fecal discharge from two orifices, one supposed to communicate with the ileum, the other with the colon.	Wounds cicatrized in less than two months.

Fecal discharge from incised wounds attended with protrusion of the bowel.

Protrusion of the intestine is a serious complication of all penetrating wounds ; but even when combined with this unfavourable occurrence, incised wounds attended with fecal discharge, may terminate favourably, without permanent fistula being established.

By referring to the following table, which exhibits the leading features of eight cases of fecal fistula, following incised wounds, complicated with protrusion, it will be seen that in six the escape of feces was not permanent.

This favourable result was obtained by placing these injuries, as nearly as circumstances would allow, in the same condition as those already noticed, in which the wound was unaccompanied by protrusion. Thus in four instances the protruded and injured intestine was simply returned into the abdomen ; and it is highly important to observe that the wound in the intestine, without any aid from ligature, remained in direct apposition or in close proximity to the external opening ; hence, the free discharge of the intestinal contents. It is also equally interesting to notice, that fecal effusion into the opened cavity of the peritoneum did not occur. In the other two cases, which terminated without permanent fistula, the wound in the intestine was accurately closed by suture, and the protruded part afterwards replaced. In all these favourable cases it is evident, that in the process of repair, the capacity of the intestinal canal was not materially diminished ; consequently when the early inflammatory symptoms had subsided, the natural functions of the bowels were restored, and the abnormal aperture soon spontaneously closed.

The result, however, is widely different, when, from the bowel being extensively wounded, or completely divided, the mutilated part must of necessity assume an angular disposition. The projecting valve, attendant upon this arrangement, obstructs the course of the intestinal contents, and determines their escape by the wound. Two such instances are exhibited in the table, and, in both, permanent intestinal fistula was established. But it has been already shown that much larger portions of intestine have been detached in gangrenous hernia, and yet the natural reparative powers were sufficient to restore the continuity of the canal ; whereas, in similar injuries of the intestine in connection with wounds of the abdominal walls, as in the two cases by Albinus and Moscati, the natural powers were totally inadequate to the task. The failure of restoration under such circumstances is, with great propriety, attributed by Scarpa to the absence of the membranous funnel, which has been shown to perform a most important part in restoring the continuity of the canal after a hernial portion of intestine has been divided by gangrene.

Cases of incised wounds of the abdomen attended with protrusion of the bowel and fecal discharge.

Tulpius. Obs. Med. l. 3, c. 20.	Colon wounded and protruded; after exposure for thirty hours it was reduced, and feces escaped by the wound.	Recovery.
Hollerius. Obs. ad Cons. Curandi, p. 17.	Abdomen wounded by a small sword; protrusion of part of small and large intestines; intestine returned; fecal discharge.	Recovery.

Nourse. Travers' Inquiry, &c., p. 163.	Wound of the abdominal walls three inches in length; half of the intestinal canal protruded; wound detached; intestine returned; fecal discharge on the third day; external wound sloughed extensively, so as to expose the colon, in which was an opening allowing the feces to escape.	Healed by a tedious process of granulation.
Travers. Phil. Trans. vol. 50, p. 35.	Twelve inches of small intestine protruded through a small wound in the abdominal wall; a wound in the intestine which was closed by an uninterrupted suture; the intestine afterwards reduced, and the external wound sewed.	Recovery in six weeks.
Glendorpius. Spec. Chirurg. obs. 33 & 34.	Colon wounded; feces discharged; wound of intestine closed by the glover's suture.	Recovery.
Albinus. Annot. Acad. lib. ii. cap. 8.	Wound below the left ribs; discharge of aliment on following day; wound dilated until it exceeded a span in length; copious discharge of feces.	Permanent intestinal fistula, with double prolapse.
Scarpa. Wishart's Trans. p. 358.	Abdomen wounded; small intestine protruded, and perforated incautiously by a surgeon pushing it back with the point of a spindle; fecal discharge for a length of time.	Spontaneous cure.
Moscati. Mém. de l'Acad. de Chir. t. 8.	Abdomen wounded by a knife; three feet of intestine protruded, and gangrenous from being strangulated by the parietal wound; free discharge of feces on the fifth day.	Permanent intestinal fistula.

Fecal fistula from gun-shot wound.—Wounds of the intestines inflicted by fire-arms, as well as those produced by sharp instruments, are not necessarily attended with fecal effusion into the peritoneum, nor with an external escape of feculent matter. When, however, fecal discharge follows injuries by fire-arms, it may occur either immediately after their infliction, or not until several days have elapsed; in which case it is presumed that the intestine in the first instance had not been wounded, but only contused; and that the discharge occurred after a gangrenous slough had been detached. This explanation is only applicable to such openings in the bowel as are in immediate proximity to the external wound; for when the gangrenous portion of intestine is not in direct communication with the wound in the abdominal walls, there is usually no escape of feces; the separated slough falls into the intestinal canal, and is cast off by the natural passage, the breach in the intestine being repaired by a peritoneal surface, borrowed from the contiguous intestine, omentum, or abdominal wall.

The following table, which exhibits the leading characters and result of ten cases of fecal discharge from injuries of the intestines by fire-arms, shews that in a very large proportion of such cases the discharge is only temporary, since it ceased altogether in eight of the ten cases. From the successful issue of these injuries it may be inferred that the intestine had not been much reduced in capacity. Therefore the alimentary and fecal matters experienced but little interruption to their natural course, and consequently the discharge from the wound soon ceased. When, however, the injury causes complete division of the intestine, the wounded tube becomes united at an angle more or less acute; an impediment to the course of the intestinal contents is thus produced, which determines their permanent exit by the external wound. The table exhibits two instances in which permanent intestinal fistula was in this manner established. The case by Dessault was accompanied by protrusion, and complete division of the intestine; and that by Larrey exhibited a similar condition, and other complications. In both cases, in consequence of the absence of the membranous funnel, and the retraction of the divided extremities of the intestine which this structure has been shown to promote, the natural powers of reparation were inadequate to the task of restoring the continuity of the canal.

Cases of gun-shot wounds of the abdomen followed by fecal discharge.

Belloste. Chir. d'Hopital, p. 3, c. xv.	Gun-shot wound of abdomen; extensive laceration of colon; escape of feces.	In two months spontaneously cured.
Rey. Mém. de l'Acad. de Chir. t. ii. p. 364. edit. 1819.	Gun-shot wound; escape of feces on the twentieth day.	Perfect cure in six weeks.
Gerard. Mém. de l'Acad. de Chir. t. ii. p. 364.	Gun-shot wound traversing the abdomen; colon wounded; feces discharged from two openings.	Wounds cicatrized in thirty-five days.
Hunter. Treatise on the blood and inflammation, p. 551.	Three balls entered the abdomen at the left of the navel, and passed out near the first lumbar vertebra; feculent discharge occurred in the third week.	The discharge of feces soon ceased, and the wounds healed favourably.

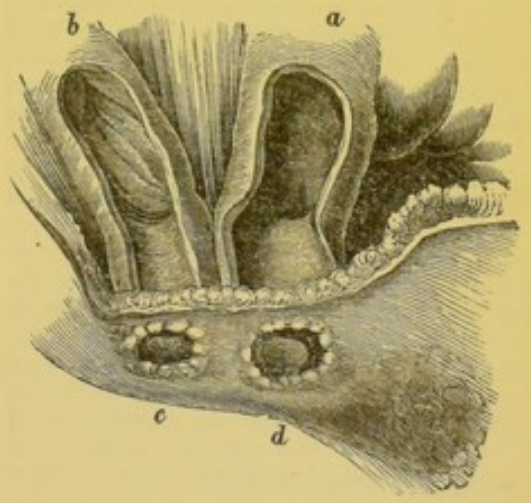
Poneyes. Mém. de l'Acad. de Chir. t. ii. p. 354. Edit. of 1819.	Gun-shot wound; fecal discharge on the following day.	Fecal discharge ceased entirely in a few days.
Desault. Œuv. Chir. t. ii. p. 370.	Wounded by the bursting of a bomb; one inch of intestine protruded, divided, and afterwards retracted within the abdomen; free discharge of feces.	Intestinal fistula with prolapse for four years; cured by the use of the linen tent.
Larrey. Relat. Chir. de l'Armée d'Orient. p. 300.	Gun-shot wound of abdomen; ileum divided by the ball, and the extremities of the gut drawn apart from each other, prolapsed, and strictured by the wound; wound dilated; the divided extremities brought together, and left within the wound.	In two months there was intestinal fistula, which was cured by the use of Desault's tent in two months afterwards.
Hennen. Observations on Military Surgery, p. 441.	Severe contusions of the abdomen from the splinter of a shell. The contused parts sloughed on the sixth day, after which the feces entirely passed by the opening thus produced.	In three months the feces first began in part to take their natural course. In six months the wound was so far reduced in size as to be scarcely perceptible, no feces issuing from it.
Hennen. op. citat. p. 443.	Wound from a musket-ball which entered at the right groin, and escaped at the back part of the pelvis on the left side. Soon afterwards clotted blood and feces passed by the anus, and excrementitious matter and flatus escaped from both wounds.	In five weeks the feces ceased to escape from the posterior orifice, which soon after closed. In eleven weeks the anterior orifice had also closed; after which the posterior wound opened three successive times, and discharged feculent matter, but soon closed.
Hennen. op. citat. p. 445.	Wound with musket ball which passed obliquely thro' the long head of the left triceps adductor, traversed the pelvis below the bladder, wounded the rectum, and escaped through the inferior portion of the os ilii. For eight days the feces passed entirely by the anterior wound.	On the ninth day the feces passed partly by the natural course. On the thirty-first the posterior orifice had healed, and the anterior wound was assuming a more healthy character. On the sixty-third day, all the feces took their natural course, and the anterior wound was cicatrized.

IV. Anatomical Characters of Intestinal Fistula.

When the natural efforts fail in restoring the continuity of the intestinal canal, if life be preserved, permanent fecal fistula, or abnormal anus, is produced. In this condition, the intestinal contents may escape entirely, or in part by the accidental opening; or the aperture may be so small as only to allow of the occasional discharge of liquid feculent matter, or a little mucus. The discharge from the adventitious opening is always involuntary, as there is not a sphincter muscle to control it. The aperture is generally rounded, sometimes irregular, varying considerably in size, being sometimes an inch or more in diameter, and occasionally so small as scarcely to admit a probe.

The following drawing, from the collection of Dupuytren, represents a case of intestinal fistula, in which the two portions of intestine terminated *on the cutaneous surface* by separate orifices.

Fig. 2.



Intestinal fistula from Dupuytren's collection.

a, Upper portion of intestine.
b, Lower ditto.
c, Aperture of lower portion.
d, Aperture of upper portion.

Sometimes there are several small fistulæ communicating with the intestine. The surrounding integument is generally indurated, thickened, inflamed, and excoriated. Within the opening, the mucous membrane of the intestine may often be seen tumid and of a bright red colour. If the external aperture be large, the two openings of the intestine, and the partition separating them, may be seen. "One of these orifices," says Dupuytren [1], "belongs to the upper part of the bowel; and, from being constantly permeated by food and feces, is the largest of the two. The other, or the opening of the lower intestinal extremity, receives no alimentary or fecal matter, or only a small quantity; it is contracted, narrow, and with difficulty discovered. Beyond these orifices are the two extremities of the intestine, of

[1] Mémoire sur une Méthode nouvelle pour traiter les Anus accidentelles, in the Mémoires de l'Académie Royale de Médecine, t. i. p. 464; and Lawrence on Ruptures, fifth edition, p. 383.

which they constitute the termination ; these pass back into the abdomen, and are lost among the convolutions of the canal.

"Between the two orifices, an angular fold, of greater or less projection, is placed edgeways. Formed by the intestinal coats towards the mesentery, the ridge comes nearer to the skin, in proportion as the loss of intestinal substance has been more considerable, and the change in the direction of the canal more marked. It is slight, and concealed in the depth of the funnel, when the intestine has been simply opened by a wound or a small mortification. It is very large, and advances to the level of the skin, when the whole circumference of the bowel has been destroyed, so that the two ends meet at an acute angle. In the first case, there exists between the two ends of the bowel a channel more or less deep, capable of conveying the contents from the upper to the lower end : this is the kind of intestinal fistula most easily cured. There is no vestige of such channel in the second instance ; the projecting ridge, placed between the two ends of the intestine, forms an impassable barrier between them ; here the cure is more difficult.

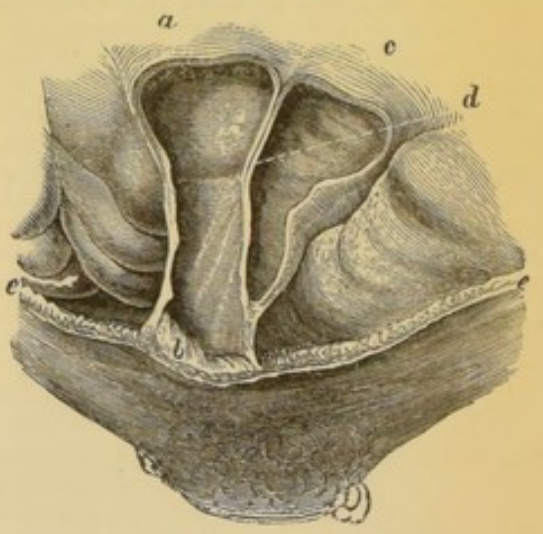
"The ridge, although placed between the two ends of the bowel, does not divide the bottom of the funnel equally ; or, if this should be the case at first, the division becomes unequal subsequently. Being fleshy and moveable, it is turned aside by the stream of matters coming through the end corresponding to the stomach, and pushed toward the anal extremity, contracting it, and acting as a kind of valve, which sometimes entirely shuts it. Hence the difficulty so often experienced of discovering the lower or anal orifice of the bowel."

