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Intestinal Obstruction

Frederick Treves F.R.C.S.

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INTESTINAL OBSTRUCTION:

ITS VARIETIES,

WITH

THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT.

The Jacksonian Prize Essay of the Royal College of Surgeons of England, 1883.

BY

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COLLEGE OF SURGEONS OF ENGLAND.



WITH 60 ILLUSTRATIONS.

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To

JOHN STRUTHERS, Esq., M.D.,

PROFESSOR OF ANATOMY AT THE UNIVERSITY OF ABERDEEN,

AS A TOKEN OF RESPECT

FOR HIS POSITION AS AN ANATOMIST,

AND AS A

SLIGHT ACKNOWLEDGMENT OF MANY ACTS OF KINDNESS.

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PREFACE.

THE importance of the subject of Intestinal Obstruction may be, in one way, estimated by the circumstance that over two thousand individuals die every year in England alone from various forms of obstruction of the bowels, exclusive of hernia.

In the following work I have based the classification of the different varieties of Intestinal Obstruction upon pathological grounds rather than upon clinical distinctions. This has been done for two reasons. In the first place, the knowledge of the morbid anatomy of Intestinal Obstruction is much more extensive and precise than is the knowledge of its clinical history; and, secondly, the arrangement is more convenient, inasmuch as it avoids much repetition which would otherwise be necessary. A classification, however, based upon purely clinical grounds is extremely desirable, and this classification I have attempted in the chapters upon diagnosis.

In the consideration of the various forms of the present affection I have dealt first with the pathological aspect of the case, then with the symptoms, and finally with the prognosis. The general diagnosis of Intestinal Obstruction, as a whole, is reserved for some special chapters, and the same method has

been adopted with regard to the whole subject of treatment.

The drawings are, with a very few exceptions, original, and I am indebted to the artist, Mr. R. E. Holding, for the care he has expended upon them.

The work is in substance the Essay to which the Jacksonian Prize was awarded by the College of Surgeons in 1884. The Essay was completed in December, 1883. It has been entirely revised, some parts have been re-written, and such new matter has been introduced as was required to bring the work up to date.

My thanks are due to the Council of the College of Surgeons for permission to publish the Essay and certain of the plates that illustrate it.

FREDERICK TREVES.

18, *Gordon Square, W.C.*
September, 1884.

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INTESTINAL OBSTRUCTION.

CHAPTER I.

THE CLASSIFICATION OF INTESTINAL OBSTRUCTION.

THERE are several different plans upon which a classification of the various forms of intestinal obstruction may be based.

By one method they may be divided into the two great classes of the *congenital* and the *acquired*, according to whether the conditions that produced the obstruction existed at birth, or had been subsequently produced. Among the former may be placed such examples as depend upon congenital stenosis, upon certain congenital deformities, upon Meckel's diverticulum, upon peritoneal bands the result of intra-uterine peritonitis, and the like. Among the latter would be grouped cases of stricture following ulceration, intussusception, volvulus, strangulation by bands produced by peritonitis, cases of obstruction by foreign bodies, and indeed all the principal examples of intestinal occlusion.

By another method the classification is founded upon a discrimination of the different mechanical conditions that produce the narrowing or closure of the lumen of the bowel. Thus in one set of cases the lumen of the canal is obliterated by *pressure from without*. This division would include all cases of strangulation by bands and through apertures, and all examples of obstruction by the pressure of a tumour

outside the bowel. In another set of cases the intestine is occluded in consequence of an *alteration in its normal outline* and in the relation that its walls bear the one to the other. Under this heading would be classed examples of volvulus, of occlusion by kinking and bending, and the important series of cases known as intussusceptions. In a third variety of case *the lumen of the bowel is blocked* by some substance such as a foreign body that has been swallowed, a gall stone, an enterolith, a mass of fæcal matter, or a neoplasm growing from the intestinal wall. In a still further series of cases the obstruction depends upon *changes arising in the wall of the gut itself*, and under this heading we meet with stenoses and strictures of all kinds, including both those that are simple and those that are cancerous.

By a third method of classification all cases are divided according to their *clinical character* and are grouped into acute and subacute cases, into chronic cases and into chronic cases that end acutely. This division of the subject has been adopted in that part of the present volume which deals with the general subject of diagnosis.

Lastly there is a method of classification based upon *pathological anatomy*. This is the method that has been followed in the body of the present work.

This plan consists in grouping together instances of intestinal obstruction that are pathologically alike. It consists of such an arrangement and grouping as would probably be adopted if all the specimens of intestinal obstruction in any large museum were taken, and an attempt then made to arrange them in some definite and coherent order. The classification that is founded upon this basis is the following:

Strangulation by bands, etc., or through apertures.
Volvulus.
Intussusception.

Stricture.
Obstruction by neoplasms.
Compression by tumours, etc., external to the bowel.
Obstruction by gall stones and foreign bodies.
Obstruction by enteroliths.
Obstruction by fæcal masses.

CHAPTER II.

SOME ESPECIAL FEATURES IN THE ETIOLOGY OF INTESTINAL OBSTRUCTION.

Into the very wide and complicated subject of the general etiology of intestinal obstruction I do not propose to enter in this place, since the more important features in the causation of the various forms of stoppage of the bowels are detailed in the account given of those different forms when considered individually.

There are, however, certain phases of the matter that are well worthy of a separate consideration upon special grounds, and among these may be taken the influence of the following affections in producing intestinal obstruction, viz.:

Peritonitis.
Strangulated hernia.
Mesenteric gland disease.

The important subject of the influence of ulceration of the intestine in producing occlusion is fully considered in the chapter on stricture.

Peritonitis.—It is well known that in this affection, and especially in what is known as the adhesive form, a fibrinous exudation appears upon the surface of the inflamed membrane. Any two surfaces so affected may, through the medium of the

exudation, become adherent if they be brought into contact with one another.

The adhesion may be over a very extensive surface, or may involve only a few isolated points. As the inflammation subsides there is no doubt that a good deal of this exudation is in time absorbed. Such as remains becomes organised into fibrous tissue, and so are produced "adhesions," "bands," "peritoneal false ligaments," and the like.

Some of these adhesions may be extremely loose and delicate, while others are composed of a more callous material. It would appear that many of the more flimsy of these uniting structures in time disappear, even after they have become organised into definite connective tissue. It is much to be regretted that so little is known of the circumstances that favour the absorption of adhesions after peritonitis, and so an important element in the prognosis of that affection is lacking. One circumstance that has distinct influence in this direction is certainly the movement of the adhering parts. As an illustration of this might be taken adhesions that involve the small intestine, and that are connected with that bowel either by both of their points of attachment or by one.

During the progress of peritonitis the intestines are relatively still. They are, moreover, more or less distended from some paralysis of their walls. As a result of this distension coils of bowel may be brought together that were hitherto far apart, or a certain loop may be placed in association with a comparatively distant point on the parietes. When the inflammation has subsided the parts return, as far as possible, to the status quo ante, peristaltic movements spread through the intestine, coils that were close together tend, as a result of those movements, to become separated, and adhesions that attach the

intestine to points upon the parietes are persistently dragged upon. It follows from this almost constant tension that the still soft adhesion yields, becomes elongated and thinned, ultimately gives way and is absorbed.

Movement also has great influence upon the future physical characters of the adhesion. Most of the adhesions assume primarily a membranous character, and this they may retain throughout their existence. It is not uncommon to find some coils of intestine matted together by an extensive series of false membranes, which appear sometimes as wide expansions, at other times as thin but broad ribbon-like bands, of all dimensions and of various lengths (Figs. 1 and 24). If two distant coils of small intestine have been brought together during peritonitis, and have become attached to one another by means of the exudation, or if a like attachment has taken place between the intestine and the parietes, then, as movement is restored in the bowel, the adhesions, which may be quite membranous, are dragged upon, and as a result become elongated. As they increase in length so must they become attenuated in width and thickness. The constant tension, moreover, probably interferes with their already feeble nutrition, and induces a further wasting.

The wide membranous adhesion may thus become narrowed and ribbon-like.

It may, however, undergo a still further change. This adhesion, subjected to the rolling movements of the intestines over one another, and subjected to frequent tortion, now in one direction and now in the other, tends to become rounded and cord-like, and the more that it is stretched the more completely is this transformation favoured. Thus are formed "peritoneal false ligaments" and the bands that are so common a cause of strangulation of the bowel.

The moulding of the mass of adhesion-tissue into a cord by the movements active within the abdomen is illustrated by the changes that are effected by those movements in the omentum when it becomes adherent. This structure may become attached by its free extremity, and in the course of time, if the abdomen be opened, it will be found to be changed into a cord-like mass. The intestines in their movements have rolled over and under and about the adherent membrane, and at last they have moulded it almost as a piece of clay may be moulded when rubbed between the palms. This change is best brought about when the situation of the adhesion is such as to keep the membrane on the stretch.