Mr. Lawrence, in his valuable treatise on Ruptures, observes that "the two portions of the bowel lie near together, but are not adherent ; they are separated by the ridge called by Scarpa *promontorio*, and by the French *éperon*. If we introduce a finger into each orifice, and bring the fingers together, they are separated merely by the sides of the two portions of intestine. When it is described that they are kept apart by an intervening partition, we must remember that there is nothing but the intervening tunics. We might pass an instrument from one end of the bowel into the other, and thus cause a direct communication between them, by perforating their coats ; but as the bowels are simply contiguous without adhering, we should make a double wound into the cavity of the abdomen [1]."

The two extremities of the intestine at first resembling each other, soon exhibit striking differences. The superior portion stimulated by the transit of fecal and alimentary matters, not only maintains its natural size, but becomes thicker and stronger. The inferior orifice, on the contrary, having ceased more or less completely to perform its natural functions, becomes atrophied to such a degree, that when the parts are examined, after the morbid condition has existed several years, it would, as M. Dupuytren has remarked, be difficult to suppose that the two portions of the intestine belonged to the same individual. Notwithstanding this change which takes place in the coats of the lower portion of intestine, it still generally remains pervious, and its lining membrane continues to secrete a whitish viscid mucus, which may remain in the canal for months or years without acquiring a feculent odour. The following case recorded by M. Dupuytren, however, shows that obliteration of the lower portion of the canal is not impossible. An old man [1], a patient of M. Begin, at the Val-de-grâce, had, for more than forty years, at the left groin, an abnormal anus formed on the transverse arch of the colon. The superior opening of the intestine only could be detected. No opening corresponding to the inferior extremity, could be discovered at the wound, in the cicatrix, nor in the surrounding parts. The lower portion of intestine, resembling a solid white cord, of the size of a goose-quill, ascended to the left kidney, and afterwards forming some turns, descended to the anus. At the lower part it was still open and contained whitish mucus. Above it was so contracted as only to admit a small probe, and still higher, in the neighbourhood of the accidental anus, no trace whatever of an internal cavity could be discovered.

The following figure, represented by M. Bourgery from a drawing in Dupuytren's collection, exhibits an instance of intestinal fistula, in which the lower aperture was closed by the projecting valve.

Fig. 3.



Intestinal fistula from Dupuytren's collection.

a, Upper portion of intestine.
b, Aperture of ditto.
c, Lower portion of intestine.
d, Projecting valve closing the entrance to the lower portion of intestine.

[1] Treatise on Ruptures, p. 383.

[1] Dict. de Méd. et de Chir. Pr. t. iii. p. 133.

V.—Effects of Intestinal Fistula.

The intestine, in the lesions now under consideration, being diverted from its natural course, restrained by adhesions, and perforated, is usually in a condition unfavourable for the perfect performance of the function of assimilation. The transit of aliment is often accelerated, and its course shortened; consequently, the changes essential to a healthy digestion are imperfectly performed, and the surface for absorption is often too limited for maintaining the nutrition of the body. Hence intestinal fistula is more dangerous in proportion as the opening maintains a greater proximity to the stomach. If the accidental anus be seated in the jejunum, the matters voided are not fetid, and the patient usually dies in a few days or weeks from inanition. In a case of umbilical hernia, recorded by Sir A. Cooper[1], terminating in intestinal fistula at the lower part of the jejunum, death from inanition occurred in three weeks. Solid food was discharged from the wound in half an hour, and liquids in ten minutes. When the opening is in the ileum nutrition is generally less seriously affected; and, if it be situated at the lower part of this intestine, a tolerable degree of health is sometimes maintained. In this condition the evacuations having been longer retained, and subjected to greater changes, have acquired a degree of feculent odour. When the larger intestine is the seat of the injury, the health may remain perfect, and persons have been known to acquire a considerable degree of corpulency during the existence of intestinal fistula of the colon.

The injurious effects of intestinal fistula, even when situated in the upper part of the canal, are much mitigated when the escape of alimentary matters through the abnormal opening is only partial. In this case nutriment may pass into the lower portion of the intestine in sufficient quantity to support life, until the process of spontaneous cure is completed. The interference of art may also modify the injurious influence of a fistula at the upper part of the small intestine, provided the continuity of the canal be not entirely interrupted. Thus moderate external pressure may sometimes prevent the escape of nutriment, and direct it into the lower portion of the tube. The serious consequences of inanition may also be retarded, and sometimes altogether averted, by the use of nutrient clysters.

VI.—Complications of Intestinal Fistula.

i. *Prolapse.*—As the orifice of an intestinal fistula is not guarded by a sphincter muscle, it frequently allows the intestine to protrude, and to form a tumour, which greatly aggravates the sufferings of the patient.

At the commencement, the tumour appears as a slight projection of the mucous membrane of the intestine, of a red colour, occupying the abnormal opening. Subsequently, it increases in size by the further protrusion of the inverted intestine. Desault has observed it nine inches in length; Sabatier[1] refers to cases of greater magnitude; and Schacher[2] has described a protrusion of the colon, which measured 16 inches. The size is subject to variation from position; after the recumbent posture has been maintained for several hours, the tumour is generally diminished in size, and sometimes altogether disappears. Its growth is usually gradual, but under violent muscular efforts, as coughing or straining, it may suddenly attain considerable size. The tumour is generally of an elongated and slightly tortuous form, contracted at its attachment, and perforated at its free extremity; constituted externally by the everted mucous membrane of the intestine. It is of a red colour, and low degree of sensibility; moistened by a secretion of mucus; and, when strongly constricted, by an oozing of blood. The surface is sometimes wrinkled, from the presence of the valvulæ conniventes, and occasionally exhibits numerous small tubercles, which are the solitary glands in a tumid state. Sometimes the tumour exhibits obscure vermicular or peristaltic movements.

Protrusion of the intestine may commence within a short period of the establishment of fecal fistula. Sir Astley Cooper has observed it in one month from the occurrence of gangrenous hernia. In a case recorded by Scarpa, prolapse did not occur until three years had elapsed. In the latter instance the abnormal aperture had been reduced to the size of a small fistula.

The protrusion may occur at the upper, or at the lower opening, or at both orifices.

Prolapse at the superior aperture is the most frequent, and usually attains the greatest magnitude. It is easily recognized by the alimentary matters escaping from the opening at its free extremity. Mr. Lawrence gives the following description of this affection in a man sixty years of age, who had voided the feces entirely through the groin seventeen years. "The projecting part was four inches long when I saw him, and the basis, which is the largest part, measured nearly six inches in circumference. This prolapsus never recedes entirely, but is sometimes considerably smaller. It has occasionally protruded to the length of eight or ten inches, being at the same time equal in size to the forearm, and bleeding copiously. This is attended with great pain, and only happens when the bowels are much disordered. Warm fomentations, and a recumbent position, relieve in this case, by causing the gut to return. The prolapsus is of an uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucous secretion. It feels firm and fleshy, and can be handled without exciting pain: it approaches on the whole to

[1] Op. citat. part i. p. 55.

[1] Mém. de l'Acad. Royale de Chir. tom. v. p. 400.

[2] Diss. de Morbis a situ Intestinorum preternaturali, in Halleri Disp. Chir. tom. iii. p. 78.

a cylindrical form, and its anterior loose extremity, which is of a circular figure, contains a roundish depressed opening, through which the stools are voided. The basis of the swelling is continuous on all sides with the integuments, and I could discover no opening of the lower end of the gut [1]."

When the protrusion from the upper opening of the intestine is large, the projecting valve is pressed downwards over the inferior aperture so as to conceal it from view, and to obstruct the entrance of the feces into it. Actual obliteration of this opening has been known to occur [2].

Prolapse of the lower orifice of the intestine is usually of smaller size, and is known by the opening at its free extremity only giving exit to mucous secretions; the fecal matters, discharged from the orifice of the upper portion of intestine making their appearance near the base of the tumour.

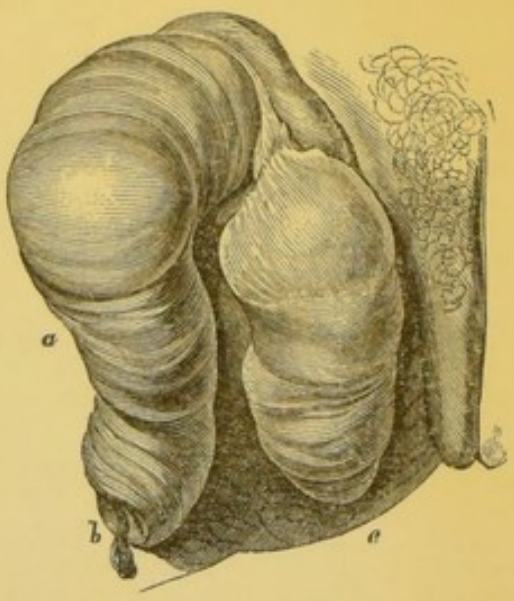
Sabatier, in an interesting memoir [3], has described the case of a soldier, who had a fistulous opening at the right side, communicating with the intestine, and allowing a partial escape of the feces. After this accidental aperture had existed a year, he was seized with colic, and being obliged to go to bed, found at the wound a red tumour, equal in size to a small nipple, which increased rapidly to the size of a fist. The prolapse afterwards varied much in size, but was ordinarily about six inches long, and one and a half in diameter, and exhibited very clearly the folds and glands of the intestine. It was not painful. The feces flowed constantly from its basis in a fluid state, without the patient being conscious of their discharge. Small hard lumps, resembling fat in appearance, were occasionally expelled from the rectum. The patient enjoyed a good state of health, and was tolerably lusty and strong.

The same author has also related another example of prolapse occurring at the inferior opening.

Prolapse at both orifices is occasionally observed. In this case, the peculiar character of the excretions voided by the two tumours, or the excretion of alimentary matters from one tumour, and the absence of such excretion from the other, readily determine which respectively belongs to the upper or to the lower opening in the intestine. Sir Astley Cooper represents this double protrusion in the second plate of the first part of his work on Hernia [4]. The accompanying illustration is taken from Bourgery's work [5]. Two interesting cases of this affection are quoted by Mr. Lawrence [6], from Albinus and Sabatier.

Effects of prolapse.—Obstruction to the passage of alimentary matters from the upper to the lower portion of the intestine, is a frequent result of prolapsus. In cases where the evacuations have in part been discharged by the natural passage, in proportion as the protrusion increases, the natural evacuations diminish, and at length become entirely interrupted. Hence it is evident, that in our attempts to restore the continuity of the alimentary canal, it is highly important to guard against the occurrence of prolapse. When the protrusion is great, painful dragging sensations in the abdomen are experienced; and the patient is sometimes involuntarily compelled to incline the trunk forwards. Although intestinal fistula complicated with prolapse has been shown to be occasionally compatible with continuance of life and tolerable health, yet it may be stated as a general rule, that this complication aggravates all the inconveniences resulting from intestinal fistula; nutrition is more seriously disturbed, emaciation proceeds more rapidly, and the unfortunate patient is more liable to sink from inanition.

Fig. 4.



Intestinal fistula with double prolapse, from Bourgery.
a, Prolapse of the upper portion of intestine.
b, Aperture of ditto.
c, Prolapse of the lower portion.

Causes of prolapse.—The weakened state of the abdominal walls at the site of the abnormal opening, and the absence of a sphincter muscle to protect it, are the principal predisposing causes of the affection. Undue action of the respiratory muscles, in coughing, straining, or other violent efforts, is the general exciting cause.

Changes of organization in the prolapsed part.—The dense resisting cicatrix, which bounds the abnormal opening, exerts more or less constricting influence upon the protrusion, by which a congested state of the minute vessels of the part is produced. Hence the mucous membrane appears red and turgid, and the entire mass becomes thickened and indurated by interstitial deposition. Adhesions also occur which sometimes render the tumour

[1] Treatise on Ruptures, p. 417.
[2] Dupuytren, Dict. de Méd. et de Chir. Pr. t. iii. p. 136.
[3] Mém. de l'Acad. de Chir. t. v. p. 398.
[4] Second Edition.
[5] Tom. vii. pl. 33.
[6] Treatise on Ruptures, p. 419.

irreducible. So great is the constriction in some instances that actual *strangulation* occurs. M. Puy of Lyons has related two instances in which strangulation of the prolapse was attended with a fatal result. Flajani[1] also, has recorded the following case. Bernardino Facchino had undergone the operation for bubonocele eighteen years since; a small fistula remained, through which a part of the feces passed: one morning whilst making repeated efforts to expel his feces without the truss, which he usually wore, he perceived the passage of a portion of the intestine through the fistula; and it increased in proportion to his efforts. Vomiting and fever ensued; and he entered the hospital the following morning. "I found," says Flajani, "a portion of small intestine, eighteen inches in length, livid and flaccid, protruding from the fistula; the belly tumid, pulse irregular, extremities cold. I endeavoured to introduce a probe-pointed knife, and to dilate the aperture; but this was not possible. The symptoms continued; and in a few hours he died."

ii. *Intestinal fistula complicated with hernia.*—Internally the two divided portions of intestine, where they join each other at an angle, form a kind of pouch communicating with the general cavity of the abdomen. Into this bag the loose viscera are received, and under great pressure of the respiratory muscles sometimes form a hernial protrusion at the abnormal opening.

VII.—Accidents liable to occur after Recovery.