A like metamorphosis may be effected in any smaller part of the great omentum that may have become adherent to a distant point.

By a combination of these various circumstances, by a stretching of the adhesion on the one hand, by its consequent attenuation on the other, and its subjection to the moulding influences of moving intestines for the third part, it happens that cords and bands of great length are often produced as a result of peritonitis. Many instances may be given, but one of the most striking is afforded by a case reported by Mr. Obre.* In this example a cord-like band was found to pass from a coil of small intestine situated near the xiphoid cartilage to the parietal peritoneum about the inguinal canal. The false ligament measured seventeen and a half inches. The patient had had a strangulated inguinal hernia, and there was clear evidence to show that the herniated bowel had been that to which the cord was attached. Subsequent changes in the abdomen, which were associated with much violent peristaltic movement and much distension, had carried the involved coil so far

* Path. Soc. Trans., vol. iii., page 95.

away from its original point of adhesion as to produce the band described.

It must be remembered that not only may these bands form arcades beneath which coils of intestine may become strangulated, but the longer of them may become separated at one of their points of attachment, and so form floating cords that may lead to strangulation of a loop by "knotting."

Adhesions of all kinds, but especially those attached to parts not susceptible of much movement, may undergo considerable contraction. In cases of extensive peritonitis this contraction may produce great deformity. The mesentery may become so shrunken as to produce obstruction in the intestine to which it is attached. The most severe form of this condition is that known as peritonitis deformans.

Adhesions upon the surface of a fixed part of the intestine may, as a result of their contraction, produce great narrowing of the bowel by compressing it. This condition is not infrequently met with in the colon, and especially in the hepatic and splenic flexures (Fig. 22). In parts of the tube where the gut cannot be compressed against an unyielding surface the contraction of peritoneal adhesions may still produce some obstruction by causing an extensive puckering of the intestinal walls.

Some of the adhesions formed after inflammation of the serous membrane are exceedingly complicated, while others are found to unite parts that are usually far separated from one another. Thus I find instances of adhesion between the ascending colon and the ovary, between the transverse colon and the cæcum in one case, and the mesentery over the lower lumbar region in another, between the arch of the colon and a part of the parietes not far above the symphysis. Then again the sigmoid flexure has been found connected by adhesions to the bladder, the

uterus, the rectum, the peritoneum in the right iliac fossa, and the cæcum. In all these cases I think that the unusual connection of parts may be explained by displacement from distension, the distension occurring during the development of the peritonitis. Thus the transverse colon when distended is apt to become bent upon itself, and by such bending to reach the lower parts of the abdomen. In the same way the distended sigmoid flexure may turn down into the pelvis, or extend across to the right iliac region, or even mount up in the abdomen and reach the liver.

In addition to the causes of obstruction already alluded to, peritonitis may be the means of bringing about an occlusion in the intestine by other and very different methods.

The adhesions may form a part of the bowel into a rigid loop, they may bend it so acutely as to greatly narrow or even entirely obstruct its lumen, they may lead to obstruction by kinking, or they may bring about an arrangement of certain coils of small intestine or of the loop of the sigmoid flexure that especially favours the production of a volvulus.

In another series of cases as a result of local peritonitis, the omentum or the tip of the appendix vermiformis has become adherent at one point, and beneath the arcade so formed coils of intestine have been strangulated. Similar arcades have been formed by the adhesion of the point of a free Meckel's diverticulum, and of the outer extremity of the Fallopian tube.

In still another variety of case a loop of bowel has been strangulated through a slit in a membranous adhesion, or through an aperture formed by adhesions between adjacent viscera, or through the gap left between two parallel adhesions.

With regard to the forms of peritonitis that may lead to adhesions capable of producing obstruction,

it can be briefly said that any variety of peritoneal inflammation from which a patient recovers may become indirectly a cause of intestinal occlusion. In the great majority of cases, therefore, it will be found to have been a very localised peritonitis. The principal examples are furnished by the circumscribed pelvic peritonitis that is comparatively so common in women, by that attending typhlitis or perityphlitis, by that depending upon injury, or upon an ulceration of the stomach or intestine that has not quite advanced to perforation. Another common form has followed upon strangulated hernia. Another has been induced by gall stones, and has led probably to adhesion between the gall bladder and the colon. Another has been set up by fæcal accumulations, or by the impaction of some foreign substance in the bowel.

It must be remembered also that peritonitis may occur during intra-uterine life. Dohrn, indeed, reports a case of obstruction in a child eight days old that ended fatally, and was found to be due to adhesions formed evidently before birth.*

There is also a form of peritonitis that may occur shortly after birth, and that appears to be due to extension of inflammation from the divided umbilical cord.

The variety of peritonitis known as "infantile," and which is distinct from the localised form just mentioned, is with very rare exceptions always fatal, and in the newly born would appear to be without exception fatal.

Acute diffused peritonitis is so very seldom recovered from that it can have little concern in the etiology of obstruction. In puerperal peritonitis, according to Bauer, "an absolutely fatal prognosis

* Quoted by Bauer ; Ziemssen's Cyclopædia of Medicine, vol. viii., page 288.

must be made," and the same gloomy prognosis applies to the peritonitis depending upon carcinoma.

With regard to tubercular peritonitis, it leads in time to a certain death; but its course is usually chronic, and during its progress it is apt to produce very numerous and extensive adhesions, which are frequently the cause of intestinal obstruction. Indeed, certain writers have included chronic tubercular peritonitis among the varieties of chronic occlusion of the bowels.

Strangulated hernia.—There is, I think, a fairly common impression that when a strangulated hernia has been reduced and the patient has recovered from the operation, no further evils will result beyond a possible return of the hernia, and with it a risk of a second strangulation. A piece of bowel, however, that has been strangulated in an external hernia and has then been reduced into the abdomen may be the cause of one of many different forms of intestinal obstruction. I do not allude to results immediately following the reduction of the hernia, but to results that are comparatively remote. Among the former, as is well known, it is not infrequent for the once strangulated loop to remain so entirely paralysed after reduction as to continue the symptoms of obstruction until death ensues, and that, too, without either becoming gangrenous or causing peritonitis.*

The conditions with which I propose to deal briefly are remote, and are subsequent to the more or less complete recovery of the patient from the operation.

1. The peritonitis about the reduced loop of bowel may lead to adhesions, and these may cause obstruction

* *See* cases by Mr. Pitts, St. Thomas's Hosp. Reports, 1882, page 75; and Henrot (Pseudo-étranglements, page 46). For a general consideration of the immediate effects that may follow reduction, *see* "Les Accidents consécutifs à la Réduction de l'Entérocèle étranglée," by Jules Perret. Thèse. Paris, 1879.

by kinking or bending of the gut. On the other hand, the omentum or a free coil of intestine may become adherent to the inflamed serous surface, and thus a condition be produced that may lead to obstruction.*

2. The reduced loop may adhere to the abdominal parietes and become obstructed by bending and by the changes known as "traction effects." Examples of this form of obstruction are given in chapter vi.

3. The adhesions about the reduced and adherent loop may be extensive, and may so contract as to narrow the lumen of the gut by compression.

4. The herniated coil may be retained in the form of a permanent loop by means of adhesions, and this loop, whether an "open" or a "closed" one, may lead to obstruction of the intestine, as is fully explained in a subsequent part of this work.

In one instance at least a fistula bimucosa was formed between the extremities of the loop.

5. Stricture may follow as a result of damage to the walls of the bowel, ulceration of the mucous membrane, and the like. Several illustrations of this condition will be found in the chapter upon cicatricial stricture.

6. The great lengthening of the mesentery that is usually found in large herniæ favours especially the formation of volvulus of the small intestine. The connection between these two conditions is well shown in a case reported by Dr. J. K. Fowler, where there is little doubt but that a fatal volvulus of the ileum depended upon an unduly long mesentery resulting from hernia.†

* Bull. de la Soc. Anat., 1864, page 252; M. Besnier. *See also* Path. Soc. Trans., vol. vii., page 198; Mr. Obre.

† For a further account of this matter *see* a paper by the author on "The Forms of Intestinal Obstruction that may follow after Hernia" (*Lancet*, June 7, 1884).

Mesenteric gland disease.—Mesenteric gland disease may indirectly lead to obstruction in several different ways.