After intestinal fistula has closed, the patient frequently remains liable, from irregularities in diet, to attacks of colic, and obstruction of the bowels; for, although the intestinal canal may have been sufficiently restored to allow of the passage of liquid matters, it nevertheless is often reduced in size below its natural capacity, and is unable to transmit solid masses of undigested food. A case recorded by Mr. A. Burns[2] well illustrates the diminished capacity of the bowel after closure of a fecal fistula. The patient had suffered from femoral hernia, followed by fecal discharge, which ceased entirely in two months; death subsequently occurred from inflammation of the bowels. On dissection, the ileum above the injured part was found to be considerably enlarged and perforated, below it was much reduced in size, and the intermediate portion was not larger than a goose-quill.

In consequence of this diminished size of the bowel, solid substances are arrested at the part, and excite spasmodic or inflammatory affections. Hence it is found that those individuals who have recovered from intestinal fistula are peculiarly liable to attacks of colic from irregularities in diet. Sometimes the mischief resulting from the obstruction is more serious. In the case recorded by Scarpa[1], to which we formerly referred, the shells and claws of cray-fish were arrested at the injured part of the bowel, the coats of the intestine were ruptured, and feculent matter was effused into the cavity of the peritoneum. La Peyronie[2], in his "Mémoire sur la Cure des Hernies avec Gangrène," relates the case of a female, who, after the closure of the adventitious opening, was subject to frequent attacks of colic, one of which at last proved fatal, being attended with perforation of the intestine, and feculent effusion. Similar cases are recorded by Morand[3], Richter[4], and others.

Occasionally the inflammation, excited by the accumulation of hard and undigested substances at the contracted part, causes the cicatrix to open. This result may be regarded as a favourable termination of the obstruction; for the feculent discharge thereby obtained is generally followed by a relief of the inflammatory symptoms, and the wound, in most instances, soon closes. The subject of a case, recorded in the Histoire de la Société Royale de Médecine[5], survived the operation for hernia eight years, during which time the cicatrix opened frequently, discharged feculent matter, and again closed. A patient under the care of La Peyronie, six months after closure of a fistula, was seized with pain in the cicatrix; abscess followed, and a small portion of bone was discharged. The wound closed in two months. In a case of femoral hernia related by Pelletan, obstruction took place from indigestion; a tumour formed and burst, and the fistula afterwards closed.

VIII.—Treatment of Intestinal Fistula.

After reflecting upon the published records, which refer to the spontaneous cure of intestinal fistula, and to the occasional failure of this process; the surgeon will enter upon the treatment of abnormal openings in the intestines with the firm conviction, that, in many instances, he ought only to be a quiet spectator of nature's work; that he may, sometimes, gently aid her efforts, by removing or mitigating such causes as disturb or interrupt her functions; and that, occasionally, when the natural efforts fail, he may feel justified in interposing the bolder hand of art.

It is not our present purpose to discuss the treatment of hernia in a state of gangrene (see Hernia); but we shall proceed to the subsequent stage of the malady, when the sloughs have separated, the feces are escaping from the wound, granulation is commencing, and

[1] Collezione d'Osservazioni e Riflessioni, &c. tom. ii. quoted in the Quarterly Journal of Foreign Medicine, No. x.; and in Lawrence's Treatise on Ruptures, p. 429.

[2] Monro on the Morbid Anatomy of the Gullet, &c. p. 399.

[1] Treatise on Hernia, Wishart's translation, p. 304.

[2] Mém. de l'Acad. Royale de Chir. tom. i.

[3] Académie des Sciences. 1735.

[4] Traité des Hernies, p. 153.

[5] Tom. iv. p. 321.

the adhesions uniting the intestine to the neck of the sac are becoming firmly organized. In this stage, the surgeon allows the process to advance without interruption. He provides for the comfort of his patient by attention to cleanliness, securing the frequent removal of the excretions, and correcting the fetor of the discharges by the application of linen wet with some antiseptic lotion (creosote half a drachm, distilled water one pint). Should inflammation exist in the abdomen, he combats it by its own appropriate treatment. He supports the strength of the patient by nutrient liquids; and if the passage of feces into the lower part of the intestinal canal be not entirely interrupted, he provides for the occasional evacuation of the lower bowel by clyster.

During the progress of the case, those changes which we have already noticed as conducing to the permanent restoration of the alimentary canal, and to the closure of the external wound, gradually proceed, and more or less perfectly accomplish the cure. In aiding these processes, or in altogether superseding them, when they are ineffectual, various remedial measures are indicated, which we shall consider in detail, after having briefly noticed the early treatment of fecal discharges consequent upon penetrating wounds.

It has been already shown that fecal discharge from wounds inflicted by sharp instruments or by fire-arms, in a great majority of instances, ceases spontaneously, and that such discharge often proves beneficial, by mitigating the severity of the subsequent inflammation. Bearing these facts in mind, the surgeon, in treating penetrating wounds of the abdomen attended with fecal discharge, but unaccompanied by prolapse of the bowel, regards the feculent discharge rather as a favourable occurrence, and allows it to proceed, for some time at least, without interruption. His great solicitude is to guard against the destruction of the adhesions which are in process of formation, and to combat the very first outbreak of inflammation. These objects he endeavours to attain by quietude of mind and body, by abstinence, and by the use of unirritating clysters. At the same time he avoids all irritating and obstructing applications to the wound, which may be lightly covered with wet linen, or a poultice of scalded bran enveloped in a linen bag. Should inflammation occur, slight in degree, and in a subject whose constitution is feeble and exhausted, mild antiphlogistic measures, as the local abstraction of blood, fomentations and bran-poultices over the whole abdomen, may be employed. When, however, the inflammatory symptoms are developed with great intensity, free, and some times repeated, venesection is required, seconded by the frequent application of leeches to the abdomen, followed by fomentations and poultices. After the acute stage of inflammation is subdued, the mischief may still obscurely linger in a subacute or chronic form, requiring the occasional use of leeches, and of large blisters over the abdominal surface.

The surgeon having thus, by active treatment, arrested the inflammation, nature usually accomplishes the gradual closure of the wound. In the five cases, which we have briefly quoted in page 197, the wound was closed in periods varying from three to five weeks.

When the intestine protrudes through the opening in the abdominal walls the danger is greatly aggravated; inflammation is more liable to occur; the protruded bowel may slough, from being strictured by the parietal aperture; and the wound in the intestine, in such cases, is frequently more extensive. It now becomes the duty of the surgeon to reduce the case as nearly as possible to the condition of those injuries, unattended with protrusion, which we have just considered. When stricture exists, it must be moderately and carefully dilated by the bistoury, so as to allow the return of the bowel. If the wound of the intestine be small, it appears to be a matter of indifference whether the bowel be returned into the abdomen with or without being closed by suture or ligature. When the intestine is returned without suture, it has been ascertained that fecal effusion into the peritoneum rarely if ever occurs; but in some instances the wound in the intestine remains in apposition with the external opening, allowing of the discharge of feces, which after a time generally ceases. If the small wound be closed by ligature or suture, and the intestine afterwards replaced, effusion very rarely takes place, and the ligature, when detached, falls into the cavity of the intestine, and escapes with the feces by the natural passage. There are, as Mr. Travers[1] remarks, observations which "satisfactorily establish the practicability of either mode of proceeding." Richter, Dionis, Garengeot, Sharp, and Sabatier, advocated the return of the intestine, when the wound was small, without uniting it by suture or ligature. Le Dran and Mr. Benjamin Bell incline to the opposite treatment. Mr. Travers adopts the ligature without hesitation in all such cases, observing to cut off the ends of the ligature[2], "by which precaution it will pass directly by the bowel, and not impede the healing of the wound." It may, however, be fairly questioned, whether in small wounds of the intestine attended with protrusion, the safety of the patient is increased by the use of the suture or ligature; for it has been shown, that without it effusion is scarcely to be apprehended; and the application of the ligature, and its presence in the abdomen, may possibly excite or aggravate inflammation, which is the great evil to be feared in such cases.

When the wound in the intestine is extensive, there are strong reasons for the employment of the suture. If large wounds of the intestine are left to be repaired by the

[1] Inquiry, p. 169.
[2] Ibid. p. 178.

process of spontaneous cure, the diminished capacity of the bowel, and the angular form which it assumes, tend, in most instances, to divert the whole of the intestinal contents from their natural course, and to produce exhaustion from inanition, when the opening is high in the canal; or permanent fistula, when it is seated lower. But when such extensive wounds are healed by direct union of their edges, from the use of the suture, these evils are avoided. The uninterrupted form of suture is preferred by Mr. Travers, and its use is sanctioned by a considerable weight of authority and practice. The two cases by Travers and Glandorpius, to which we have before referred, exhibit the successful result of this mode of treatment. (See Wounds.)

When the wounded and protruded intestine is gangrenous from being strictured by the parietal wound, suture is useless. If in this case the wound in the intestine is not large enough to allow of the free evacuation of the canal it must be dilated; and if the stricture still offer resistance to the exit of fecal matters, it must be released by slight incision. The intestine may then be left to slough within the edges of the parietal wound; no ligature through the mesentery being requisite to prevent it being retracted within the abdomen, or removed from the vicinity of the external wound.

Having now briefly described the treatment applicable to the early stage of some of the varieties of intestinal fistula, we proceed to notice the indications of treatment in its more advanced stages.

The two principal indications to be fulfilled in most cases, are to remove the obstruction caused by the projecting ridge or valve, and to close the external wound. Besides these, there are some minor indications which are often important, and even essential to be fulfilled. We shall consider them, and the means by which they may be accomplished, in the following order:—

1. To diminish or remove the obstruction from the projecting ridge or valve.
2. To support nutrition.
3. To solicit the natural action of the bowels.
4. To prevent or relieve prolapse.
5. To prevent premature closure of the external wound, or to obviate the evils resulting from it.
6. To close the external wound.
7. To palliate the evils of fistula when it cannot be cured.

1. *To diminish or remove the obstruction from the projecting valve or ridge.*—The means by which this object may entirely, or in part, be accomplished, are, diet, external pressure, direct pressure on the projecting part, and surgical operation.

Diet.—It has been already shown, that the intestinal contents, in passing over the projecting ridge have a tendency gradually to diminish its prominence, and to push it towards the lower opening of the intestine. Guided by this observation, Scarpa[1], in accordance with the views of Louis, and in opposition to those of La Peyronie, who adopted a rigid diet, under the hope of speedily closing the external wound, recommended that the patient should be nourished by an abundant quantity of alimentary matter of good quality, and of easy digestion, in order that the alimentary canal might be distended at the injured part, and sufficiently dilated to allow of its functions being well performed before the abnormal opening closed. Scarpa further advised the use of such means as are calculated to accelerate the course of the feculent matter through the canal, as clysters frequently repeated, and mild purgatives at intervals. The latter suggestion must not, however, be adopted without some restrictions; for, in many instances, the peristaltic action is already preternaturally excited; in which state, the treatment recommended by this distinguished surgeon might be injurious. When the opening is situated at the upper part of the alimentary canal, the accelerated transit of alimentary matters is sometimes so great as to interfere with nutrition, and to require the use of such remedies as are calculated to retard their progress.

External pressure.—Pressure applied to the external opening, so as more or less perfectly to prevent the escape of the intestinal contents, may sometimes be beneficially employed in causing the alimentary matters to press with greater force upon the projecting ridge, and thereby to aid in diminishing the obstruction which it causes. But in thus employing pressure as a remedial agent, great caution is required. In the early stage, before the adhesions are fully organized, it may give rise to feculent effusion in the peritoneum, and, at any period, unless its effects be carefully watched, serious intestinal obstruction might be produced.

Direct pressure upon the projecting ridge.—Desault[2] attempted to remove the obstruction by introducing into the two ends of the bowel long tents, so as to dilate the lower portion of intestine, and to facilitate the passage of feces. In this way he tried to efface the angular projection, and to cause the two ends of intestine so far to correspond that the alimentary matters might find a passage from the superior to the inferior opening. He placed also a plug of linen in the external aperture to prevent the escape of fecal matters, and assisted the treatment by laxatives and clysters. When success attended the plan, it was first indicated by the escape from the anus of air, and then of feces; and as the latter increased, the external wound contracted. Desault adopted the practice in the case of Francis Vialter, a sailor, who was wounded in the abdomen by the bursting of a bomb. The wound was situated on the right side, and extended from two inches

[1] Op. cit. pp. 328. 331.
[2] Dict. de Méd. et de Chir. Prat. t. iii. p. 145.

above the external ring to the bottom of the scrotum, where it had exposed the testicle. A portion of intestine, an inch in length, completely divided by the accident, appeared at the upper part, and was withdrawn into the abdomen during the washing of the wound. This injury was followed by intestinal fistula and double prolapse. After four years he entered the Hôtel Dieu at Paris, on the 29th of September, 1790, when "the prolapse had acquired a considerable bulk, its form was nearly conical, and it measured nine inches in length; the middle and anterior part was very prominent. Its basis, rather contracted, appeared to proceed from beneath a fold of the skin just above the ring; the apex reached to the middle of the thigh, and possessed a small opening, through which the feces issued. Nothing had passed by the anus since the period of the wound, except a little whitish matter, at intervals of three or four months. The surface of the swelling was every where red and folded; and these folds, resembling the valvular productions of the mucous membrane, were particularly conspicuous below. A smaller swelling, similar to the former in colour and consistence, was placed externally to it, having an oval form, and discharging a little serous fluid from a puckered orifice. Both possessed a kind of peristaltic motion, which could be excited by throwing a few drops of water on them." By pressure with the hands, continued for a few minutes, Desault succeeded in diminishing the size of the swelling; and after maintaining a moderate degree of pressure with a bandage for four days, he accomplished the entire reduction of the prolapse. A thick linen tent, three inches in length, was introduced into the intestine, and maintained there by a proper bandage. He "proposed to remove this twice a day for the evacuation of feces; but after some noise in the bowels, accompanied by an acute sense of heat, wind passed by the anus, colicky sensations, and twitching pains in the rectum followed; and half a pint of fluid matter was discharged through the rectum. Eight evacuations of the same kind, preceded by similar feelings, took place during the night, and made the patient rather weak. The stools were very numerous in the three following days; but they gradually became thicker, and diminished in number. The linen tent was discontinued on the eighth day, and the opening was closed by lint and compresses, supported by a truss with a broad flat pad. This plan entirely prevented the escape of fecal matter by the wound. The young man perfectly recovered [1].

In a case resembling the above, Scarpa adopted a somewhat similar practice. He introduced into the fistulous canal a tent of linen about the size of the finger, an inch and a half long. In a few hours the patient repeatedly went to stool. The use of the tent was continued for a week, and afterwards simple dressings were applied to the wound. The external opening, however, did not permanently close, and it was necessary for the patient to continue the use of the tent, supported by a bandage [1]. The practice of Desault was successfully adopted in a case treated by Larrey [2].

Dupuytren [3] also attempted to relieve the obstruction by direct pressure against the projecting ridge from without. For this purpose he constructed an instrument, of which one end was a crescent, three quarters of an inch in width, the edge and points being smooth and covered with linen. This crescent was fixed on a stem, two or three inches long, terminated by an elongated plate, perforated with openings at each end for the passage of strings, by means of which the instrument could be fixed in its place. This plan was tried in 1809 on a patient in the Hôtel Dieu. Pain, colic, and nausea, soon came on, and he left the hospital unrelieved.

The practice adopted by Desault and others having for its object to push back the projecting ridge, is considered by Mr. Lawrence to be "rational and judicious;" but, as this distinguished surgeon remarks, it is "in most cases inadequate, as it gives relief without producing a permanent cure." Desault himself allows that the method fails if the internal angle be too acute, and if the two portions of intestine have become strongly adherent to each other, or to the surrounding parts.

Perforation of the partition.—M. Dupuytren [4], not satisfied with the various attempts which had been made to push back the projecting angle, conceived the idea of establishing a direct communication between the two portions of intestine, by perforating or destroying the intervening angle and partition. Having ascertained by experiments on animals, that a seton, passed from one portion of bowel to the other through their contiguous walls, excited adhesion of their peritoneal surfaces, he practised this process on the 17th of May, 1813, upon a man, thirty-six years of age, who had intestinal fistula following the loss of a loop of intestine three or four inches in length, in consequence of gangrenous hernia. The two ends of intestine were lying parallel to each other, and were separated by a very prominent ridge. M. Dupuytren cautiously passed a curved needle as high as possible into the upper portion of intestine, and brought it out at the corresponding part of the lower portion armed with a thread, which was allowed to remain in the perforation. A few days after, a seton attached to the thread was drawn through the same opening; air of a feculent odour soon began to pass by the anus. After eight days, the size of the seton

[1] Œuv. Chirurg. t. ii. p. 370 et seq.; and Lawrence on Ruptures, p. 392.

[1] Op. cit. p. 240.

[2] Relat. Chirurg. de l'Armée d'Orient, p. 300.

[3] Mémoires de l'Académie Royale de Médecine, 1828. t. i. p. 281.

[4] Dict. de Méd. et de Chir. Prat. tom. iii. p. 149.

having been gradually increased, the patient experienced some pains in the abdomen, and feces began to take the natural course. The projecting ridge, reduced to a narrow band as the aperture was progressively enlarged, at length gave way, and a free communication between the two ends of intestine was established. Some portions of intestinal matters still escaped by the wound; and M. Dupuytren, desirous of preventing the unnatural discharge, and concluding that the two portions of intestine had become adherent to a considerable extent beyond the perforation, cut away portions of the partition by curved probe-pointed scissors, repeating the operation at intervals of three or four days. Yielding at length to the importunities of his patient, he one day removed the intervening substance more freely; and peritonitis, speedily proving fatal, followed. On examination of the body, no opening into the peritoneum could be detected, and there was not any feculent effusion. The opening between the two portions of intestine was about two inches in extent. The two extremities, formerly separated by a prominent angle, now presented a uniform cavity, on the posterior wall of which was observable the cicatrix which marked the place of section of the intestine. A similar operation had been previously performed by Schmalkalden in Germany, and by Dr. Physick in America, without being known to M. Dupuytren.

Destruction of the partition by the Enterotome.—From the difficulty of passing the needle to a sufficient height in the intestine, and from the danger of there being perforation without adhesion in those cases where the two portions of intestine were not parallel and in contact, M. Dupuytren relinquished this mode of operation, and directed his energies to the discovery of one less objectionable. Accordingly he devised an instrument, which he has named the *enterotome* [1], calculated to seize the parts, to hold them in apposition and forcibly to compress them. The result of its application would be, the destruction of the vitality of the inclosed part, the detachment of the dead portion by the sloughing process, and the unison by adhesion of the adjacent living parts, held in apposition by the instrument.

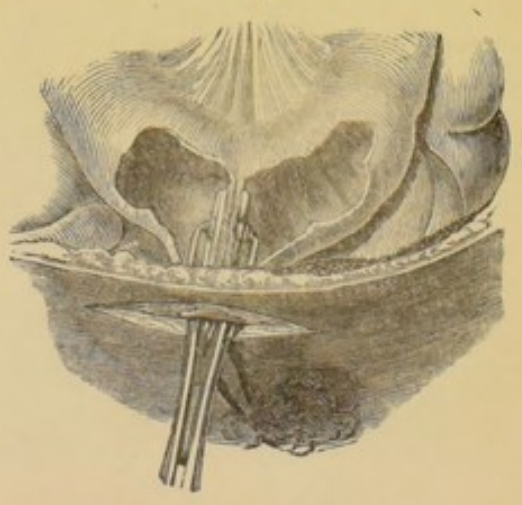
The instrument is a kind of forceps, consisting of three pieces,—namely, two branches, which lock like the blades of forceps used in midwifery, and a screw, whereby the handles can be approximated or separated. The branches are each six or seven inches in length, consisting of the blade and the handle, between which is the part constituting the joint. The blade of the male branch is received, to the depth of a line, in a groove formed in the female branch, as the edge of a pocket-knife fits into the groove of its handle. This blade is four inches long, three lines wide, and half a line thick on what may be called its cutting edge, which is undulated, and terminates in a small spheroidal button. The female branch is grooved to receive the cutting edge of the male, the margins of the groove being undulated in correspondence with the waving line of the male branch. The button at the end of the male is received into a cavity of the female branch.

The blades separately introduced into the two portions of intestine, and afterwards approximated, compress the projecting ridge and intervening partition between their undulating edges. By increasing the pressure, the inclosed parts lose their vitality, and are afterwards detached, being retained within the grasp of the instrument. Whilst the partition is thus undergoing division, the accompanying adhesive process prevents the cavity of the peritoneum being laid open.

Before applying the instrument, it is necessary to ascertain with precision the situation and direction of the two ends of intestine. The superior opening, from its large size and the escape of feculent matter, may in general be easily detected; but the lower aperture, which is usually reduced in size, pushed out of its original position, and concealed by the projecting valve and the inequalities in the wound, is with difficulty found, and has sometimes, even by M. Dupuytren, not been detected until after several days have been devoted to the search.

This object being attained, the operator introduces one branch of the enterotome, guided by the fore finger of the left hand, into one end of the bowel, to a depth varying

Fig. 5.



Segmental enterotome applied.

[1] The views of M. Dupuytren on the treatment of abnormal anus by the enterotome, were originally expounded in his Clinical Lectures, and first published in Germany in 1817, by M. Reisinger. A further account was published in England, in the Quarterly Journal of Foreign Medicine and Surgery, Nos. 9 and 10, by M. Breschet. At a later period, M. Dupuytren himself embodied his own views in essays published in the Mémoires de l'Académie Royale de Médecine, t. i. 1828; and in the Dictionnaire de Médecine et de Chirurgie Pratiques, t. i. 1829. The Treatise of Mr. Lawrence on Ruptures, 5th edition, contains a full notice of the proceeding of Baron Dupuytren.

according to circumstances from one to four inches. An assistant now supports this branch, whilst the surgeon introduces in the same manner the second branch into the other portion of bowel to the same depth. The two branches are now united, like those of forceps used in midwifery, care being taken that the button at the end of the male is received into the cavity of the female branch. The approximation of the blades is now effected by means of the screw, to such a degree as to destroy the vitality of the included part. Every second day the pressure must be increased, lest from the shrinking of the included tissues, the circulation in these structures should not have been perfectly arrested.

During the time the enterotome is applied, it is necessary to employ a diluent diet, perfect rest, emollient fomentations, and mucilaginous clysters frequently repeated. Slight pain, or moderate increase in the heat of the skin, or frequency of the pulse, need not excite alarm; but if inflammatory symptoms of considerable intensity occur, attended with nausea, hiccough, and vomiting, local and general evacuations of blood, repeated according to circumstances, the most rigid diet, and the occasional use of sedatives are required [1].

According to Dupuytren, the employment of the enterotome does not usually give rise to pain, colic, vomiting, intestinal obstruction, or constitutional irritation. On the contrary, he states that such symptoms only occurred in a small proportion of the cases in which he operated, and that the inflammation was limited to the parts embraced by the instrument.

When first applied, the enterotome is fixed; after a few days it becomes loose, its mobility increasing until it drops out about the eighth day, carrying with it the included portion of the intestinal coats, in a dry state, resembling parchment. By this loss of substance, the obstruction produced by the projecting valve and intervening partition is removed, and a direct communication between the upper and lower portions of intestine is established. The fecal matters frequently begin to resume their natural course even before the instrument is detached. For a few days the evacuations are generally liquid, frequent, and attended with griping; by degrees they become more solid and less frequent, and at length assume a natural character. After the separation of the enterotome, the external wound, for some time, rapidly diminishes in size; but it is generally slow in completely cicatrizing, sometimes requiring the assiduous efforts of the surgeon to be exerted during many weeks or months before its closure is completed [2].

An opportunity was afforded to professor Lallemand of examining the body of a patient seven years after he had been successfully treated by the enterotome for abnormal anus following gangrenous hernia. "On examining the body after death, there was found in the left inguinal region an oblique fistulous opening of the size of a crown leading into the canal. Around this, to the extent of five or six lines, was a thin shining cicatrix, in which wrinkled folds of the skin terminated. A portion of ileum, not differing from the usual appearance of the intestine, was adherent to the left inguinal region by two slender columns. One of these, four lines long by two in width, contained the canal of communication between the fistula and the cavity of the intestine. This canal passed through the inguinal ring which was short and nearly direct. The other, was an ordinary slender fibrous adhesion." "As soon as the fistulous communication had passed the ring it began to enlarge and assume the funnel shape, and was quickly lost in the cavity of the intestine. When the latter, which presented the usual circular figure, was laid open, a slight prominence marked the situation which had been occupied by the ridge; the mucous membrane was just the same here as elsewhere. In short, the intestine, which had not only been retracted within the abdomen, but carried to some distance, so as to be quite free from the inguinal canal, except at the adhesion already mentioned, had recovered its natural curve within the belly, and presented very little appearance, either on the exterior or interior, of the loss of substance which it had undergone, and of the operation, by which the natural course of its contents had been restored [1]."

M. Dupuytren [2] gives the following statement of the result of forty-one operations, by means of the enterotome, performed by himself, M. Lallemand, and others. The abnormal opening in three fourths of these cases resulted from gangrenous hernia; in the remaining fourth from wounds of the abdomen with more or less loss of substance of the intestine. Three of the patients died, one from feculent effusion, a second from "indigestion," and a third from acute peritonitis. Of the remaing thirty-eight, the greater part experienced no unfavourable symptoms; colic, nausea, and vomiting, however, occurred in some, but yielded to aerated draughts, leeches applied near the anus, fomentations, and abstinence. Recovery was not equally perfect in all: nine had fistula remaining, which required the use of a compressing bandage, to prevent the escape of air, mucus, bile, and even feculent matters. The remaining twenty-nine were permanently and completely cured in a period varying from two to six months.

From the observations of M. Jobert [3], it appears that the operation with the enterotome has not proved so mild in its effects when practised by other surgeons as in the cases treated by M. Dupuytren. He found

[1] See Dict. de Chir. et de Méd. Pr. p. 157.
[2] Dict. de Méd. et de Chir. Prat. t. iii. p. 156.

[1] This case is quoted at length by Mr. Lawrence in his Treatise on Ruptures, fifth edition, p. 403, from the Repert. Général d'Anat. et de Phys. Path. t. vii. p. 133.
[2] Dict. de Méd. et de Chir. Pr. t. iii. p. 161.
[3] Traité des Mal. Chir. du Canal Intestinal, tom. ii., p. 125.

that the patients were affected with fever, and vomiting, and that the face became contracted and of a dark hue. He states that a patient died from inflammation, occasioned by the use of the enterotome, in the Hôtel Dieu of Amiens, and that other fatal cases have been recorded. A patient treated by M. Velpeau [1] died from fecal effusion on the seventh day, after the application of the enterotome. Scarcely any adhesion had been effected.

These unfavourable results ought not only to guard the operator from being too sanguine in his expectations of success, but also to impress upon his mind the importance and necessity of using every effort to avert or mitigate those injurious consequences to which the operation, undoubtedly fraught with danger, may probably give rise.