1. The little local peritonitis excited in the serous membrane covering the glands may lead to the adhesion of a free diverticulum, or of the free end of the omentum, or may encourage the development of bands which may in turn prove a cause of intestinal strangulation.*

2. The local peritonitis may lead to adhesions being formed between two remote parts of the intestinal tube. Thus, in a case recorded by Dr. Hilton Fagge the sigmoid flexure was found attached to the ileum, and in the angle between these two adherent portions of gut was a caseous gland.†

3. The ileum about the seat of a diseased gland in the mesentery may become sharply bent upon itself; and between the two limbs of the loop so formed, and fusing them together, as it were, will usually be found an old and degenerate gland.

Or the bending may be very limited and well localised, so that a fold of the bowel is turned in and forms a species of diaphragm. This condition is shown in the remarkable, and, I think, unique, case depicted in Fig. 49.

4. In several instances the shrinking of the mesentery after extensive gland disease has been so considerable, and has produced so much distortion, as to lead to a fatal obstruction of that part of the bowel connected with the diseased area.‡

5. Dr. Leared has reported a case of fatal stran-

* *See* specimens, Guy's Hosp. Museum, No. 1,819 (36); and St. Bart.'s Hosp. Museum, No. 2,165; also cases by M. Bricheteau (Bull. de la Soc. Anat., 1861, page 118), and by Mr. B. Hill (*Lancet*, vol. i., 1876, page 773).

† Path. Soc. Trans., vol. xxvii., page 157.

‡ *See* Path. Soc. Trans., vol. xxi., page 187; and cases by Dr. Fagge, Guy's Hosp. Reports, vol. xiv., page 272.

gulation of the small intestine through a hole in the mesentery. It was considered that this aperture was probably caused by the breaking down of a mesenteric gland. The patient was a lad aged 14.*

CHAPTER III.

STRANGULATION BY BANDS OR THROUGH APERTURES—HERNIA-LIKE STRANGULATION OF THE BOWEL.

Under this variety of intestinal obstruction may be included :

1. Strangulation by isolated peritoneal adhesions.
2. Strangulation by cords formed from the omentum.
3. Strangulation by Meckel's diverticulum.
4. Strangulation by normal structures abnormally attached (such as by an adherent vermiform appendix or Fallopian tube, or by a fixed mesentery), including strangulation by the pedicle of an ovarian tumour and the like.
5. Strangulation through slits and apertures in the mesentery or omentum, or in certain peritoneal ligaments, or through membranous adhesions.

These various forms may be conveniently considered together, for although in each case the anatomical cause of the obstruction is different, yet the effects upon the gut are in all instances practically identical. In each the segment of bowel involved is, almost without exception, the small intestine. In each the mechanism of the obstruction is practically the same. In each the symptoms that arise are, with some minute exceptions, so nearly identical that they may be studied as a whole. In each the course and issue of the malady are such that

* Path. Soc. Trans., vol. xiv., page 156.

these various forms may be said to share a common prognosis. Between them all, moreover, there is a close bond of union in the fact that they are adapted for the same form of treatment, and may be relieved by the same operative procedures.

Considered as a whole this form may be taken as the type of acute intestinal obstruction, and as such it assumes a position of considerable importance. It is the strangulated hernia of the interior of the abdomen. It obstructs the gut as a hernia obstructs. It involves the small intestine with about the same frequency as does an external rupture. It is indeed as rare to find a portion of the large intestine strangulated by any of the methods above named, as it is to discover colon in a femoral or inguinal hernia. The symptoms that attend this variety of intestinal obstruction are, in all main points, the symptoms of strangulated hernia, and the prognosis of the two affections depends rather upon the situation of the constricting agent than upon any other factor. It is for many reasons a matter of moment to note that strangulated hernia and the different forms of internal obstruction above described are but varieties of a single malady, that they differ from one another solely on anatomical grounds, that in their pathology and in the broader lines of their clinical history they are the same, and that, excluding the taxis, they are amenable to the same general form of surgical treatment.

It will be convenient to consider the pathological anatomy of these five varieties of obstruction separately, and then their symptoms and the elements of their prognosis collectively.

PATHOLOGICAL ANATOMY.

1. **Strangulation by isolated peritoneal adhesions.**—These isolated adhesions (known com-

monly as "bands," "solitary bands," or "peritoneal false ligaments") are the results or residues of some form of peritonitis. Owing to the high mortality of acute diffused peritonitis on the one hand, and the very general and extensive adhesions produced by chronic diffused peritonitis on the other, it follows that these isolated bands are usually due to moderate, chronic, and well localised forms of peritoneal inflammation. It would appear, as has been already pointed out, that in some cases they may be congenital, and due then to intra-uterine peritonitis. The mode of formation of these bands, and the methods whereby they become elongated and cord-like have already been described (chapter ii.).