Duly estimating the importance of the objections advanced by M. Jobert against the operation of Dupuytren. we must nevertheless regard it as a splendid boon to surgery; and we subscribe most willingly to the eulogy pronounced upon it by Mr. Lawrence, who considers that "the method of Dupuytren, founded as it was on a long series of anatomical, physiological, and practical researches, aided by persevering reflection and a remarkable fertility in resources against surgical obstacles and difficulties, does the highest credit to the talents, knowledge, and ingenuity of its illustrious author."

Modification of the enterotome.—M. Delpech successfully employed, in a case of intestinal fistula following mortified hernia, an instrument somewhat differently constructed from that of M. Dupuytren. Each of the branches was a little curved, and ended in an oval plate an inch in length. When introduced, and brought together by the screw, in consequence of the curved form of the branches, such portion only of the intestinal partition was compressed as was inclosed between the two plates. The object was to destroy a smaller portion of the partition at one time, and to repeat the process until a sufficient opening should be made in it. It was also imagined that the form of opening thus produced would be more advantageous than the elongated slit, resulting from the application of Dupuytren's instrument. The result of this case was perfectly satisfactory, but it is doubtful whether the modified form of the enterotome possesses any advantages over the original. The broad extremity of the blades would generally be attended with more difficulty in the introduction, when the external wound is much contracted; and, on bringing the compressing parts of the blades into apposition, there would be greater risk of including within their grasp neighbouring portions of omentum or intestine. Besides, it is known that the elongated opening produced by Dupuytren's enterotome is quite adequate to the free transmission of the intestinal contents, and that by their pressure it assumes a rounded form. In the case examined by professor Lallemand, seven years after the operation, the intestine "presented the usual circular figure."

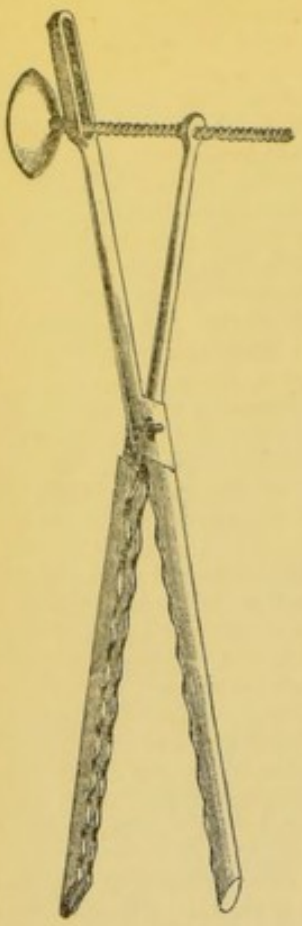
With a view of obtaining a circular opening in the partition, an enterotome has been devised, having each of the branches terminated by a large segment of a circle. One segment has a prominent edge which is received into a corresponding groove in the other. Each segment is provided with joints, moved by a sliding stem, allowing their circular form to be temporarily altered into the elliptical, for the convenience of introduction into a narrow aperture.

Time of operation.—From the successful case of Delpech, in which the enterotome was applied on the forty-first day after the gangrenous hernia was opened, it appears that the operation may be safely undertaken at this early period; but it may be doubted whether, as a general rule, the time selected in the case of Delpech, is not earlier than is desirable, at least in those cases of intestinal fistula which result from mortified hernia; for it has been shown, that, in this form of the affection, the spontaneous efforts of nature to relieve the local mischief are great, and that they are progressively advancing for a long period of time. It would therefore be unwise to subject the patient to so formidable an operation until all hope of spontaneous cure had ceased. When the abnormal opening has been produced by wound of the abdomen attended with loss of substance of the intestine, there is less hope of the natural powers restoring the continuity of the canal; and consequently in such cases the enterotome might with propriety be applied at an earlier period.

Future experience must decide whether it is safer to apply the pressure in the first instance with such intensity as entirely to destroy the vitality of the included parts, or to use more moderate pressure at first, and gradually to increase it afterwards. M. Dupuytren says, "We need not fear to carry the pressure of the enterotome on the first day, so far as to suspend life in the included parts. This is the plan most likely to prevent pain and inflammation." Mr. Lawrence recommends that the pressure of the forceps should be lessened by means of the screw, and again increased when the patient can bear it, if pain and other symptoms occur which cannot be removed by the use of warm cloths and fomentations. This gentleman is also of opinion that a firmly consolidated union of the divided parts is more likely to be attained by proceeding slowly; and he seems to attribute the want of success in the case treated by Velpeau to the rapidity with which the parts were divided. But in this case the division was not effected until the seventh day after the application of the instrument, which is but one day earlier than the average period when the section has been accomplished with perfect

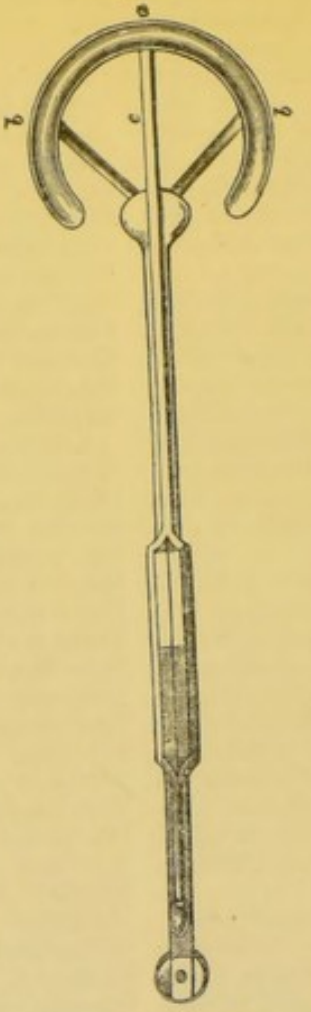
[1] Journal Hebdomadaire, Juillet 1836.

Fig. 6.



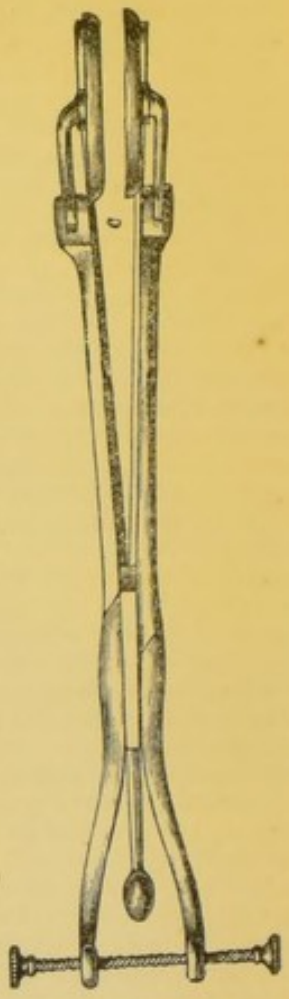
Dupuytren's Enterotome.

Fig. 7.



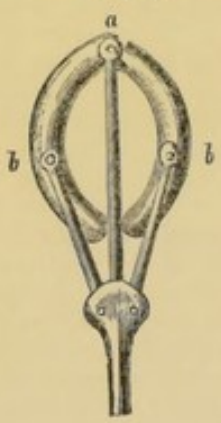
Segmental enterotome, from Bougery [1].
a, b, b, Situation of the moveable joints.
c, Sliding stem.

Fig. 8.



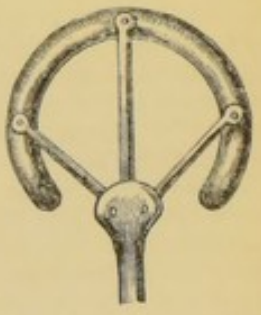
Segmental enterotome viewed laterally.
c, Sliding stem.

Fig. 9.



Head of segmental enterotome closed for the purpose of introduction.
a, b, b, The moveable joints.

Fig. 10.



Head of segmental enterotome expanded after introduction.

[1] M. Bourgery has obligingly favoured the writer of this article with a further account of the segmental enterotome; but unfortunately the communication of this highly talented surgeon arrived too late to be embodied in the text. M. Bourgery states that the instrument represented in figs. 7, 8, 9, 10, is his own modification of the enterotome of M. Liotard. The instrument of the latter was successfully used on animals, and once employed with advantage on the human subject by M. Blandin; but in consequence of this surgeon experiencing much difficulty in the introduction of a large circle into the fistula, M. Bourgery devised the present modification, whereby the breadth of the compressing part of the instrument can be diminished.

adhesion; the failure therefore of the adhesive process, and the consequent effusion of feces into the peritoneum, cannot justly be imputed to the rapidity with which the section was accomplished; but may rather be attributed to some constitutional peculiarity, which, after this as well as other operations, occasionally renders abortive the adhesive process, and favours the development of diffuse inflammation. Analogy would lead us to expect that compression, carried at once to such an extent as entirely to extinguish vitality, would be less likely to produce serious irritation, than a more moderate degree of pressure. This is, however, a question which experience alone can decide; and to this test must also be referred the question whether the destruction of the septum throughout its whole length at one attempt, as practised by Dupuytren, or by successive portions, as adopted by Delpech, be the milder and safer mode of proceeding.

Second Indication. To support nutrition.—Attention to this indication is more especially required when the abnormal opening is situated at the upper part of the intestinal canal, allowing the alimentary matters to escape before they have been exposed to a sufficient extent of absorbing surface. This cause of defective nutrition is sometimes aggravated by an accelerated transit of the intestinal contents. By attention to diet, and the exhibition of nutrient clysters, these evils may sometimes be successfully combated.

The diet should consist of liquid animal matters, as milk, broths, and eggs, combined with farinaceous vegetable substances, given in moderate quantities, and repeated at very short intervals. The clysters may be composed of the same materials, and repeated every fourth or sixth hour. When the transit of the alimentary matters is too rapid, the peristaltic action may be tranquillized by small and repeated doses of opium.

Third Indication. To solicit the natural action of the bowels.—This object may be promoted by the judicious use of purgatives and clysters. In numerous instances, the first return of the natural evacuations occurred soon after the employment of these remedies. In a patient, treated by Scarpa, the excrements resumed their natural course, after having been entirely discharged by the wound for four months, on the same day that he took a purgative of senna and manna, and the wound was cicatrized in a fortnight afterwards. Scarpa[1], whose authority is entitled to the highest respect, was of opinion that an abundant allowance of food easy of digestion, continued for some weeks, in conjunction with the uninterrupted use of slightly stimulating clysters, and the occasional exhibition of a purgative, induced the feculent matters gradually to take their course by the rectum.

Fourth Indication. To prevent or relieve prolapse.—Protrusion of the bowel through the abnormal opening, is not only a source of suffering, and even of danger, but also a serious obstacle to the cure of intestinal fistula. The prevention or relief of this affection, is, therefore, a most desirable object.

Pressure suitably applied, and the use of the linen tent, have been beneficially employed as preventive means. The degree of pressure must be moderate, and such only as to give support to the breach in the abdominal walls, and not so powerful as to compress the membranous funnel, and diminish its capacity. A pad, slightly concave, so as to correspond to the moderate convexity of the abdomen, may be placed over the opening, and fixed by a bandage, or an elastic spring. This apparatus is well adapted to the purpose, and ought to be employed whenever a tendency to eversion of the bowel is observed. In addition to slight external pressure, a tent of linen was successfully used by Desault. When the tent is employed, a greater degree of external pressure may be borne. Desault[1] observes, that "the most effectual means of preventing eversion of the intestine, of keeping the opening sufficiently dilated, putting a stop to tenesmus, and restraining the intestinal contents long enough for the nourishment of the body, is to place in the opening a plug of linen, supported by a compress of lint, and a moderately tight bandage." "Some restraint is felt when this plan is first employed, and slight colic pain may be caused by it; but these effects speedily subside."

Scarpa[2] adopted with success a similar plan of treatment in this reducible condition of the protrusion. After returning the inverted intestine, he introduced into the fistulous canal a tent of linen about the size of the finger. Not only was the protrusion relieved, but soon after the introduction of the tent the feces began to pass by the natural route, notwithstanding the presence of the tent in the fistula.

When the prolapse is irreducible by the hand, continued pressure of moderate force, aided by recumbency, have succeeded in reducing the swollen state of the tumour, and ultimately have rendered it capable of being returned.

When the pressure of the cicatrix threatens the destruction of the protruded part from strangulation, an attempt should be made to relieve the part by dividing the stricture. In the case related by Flajani, which proved fatal from strangulation, attempts were made to dilate the aperture, but without success. In most instances, however, it may be presumed that the stricture might be divided without much difficulty.

When the abnormal aperture is the site of hernial protrusion, moderate pressure with the flat or slightly concave pad, recommended for prolapse, will generally afford relief.

Fifth Indication. To prevent premature

[1] Op. cit. p. 335.

[1] Œuvres Chirurg. t. ii. p. 362.
[2] Op. cit. p. 340.

closure of the external wound, or to obviate the evils resulting from it.—The symptoms indicating premature contraction of the wound, are such as may be attributed to partial or complete obstruction of the bowels; namely, scanty or suppressed evacuations, tension and pain in the abdomen, eructations, and vomiting. These symptoms may be slight at first, and only occasional; they may become more intense and frequent, and if not relieved may be followed by hiccup, intermittent pulse, prostration, and death. Under these circumstances, perforation of the bowel, and feculent effusion into the peritoneum, will generally be observed on dissection. On the first occurrence of symptoms indicating obstruction, provided they can be fairly attributed to the undue contraction of the external wound, attempts should be made to dilate it, so as to allow of the introduction of a flexible catheter into the bowel, whereby a portion of its liquid contents may be extracted. Clysters and purgatives may also sometimes be of use; but, from the difficulty of calculating precisely upon the effect of the latter, and the possibility that the impulse given by them to the feces may tend to produce laceration of the intestine, and effusion into the peritoneum, they should only be administered with the greatest caution, and ought not to be employed to the exclusion of such remedies as promote an early and free exit of the intestinal contents by the wound.

Relief having been obtained by the evacuation of liquid matter from the bowel, by means of the elastic tube, time is allowed for the more gradual and complete dilatation of the opening. Bougies, sponge tents, and the instrument constructed by Mr. Weiss for dilating the female urethra, may all be found efficient aids to the surgeon. When, however, the symptoms are intense, and the abnormal opening is contracted to a small tube, it becomes necessary to lay open the fistulous tube as far as the membranous cavity. This mode of proceeding is sanctioned by the successful practice of Renaud. His patient, after the evacuations had become scanty and difficult, suffered from a fixed pain in the groin, attended with evident swelling above the cicatrix, vomiting, small pulse, and cold sweats. No relief having been obtained from bleedings, emollient poultices, and clysters, an incision was made into the cicatrix and abdominal muscles; and the membranous cavity embracing the two apertures of the intestine was thereby laid open. Fluid feculent matter was freely discharged, and a ball as large as a nut, consisting of indurated feculent matter with a plum-stone for its nucleus, was extracted. Two days afterwards the patient took a purgative, which produced its effect only by the wound. On the sixth day the excretions by the natural passage appeared, and on the twenty-first day the wound was cicatrized.

Infiltration of feculent matter beneath the integuments requires early and free incision.

Sixth Indication. To close the external opening.—This is the last curative indication, and often the most difficult which the surgeon has to fulfil; but before he attempts it, he ought to be assured that the continuity of the intestinal canal is sufficiently restored, to allow of the safe closure of the opening. In general, when the proper time arrives for the closure of the wound, nature anticipates the surgeon's work; but when this part of the restorative process fails, and there exists a free passage for the alimentary matters by the natural route, the surgeon is justified in interfering.

Various means for accomplishing the closure of the wound have been employed with more or less success, as pressure, caustic, suture, autoplasty, and the cutaneous plug.

In employing pressure, the principal object is to prevent entirely the discharges from traversing the external wound. When this is accomplished the wound generally exhibits a greater tendency to contract and cicatrize. Care must be taken that the pressure be not so concentrated or forcible as to compress the membranous cavity, and thereby obstruct the course of the feces, and counteract the desired object. The pressure, to be successful, should, in the first instance, be effected through the medium of a broad and flat surface. Afterwards a greater concentration of it may be adopted by means of graduated compresses; but the effects of such attempts must be carefully watched; and if the slightest indication of obstruction occur, the flat compress must be resumed, or the pressure for a time entirely discontinued. During the treatment, confinement to bed should be insisted upon.

The usual mode of applying pressure is by means of an elastic truss. Mr. Hey[1] employed a linen compress and bandage, over which was placed a two-ounce weight, and afterwards a weight of four ounces.

When the fistulous canal has assumed the character of a cicatrized surface, it has been sometimes advantageous to produce a granulating sore, by *caustic, cautery, or the knife,* preparatory to the steady adoption of the treatment by pressure. But all these means, however well devised and practised, will, in many instances, fail to produce the desired effect.

Attempts have repeatedly been made in obstinate cases by Cruikshank[2], Sir A. Cooper[3], Dupuytren, and others, to close fecal fistulæ by *suture,* but unfortunately without success.

Velpeau made several attempts in the same subject to accomplish this object by *autoplasty,* but was unsuccessful in them all. He afterwards employed the *cutaneous plug,* which had succeeded in two cases of laryngeal fistula. He took a portion of skin from the side, doubled it on its external or cuticular surface, and pushed it into the opening, fixing it there

[1] Practical Observations in Surgery. Second edition. p. 225.

[2] Sir A. Cooper on Hernia. Second edition, part i. p. 55.

[3] Ibid.

by means of four sutures. There was a fecal oozing the next day, and the borrowed portion of skin mortified [1].

Seventh Indication. To palliate the evils of fistula when it cannot be cured.—When all curative efforts fail, or the patient is unwilling to submit to the prescribed treatment, the efforts of the surgeon may be advantageously directed towards alleviating the sufferings of the patient, and rendering him less offensive to himself and others. For this purpose various mechanical contrivances have been adopted.

Pressure by the truss has been employed, so as to constitute, as it were, an artificial sphincter, allowing, by its occasional removal, the periodical evacuation of the bowels. When the abnormal opening is situated in the colon, where the fecal matters have acquired some degree of solidity, this mode may frequently be adopted with success; but when the opening is in the small intestines, and of large size, it is difficult to prevent the escape of liquid fecal matters.

Dr. Cheston's [2] patient, in whom there was a large opening communicating with the ileum, was able to prevent all escape of feces from the wound by using a compress and bandage, for which he afterwards substituted a truss. This case was remarkable from the circumstance, that when the escape of feces from the wound was thus mechanically prevented, they took their natural course.

Receptacles of leather, horn, or tin, with their opening applied over the fistulous aperture, and connected to a strap going round the body, have been sometimes employed.

Juville [3] delineates an apparatus, which consists of an ordinary inguinal truss, with an ivory pad perforated in the middle so as to fit the opening. A tube of elastic gum, furnished with a valve opening downwards, leads from this perforation to a receiver of silver, which is attached by a screw to the lower end of the tube, and lies against the inside of the thigh. The silver vessel may be unscrewed and emptied without disturbing the rest of the instrument.

In a case of intestinal fistula with double prolapse, Sabatier [4] employed a truss with a pad of box-wood, so constructed as to prevent by pressure the protrusion from the lower opening, and perforated to receive the prolapse from the upper aperture. A silver tube continued from the aperture in the pad, conducted the excrement to a box of tin.

IX. Intestinal Fistula established by surgical operation.

i. *Perineal artificial anus.*
ii. *Iliac artificial anus.*
iii. *Lumbar artificial anus.*

Various operations have been proposed and practised for establishing an artificial anus for the relief of insurmountable obstruction in the lower part of the intestinal canal.

The principles upon which these operations are conducted, vary considerably, according to the different localities in which they are practised. It is, therefore, necessary to treat of them separately, as performed in the perineal, the iliac, and the lumbar regions.

i. *Perineal artificial anus.*—This part of the subject has already been fully considered by Mr. Malyn, in the article "*Anus*," to which the reader is referred for a detailed account of the interesting operations of M. Roux and M. Amussat. From the satisfactory performance of these operations, in cases apparently most unfavourable, the hope may be indulged that numerous instances of malformation of the rectum and anus, which formerly were considered irremediable except by the iliac or lumbar operation, may now be relieved by establishing an artificial opening in the natural situation of the anus.

ii. *Iliac artificial anus.*—In the operation for establishing an artificial anus in the iliac region, the incision traverses the integuments, the abdominal muscles, the *peritoneum*, and the upper part of the sigmoid flexure of the colon or the cæcum. During its performance, the patient is laid on a bed or table, supported by assistants, the abdominal muscles being relaxed. Crying and all violent efforts of the respiratory muscles are, as much as possible, to be avoided. The surgeon having made an incision to a convenient extent through the integuments of the iliac region, a little above and parallel to Poupart's ligament, successively divides, to the same extent, the abdominal muscles, proceeding more cautiously as he approaches the peritoneum. All bleeding vessels must be immediately tied, to prevent the subsequent stages of the operation being obscured. The peritoneum being exposed, and carefully perforated by slight touches of the knife held horizontally, must be divided on a grooved director to an extent corresponding with the wound in the integuments. Search is now made for the distended intestine, and the portion intended to be opened, being drawn by the finger through the wound, and retained in this situation by a temporary ligature passed through its coats, is to be opened so as to allow of the free evacuation of its contents; after which the edges of the intestinal wound are to be attached to the integuments by four or more points of interrupted suture, and the extremities of the external wound closed by the twisted suture. The operation being completed, folds of wet linen may be applied over the lower part of the abdomen.

The proposal for forming an iliac artificial anus originated with M. Littre [1] in 1720. This surgeon recommended, in such cases of imperforate anus as could not be relieved by an opening in the perineum, that an incision

[1] Journal Hebdomadaire, Juillet, 1836.
[2] Cooper on Hernia. Second edition, part i. p. 53.
[3] Traité des Bandages Herniaires, sect. viii. pl. 7 and 8; and Lawrence on Ruptures, p. 388.
[4] Mémoire, p. 618.

[1] Mem. de l'Académie des Sciences, 1720.

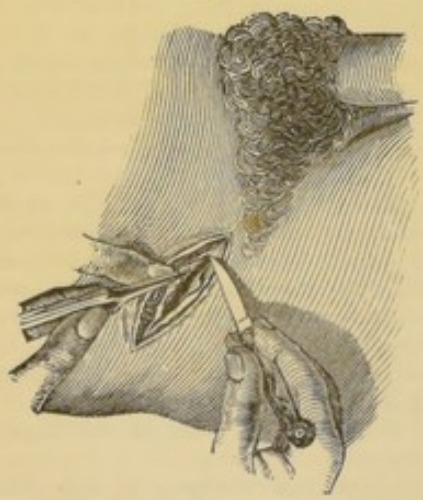
should be made in the left iliac region, through which, after the peritoneum was divided, the sigmoid flexure of the colon might be withdrawn and opened. He further proposed to retain the intestine in the vicinity of the external wound by a ligature passed through the mesentery, which should be allowed to remain a few days, until the bowel had become united by adhesion to the external wound.

The operation, according to Littre's plan, was first practised, without success, by M. Dubois[1], in 1783, and successfully by M. Duret[2], in 1793, in the following case. An infant, in whom there was no appearance of anus, the skin being firm and thick, and extending across the situation of this aperture, was brought to M. Duret thirty-four hours after birth; at which time it was suffering from distension of the abdomen and frequent vomiting; the extremities were cold, and death appeared to be impending. He made an unsuccessful attempt to relieve the patient by incision in the perineum, and then determined to open the abdomen at the left iliac region. Having found the sigmoid flexure of the colon, he retained it near the wound by two threads passed through the mesentery, and made an opening in it of sufficient size to allow of the free escape of its contents. The sufferings of the little patient were relieved, and it daily improved in health. After a few days the strings were withdrawn; and on the seventh it was restored to the care of its parents. At the age of eleven years this child was living at Brest.

The iliac operation, in a modified form, was performed by Pillore, who united the wound of the intestine to the parietal wound by several points of suture.

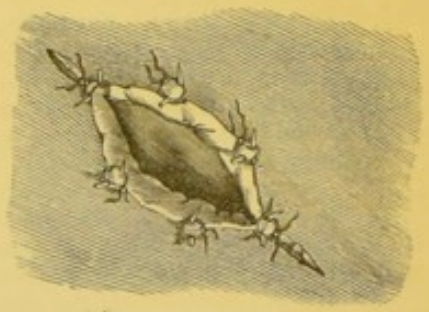
The iliac operation has since been performed in numerous instances. From the following table, which contains twenty-four cases it appears, that, in eighteen instances, the operation was performed on infants for an imperforate condition of the anus or rectum, and in seven of them with success. In one case, a girl aged four years, successfully underwent the operation for the relief of malformation. The other five operations were performed upon adults, for the relief of obstruction from tumour, carcinoma, or other cause not ascertained. Two of these cases proved successful; the others were attended with a fatal result on the second, fourteenth, and twenty-eighth days.

Fig. 11.



Pillore's operation for iliac artificial anus. Section of the cæcum. After Bourgery.

Fig. 12.



Pillore's operation completed. The wound in the intestine united to the wound of the integuments by six points of twisted suture. After Bourgery.

Cases in which the operation for establishing an iliac artificial anus was performed.

Pillore. 1776. Amussat's Mémoire sur la possibilité d'établir un Anus artificiel, &c. p. 85.	Adult male. Schirrous induration of the lower part of the colon, and upper part of rectum. Cæcum opened: edges of intestinal wound united by suture to the integuments. Peritonitic symptoms on the 20th day.	Death on the 28th day.
Dubois. 1783. Recueil périodique de la Société de Médecine de Paris, t. iii. p. 125.	Imperforate anus. Littre's operation.	Death in 10 days.
Duret. 1793. Recueil périodique de la Société de Médecine de Paris, t. iv. p. 45.	Imperforate anus. Littre's operation.	The subject of this operation was living at the age of 11 years.
Desault. 1794. Journal de Chir. t. iv. p. 248.	Imperforate anus.	Death in 4 days.

[1] See Dict. de Méd. et de Chir. Pr. t. iii. p. 128.

[2] Recueil périodique de la Société de Médecine de Paris, t. iv. p. 45.

Voisin. 1798. Fine's Mémoire in Annales de la Société de Méd. de Montpellier, tom. vi.	Imperforate anus.	Result not published.
Desgranges 1800. Mémoire in Ann. de la Soc. de Méd. de Montpell. t. vi.	Girl, aged 4 years. Rectum opening into the vagina.	Nine months after the operation the child was in good health.
Voisin. 1802. Recueil périod. de la Soc. de Méd. de Paris, t. xxi. p. 353.	Imperforate anus. Littre's operation. The artificial anus was formed in the ileum, as the large intestines were entirely deficient.	Death in 4 days.
Duret. 1809. Thèse de Miriel fils.	Imperforate anus. Littre's operation.	Death 4 or 5 days after the operation.
Legris. 1813. Thèse de Serrand.	Imperforate anus. Rectum opening into the urethra.	Death 17 days after the operation.
A surgeon of Lyons, 1813. Thèse de Sarrand.	Imperforate anus.	Successful.
A surgeon of Brest. 1813. Thèse de Serrand.	Imperforate rectum.	This child was in good health at the age of 22 months.
Freer. 1815. Lon. Med. & Phys. Jour. vol. xlv. p. 9.	Imperforate anus. Lower part of descending colon opened. "After confining the colon with one stitch at each end of the wound," a longitudinal incision, 2 inches in length, was made.	The child "died apparently from marasmus" at the end of three weeks. The opened intestine was adherent to the wound in the parietes, and there was not any appearance of inflammation.
Miriel, sen. 1816. Thèse de Miriel fils.	Imperforate rectum. Littre's operation.	The child was living 9 years afcer the operation.
Freer. 1818. Lon. Med. & Phys. Jour. vol. xlv. p 9.	Male, aged 47. Obstruction, the nature of which could not be ascertained, situated at the upper part of the rectum. Descending colon opened; intestine united to the parietal wound by two sutures.	Death on the 14th day.
Ouvrard. 1820. Thèse de Miriel fils.	Imperforate anus.	Result not recorded.
Pring. 1820. Lon. Med. & Phys. Jour. vol. xlv. p. 1.	Female, ætat. 64. Carcinoma of upper part of rectum; descending colon opened; wound of intestine attached to external wound by four sutures. Operation followed by diffuse inflammation and sloughing of the abdominal walls.	Life prolonged 16 months.
Miriel, sen. 1822. Thèse de Miriel fils.	Imperforate rectum.	Child living 13 years after operation.
Miriel, sen. 1823. Thèse de Miriel fils.	Imperforate anus. Littre's operation.	The child lived 27 months.
Martland. 1824. Edin. Med. and Surg. Journal, 1825, p. 271.	Male, aged 44. Tumour obstructing the rectum. Lower part of descending colon opened. Intestine fixed by suture to the sides of the wound.	On the 18th day the patient was able to resume his ordinary avocations, and was living a year after the operation.
Boyet. 1830. Thèse de Miriel fils.	Rectum entirely deficient.	Death a month after operation.
Boyet. 1830. Thèse de Miriel fils.	Imperforate anus.	Death on the following day.
Klewig. 1835. Gaz. Méd. de Berlin, April 29, 1835.	Imperforate anus. Pillore's operation.	Successful.
Velpeau. 1839. Gaz. Méd. de Paris, Oct. 5, 1839.	An elderly female. Obstruction of the rectum. Pillore's operation.	Death from peritonitis 2 days after operation.
Roux. 1839.	Imperforate anus.	Death 2 hours after operation.

iii. *Lumbar artificial anus.*—The operation for forming artificial anus in the loins, requires an incision in the lumbar region, extending through the integuments, muscles, and the ascending or descending colon, without opening the peritoneum.

This mode of operating was first proposed by M. Callisen of Copenhagen, who considered that as the colon, in the lumbar region, was only partially covered by peritoneum, and that it might be reached, in this situation, without opening the cavity of the abdomen. To accomplish this object he proposed to make a vertical incision, extending from the edge of the false ribs to the crest of the ilium, parallel to the anterior border of the quadratus

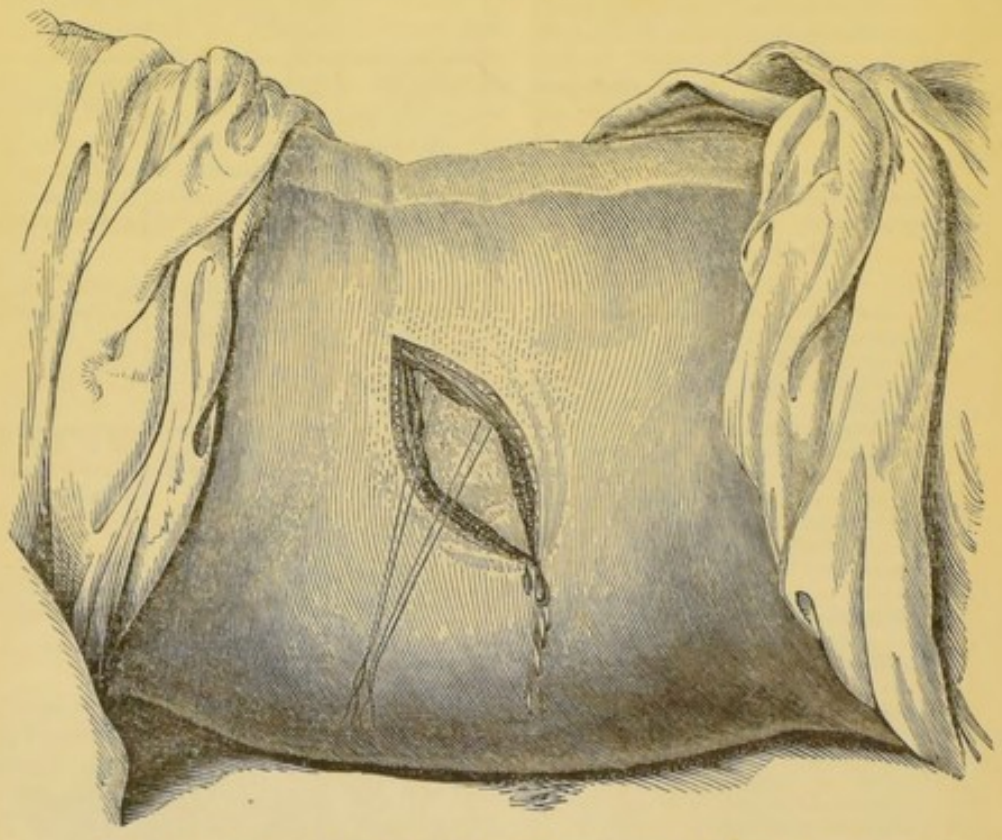
lumborum muscle. He thus hoped to reach the colon, between the layers of its short and imperfect mesentery. The advantages of the lumbar over the iliac operation are stated to be, the avoidance of opening the peritoneum, the more commodious position of the artificial aperture, and its less liability to be the seat of prolapse.

In opposition to the proposal of Callisen, it was maintained, that the superior convenience of the anus in the lumbar region was not evident, and that the operation itself was, in most instances, impracticable, as the colon in the lumbar region was generally attached by a mesentery of some extent. It was, moreover, urged that Callisen himself found great difficulty in executing the operation on the dead body, and that in many instances he failed, the peritoneum having been unavoidably opened. Most surgeons, amongst whom was Dupuytren[1], agreed in condemning Callisen's proposal, and gave the preference to the iliac operation of Littre or Pillore, until within the last few years, when the operation of Callisen has been revived and modified by M. Amussat. This accomplished surgeon has shown, that the failure of the operation on the dead subject was owing to the intestine being empty, and that, in such cases as required the formation of artificial anus, the colon is greatly distended; in which condition, the layers of peritoneum, forming its imperfect mesentery, are so far separated as to allow of the intestine being readily reached without opening the peritoneum. He has further introduced an important modification of the operation of Callisen, by adopting a transverse instead of a vertical incision of the integuments and muscles.

The operation has been three times successfully performed by M. Amussat; twice on the left, and once on the right side. We subjoin the following abridged report of these cases, which will sufficiently explain the operative proceedings requisite for establishing an artificial anus in the right or in the left lumbar region.

A woman[1], aged forty-eight, who had long been subject to a torpid state of bowels, in the beginning of May, 1839, became more

Fig. 13.



M. Amussat's operation for establishing a left lumbar artificial anus, from Bourgery.

The patient is supported on the elbows and knees; the dorso lumbar region directed upwards, and the head to the left of the page. The integuments and muscles are divided, and the distended colon, uncovered by peritoneum, is exposed.

obstinately constipated than usual. After the ineffectual employment of active remedies for twenty-six days, a consultation was held by MM. Barras, Amussat, Fouquier, Breschet, Recamier, and Puyos. On examination of the rectum, a hard, round, and almost immovable tumour was felt at a considerable height in the intestine, about double the size

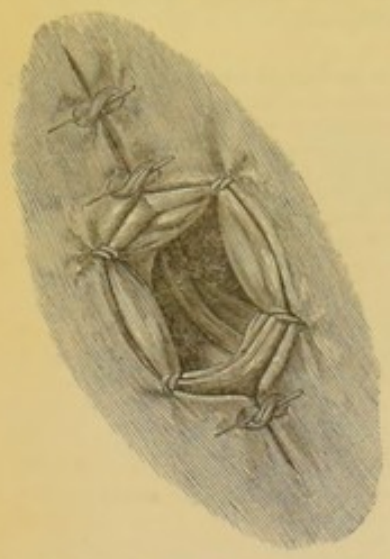
[1] Dict. de Méd. et Chir. Pr. t. iii. p. 128.

[1] Bulletin Gén. de Thérapeutique, 15th and 30th October, 1839; and British and Foreign Medical Review, January, 1840.

of the neck of the uterus. The only resource, in this case, seemed to be the formation of an artificial anus, which was accordingly made on the 2nd of June, by M. Amussat, in the following manner: the patient being placed on her face, with the abdomen supported by pillows, a transverse incision was made in the left lumbar region, where the accumulation of fecal matters caused a considerable projection. The incision was commenced at the external edge of the sacro-lumbalis and longissimus dorsi muscles, and was extended outwards for four inches and a half, at the distance of two fingers' breadth above the crest of the ilium. The skin and muscles being divided, the adipose tissue surrounding the kidney, on which the posterior part of the lumbar colon rests, was brought into view. On cutting through this fat, the colon immediately appeared between the edges of the wound, in a very distended state.

The intestine being fixed by a loop of thread passed through its coats, was opened by a trochar, and air and liquid feces escaped through the canula. The opening in the colon was then dilated by the bistoury, in a transverse direction, to the extent of an inch and a half; after which, fecal matter in immense quantity was discharged, and its removal encouraged by injections of warm water into both ends of the bowel. The edges of the intestinal wound were, lastly, united by stitches to the margin of the anterior part of the external wound, and a poultice was applied. Very little hemorrhage occurred; the symptoms were immediately relieved; and the patient passed a good night.

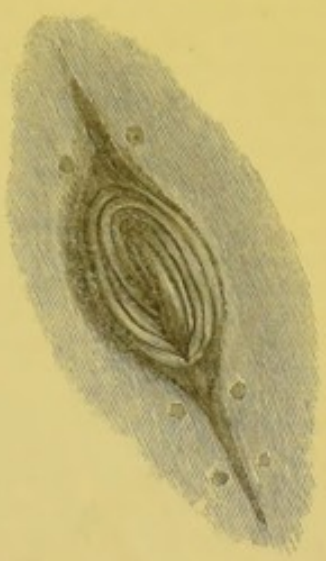
Fig. 14.



Amussat's operation for lumbar artificial anus, after Bourgery.

On the following day, slight symptoms of inflammation occurred, but they were relieved by leeches. The external wound rapidly healed, and at the period of four months after the operation, the patient was quite well, and had regained her strength; the artificial anus presented a regular rounded orifice, through which the fecal matters passed in a solid form, once or twice a day. A simple bandage fixed round the body was sufficient to retain them, which was taken off when an inclination to void the feces was felt. Nothing, except air, passed by the natural anus.

Fig. 15.



Lumbar artificial anus established by Amussat, after Bourgery.

In M. Amussat's second case[1], the operation was performed on a man, aged sixty-two, for cancer of the rectum, which entirely obstructed the canal. The result was equally favourable. His health was much improved by the operation, and the rapid progress of the disease of the rectum seemed to be arrested.

Madame B.[2], aged fifty, having suffered for some years from habitual constipation, at length became affected with obstruction of the bowels, which resisted the assiduous efforts of her medical attendants. After thirty-four days had elapsed without her having had any evacuation by the anus, M. Amussat was consulted in conjunction with M. Deguise, on the 27th of June, 1841. The abdomen was much distended, and the coils of the intestines were externally distinguishable, giving, on percussion, a clear tympanitic sound.

On attempting to pass a gum-elastic catheter, beyond six or eight inches within the rectum, it became bent upon itself. The uterus was somewhat larger than natural. Clysters were expelled almost immediately on being injected, and without bringing away any fecal matter. No part of the abdomen sounded dull on per-

[1] Ibid.

[2] Gazette des Hôpitaux, No. 93; and Provincial Medical and Surgical Journal, August 28, 1841.

cussion ; and neither side of the lumbar region was more arched or moreprominent than the other.

The operation was determined upon, and preparation for its performance was made, but the patient withheld her consent.

On the second of July a consultation was held, at which MM. Majendie, Breschet, and Chomel were present. The patient was very feeble ; her pulse small and frequent ; breath fetid ; and the skin exhaled a stercoraceous odour. There was frequent bilious vomiting, severe epigastric pains, and the abdomen was extremely tense. The propriety of operating immediately was agreed upon, but some difference of opinion existed respecting the point at which the artificial anus should be made. Some preferred the left lumbar colon, on the supposition that this part was distended, and that the obstruction was situated below it, since the patient could not retain even a single clyster. Others maintaining that this diagnostic sign was insufficient and deceptive, since it occurred in some persons in perfect health, recommended that the right lumbar colon should be opened. In the latter opinion, M. Amussat concurred ; and he was inclined to cut down upon the ascending colon, and to open it if he found it to be distended. If otherwise, he determined to cut down in front of the cæcum, and, having found the termination of the ilium, to search for the seat of obstruction. On the third of July, at 6 A.M. the operation was performed in the presence of MM. Breschet, Deguise, Boyer, and others.

The patient was placed on a mattress, the abdomen resting on a pillow, so that the lumbar region was prominent ; when it was found that each side presented the same volume, and yielded the same sound on percussion. An incision, nearly four inches long, was made transversely in the right lumbar region, midway between the crest of the ilium and the lowest false rib, commencing at the common origin of the sacro-lumbalis and longissimus dorsi muscles. The edges of these muscles being divided, and also the adjacent tissues, the operator soon arrived at the quadratus lumborum, which was easily recognized by its very oblique direction downwards and outwards. He cut the edge of this muscle, and after dividing the anterior layer of the posterior transverse aponeurosis, perceived the cellular and adipose mass covering the kidney. He then divided the fat vertically, and examining posteriorily, felt a distended intestine. This was the lumbar colon, uncovered by peritoneum. It was recognized by the resistance of its walls, and by its muscular fibres, which are more developed than those of the small intestine.

This important part of the operation being accomplished, M. Amussat fixed the intestine by a thread passed through its coats, and then opened it with a small trochar ; a quantity of air and a very little feculent matter ssued from the canula ; but, on withdrawing it, so much air was infiltrated into the surrounding cellular tissue, that M. Amussa- had to cut it away to leave the colon ext posed. The intestine was now freely opened in a vertical direction, with a blunt-pointed bistoury, and the edges of the aperture were held separate by three torsion forceps. With the index finger introduced into the intestine, he broke up a mass of indurated feces, after which a considerable quantity escaped, mixed with gooseberry seeds and cherry stones. The evacuation was facilitated by injections of tepid water into the upper and lower portion of the opened colon. The aperture in the intestine was fixed as near as possible to the inferior angle of the wound, by means of five points of interrupted suture, care being taken to evert the mucous membrane ; and the posterior angle of the wound was united by a point of twisted suture.

The patient was now placed in bed, supported on the right side to facilitate the issue of the feces ; the artificial anus was covered with a large poultice.

In the evening she was cooler and felt relieved ; the abdomen was soft and free from pain on pressure ; air and feces frequently issued from the artificial anus ; the pulse had become strong but not frequent. The next day she had passed a good night, and her pulse ranged from seventy to eighty.

The case afterwards proceeded favourably. On the fifth day after the operation, all the sutures were detached ; and on the thirtieth, the patient is reported as being in a most satisfactory state.

In order to facilitate the comparison of these cases, with those in which the iliac operation had been performed, we shall arrange their leading peculiarities in the tabular form [1].

[1] Since this article was sent to press, M. Amussat has communicated to the Academy of Medicine three additional cases in which he has performed the operation for establishing an artificial anus.

" In the first case the patient laboured under cancer of the omentum, which obstructed the sigmoid flexure of the colon, and caused complete retention of the feces. M. Amussat exposed the ascending colon posteriorly, fixed it to the integuments, and made an incision into it. Fecal matter was discharged in abundance, and sometime afterwards several evacuations by the anus took place.

" The second patient, 60 years of age, had likewise, and from the same cause, an obstruction of the bowels, which lasted forty-five or fifty days. The cancer occupied the upper part of the rectum. The descending colon was opened, and a large quantity of fecal matter was evacuated. No inflammatory reaction took place, but the woman died in ten days from the effects of the cancerous disease.

" In the third case, constipation suddenly came on, in a patient forty-seven years of age, who had previously enjoyed the best health ; there was no means of judging whether the obstacle was seated in the small or in the large intestines. Hence, M. Amussat was compelled to follow Littre's method, and opened the cæcum anteriorly. The patient, who was extremely exhausted and weak previously to the operation, died twenty-four hours afterwards. On examining the body after death, the obstacle was found to exist at the

Cases in which the operation for establishing a lumbar artificial anus was performed.

Amussat. 1839. Bulletin Gén. de Thérapeutique. Oct. 15 & 30, 1839. British and Foreign Med. Rev. Jan. 1840.	Female, ætat. 48. Hard, round, and almost immoveable tumour, at a considerable height in the rectum. Left lumbar region opened.	Favourable recovery; the patient four months after the operation was quite well, and had regained her strength.
Amussat. Ibid.	Male, ætat. 62. Cancer of the rectum. Left lumbar region opened.	Successful; the man's health was much improved after the operation, and the disease of the rectum seemed to be arrested.
Amussat. 1841. Gazette des Hôpitaux, No. 90. Prov. Med. and Surg. Journal. August, 1841.	Female, ætat 50. Obstruction in the large intestine too high to be ascertained by the finger introduced at the anus. Right lumbar region and ascending colon opened.	At the end of thirty days, the patient was in a most satisfactory state; the appetite and strength had returned, and the artificial anus was completely established.

Malformations and diseases which may admit of relief from the formation of artificial anus.—The various affections causing obstruction of the intestinal canal, which may occasionally require the formation of an artificial anus for their relief, may be referred to the following heads:—Congenital malformations; carcinoma of the rectum or neighbouring parts; and non-malignant diseases of these structures.

It has been maintained that the surgeon is not justified in prolonging the life of an infant, in whom the anus or rectum are imperforate, upon the loathsome condition of an artificial anus; but such an opinion cannot be justified upon any principle of morality, since an imperative obligation rests upon the surgeon to employ, to the utmost of his ability, the means placed at his command for the relief of human suffering and the prolongation of human life. In most cases of imperforate anus or rectum, the perineal operation, in its present improved state (see Anus), may be accomplished; and in those instances where it is impracticable, the surgeon ought not to hesitate to perform the iliac or the lumbar operation.

In obstruction from carcinoma, the operation has been objected to on the ground that the disease itself must in a short time prove fatal: but, if the obligation of the surgeon to prolong life in infancy be imperative, surely he will feel it no less binding in reference to adult age, when he considers how vast and important may be the concerns, which hang upon the prolongation of life in an adult human being for a few months, or even for a few days or hours.

In four of the cases noticed in the preceding tables, the iliac or lumbar operation was performed for diseases undoubtedly carcinomatous. One of them proved fatal on the eighteenth day, another on the twenty-eighth, but the result in the other two was highly satisfactory. In one, life was prolonged for sixteen months, and the sufferings were greatly mitigated; and of the other it is reported, that the health was much improved after the operation, and that the disease of the rectum appeared to be arrested.

The cases which afford the greatest prospect of being permanently relieved by operation, are those in which the obstruction is produced by diseases not of a malignant character. Such affections are not unfrequent, and present considerable varieties. In the case successfully treated by Dr. Martland, and in one of those attended with an equally fortunate result under the treatment of M. Amussat, the obstruction was caused by tumour, probably non-malignant, developed either in the coats of the rectum, or in its immediate vicinity.

Stricture of the large intestines is occasionally the cause of serious obstruction, which might admit of relief by the formation of an artificial anus. This disease may exist in any portion of their course. In the museum of the Leeds School of Medicine is a well-marked example of stricture of the colon, situated at a distance of three inches from the cæcum. It has occurred to the writer of this article to witness a succession of strictures throughout the transverse and descending portions and sigmoid flexure of the colon, at distances of two or three inches from each other. The contracted parts would scarcely admit the tip of the little finger, and presented a slight induration and thickening of the intestinal coats. He has been permitted by some of his medical friends to give the following brief notice of three cases, occurring in their practice. Mr. Hey was, some time ago, consulted by a gentleman who had long suffered from constipation, and, at length, experienced a severe attack of obstruction of the bowels, which proved fatal in a few days. On dissection, the rectum was found to be contracted to the size of a goose-quill, at a distance of eight inches above the anus. The coats of the intestine, at the strictured part, were a little indurated, but free from ulceration.

Mr. Smith, one of the surgeons of the Leeds infirmary, attended a gentleman, aged 67, who, for several years, had only been able to part with feces in a liquid state, which were generally ejected with considerable force. During the summer of 1832 he was seized with

point of union between the transverse and descending portions of the colon; the cavity of the intestine was here considerably contracted, and it appeared probable that this was occasioned by a small bone which was found in this point."—*Prov. Med. and Surg. Journal, Sept.* 18, 1841.

an obstinate attack of constipation, attended with frequent vomiting. After three days of severe suffering and imminent danger, copious liquid evacuations occurred, and he speedily recovered. In October, 1833, a similar attack of obstruction proved fatal in two days. On examination after death, a narrow band of stricture was found exactly seven inches above the anus. The coats of the intestine were a little thickened at the part. Above the stricture, the bowel was much distended; and, below, the rectum appeared perfectly natural.

In 1840, Mr. William Hey, Surgeon to the Leeds Infirmary, was consulted by a gentleman on account of difficulty in evacuating the bowels, attended with pain in the abdomen and a discharge of bloody mucus. Stricture was suspected, but examination by the finger failed to detect such a state. An instrument could not be passed more than five or six inches. After three months, the difficulty of evacuating the bowels had increased, and the attempts were accompanied by violent straining and discharge of bloody mucus. No feces had been passed for some time, except in a liquid state. At length, complete obstruction occurred, and, after it had continued several days, Mr. W. Hey's attendance was again requested. He found the patient suffering from frequent vomiting; his countenance anxious, and the intestines enormously distended, their convolutions being visible externally. On passing the finger into the rectum, a stricture at the upper portion of this intestine was distinctly felt, from the part being forced down by the great distension of the bowels above it. The intestinal coats, at the strictured part, were firm and thickened, and a small central aperture, of a circular form, could be readily distinguished. With great difficulty, a gum-elastic catheter was passed through the opening, and a copious discharge of air and liquid feces followed, which was further promoted by injections of warm water. The relief, however, was only temporary, death occurring on the third day following. No examination of the body was obtained.

The large intestine is sometimes observed, in certain parts of its course, to be reduced in calibre much below its natural size, without presenting any appreciable alteration of structure. The following case, lately observed by the author of this paper, may serve as an example of this affection. A lady, aged 62, subject to habitual constipation, was seized, after imprudence in diet, with violent vomiting. Undigested food was at first ejected, and afterwards watery secretions from the stomach more or less tinged with bile. Neither distension of the abdomen, tenderness on pressure, nor any symptoms indicative of inflammation existed. Clysters returned immediately after being injected, and could not be introduced to a greater amount than half a pint. By the aid of the finger, the lower part of the rectum was ascertained to be remarkably capacious; and within it could be felt a corrugated mass consisting of the upper part of the rectum, which had fallen down into the capacious lower portion. By disentangling the folds of which the prolapsed mass was composed, the tip of the finger could be made to enter a narrow canal. An ivory ball, attached to a silver stem, guided by the forefinger in the rectum, was introduced into the contracted part, and after traversing it for about an inch was firmly arrested. All attempts to procure evacuations by the natural passage proved unsuccessful; large quantities of bright green fluid were ejected by vomiting at short intervals; and the unfortunate sufferer sunk exhausted on the third day. On examination after death the lower part of the rectum was found to be unusually large, but the upper portion, at the distance of six inches from the anus, was suddenly diminished in size, so as to embrace tightly the forefinger, which could only be passed along the contracted part a little more than an inch; above this the intestine was reduced to the size of a goose-quill, and presented the same diminution of calibre throughout the whole sigmoid flexure, above which it suddenly assumed its natural capacity. Throughout the whole contracted part, the intestinal coats appeared perfectly healthy, being free from induration, thickening, or unnatural degree of opacity. No traces of inflammation were detected in the abdomen; the intestines were collapsed, and contained nothing but a small quantity of their secretions, except a large gall-stone, which was lying loose in the jejunum, having escaped through an ulcerated opening in the coats of the gall-bladder and duodenum. Another gall-stone was seen, partially protruding through a second ulcer of smaller size. This case is adduced for the purpose of illustrating an unnatural condition of the intestine, which might be productive of such obstruction as would be relieved by the formation of an artificial anus; but, to this particular case, the operation could not have been considered applicable, as there never existed any distension of the bowel above the contracted part. It is probable that the presence of the gall-stone in the intestines exerted considerable influence in the production of the symptoms.

M. Dupuytren[1] adduces as examples of such diseases as might occasionally be relieved by the formation of an artificial anus, the case reported by Lafaye, of an officer, in whom, after death, the rectum, at its junction with the colon, was found to be so small, as scarcely to admit the tip of the little finger; and another observed by Charve, in which the upper part of the rectum was contracted to the size of a quill. M. Dupuytren remarks that these cases forcibly reminded him of that of Talma.

The instances now adduced, as well as numerous others, scattered throughout the records of pathology, are sufficient to expose the fallacy of an opinion maintained by some surgeons, even in the present day, that stric-

[1] Dict. de Méd. et de Chir. Prat. t. iii. p. 125.

ture or unnatural contraction of the large intestines, rarely, if ever, exists in any other portion of the tube, except the lower part of the rectum. These facts ought to impress the mind of the surgeon with the great importance, both of recognizing such changes in their early stage, as well as of detecting their existence at a more advanced period, when they have produced such obstruction of the bowels as threatens speedy dissolution. In the former instance he may sometimes succeed in removing the affection, or in preventing its increase; in the latter, he may be enabled to hold out that prospect of relief, which an artificial anus affords.

The means whereby we may recognize these affections are undoubtedly very limited, but still they are such as may in many instances succeed. By the finger, the rectum can be explored only throughout a small part of its course, except a degree of invagination exists, as in two of the cases reported above, when even the upper portion of this bowel may be examined by direct touch. The ordinary rectum-bougie is ill calculated to give information of the state of the rectum, from its being firmly grasped by the sphincter; but much more accurate information may be attained by the use of sounds, consisting of ivory balls of different sizes, attached to a silver rod twelve inches in length, admitting of being bent to different degrees of curvature. By such instruments contractions of the rectum, as high as five, or even seven inches above the anus, may be detected, and in their early stages relieved; but, in the employment of these sounds, it is necessary to guard those, who have had but little experience of their use, against the deception which might arise from the instrument being arrested by the promontory of the sacrum, by an enlarged uterus, or by the folded state of the intestine at its junction with the colon, when the mesorectum is more relaxed than usual.

Bibliography.—The best writers on Intestinal Fistula, and their works, have been given in the body of the preceding article.

THE END.

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