Their appearance in cases where they have caused obstruction varies greatly.

Most commonly the "band" takes the form of a firm fibrous cord about the size of a No. 4 or No. 6 catheter. It may be still more slender, and appear as a tough, rigid thread. On the other hand, it may be of comparatively large size; thus M. Terrier has reported a case of internal strangulation, for which he performed laparotomy, where the constricting band had nearly the dimensions of the little finger.* The cord-like "band" is usually described as being dense and fibrous, and in one or two instances as being of almost cartilaginous hardness. Less frequently the constricting agent has the appearance of an actual band, and in such cases is found as a tough ribbon-like membrane, with a width of half an inch or even more. A band of this character is well shown in Fig. 1.†

The "false ligament" is usually single, and hence the name bestowed upon it by Mr. Gay of "the

* Bull. et Mém de la Soc. de Chir. de Paris, vol. iv., 1879, page 564.

† London Hosp. Museum, No. Ad. 78.

solitary band." It must not be assumed, however, that such a band commonly exists as the solitary *adhesion* in any given case. It most probably will be the only isolated adhesion, and the only one so modified as to be capable of strangulating the bowel. But in cases where this isolated adhesion is met with other adhesions will very usually be found. This is

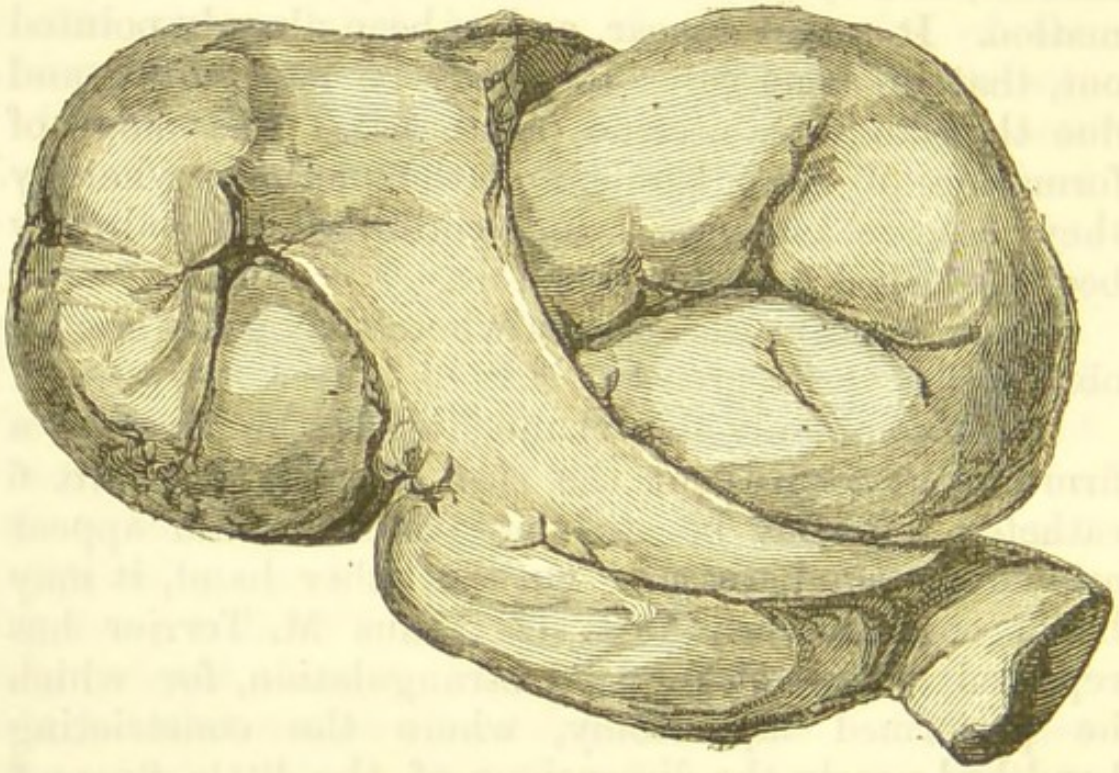


Fig. 1.—Strangulation by a broad Peritoneal Band passing between two adjacent Coils of Ileum.

especially the case when the band is due, as it often is, to pelvic peritonitis. The same applies, although in a less degree, to the local peritonitis set up by inflammation in or about the cæcum. Here, in addition to any adhesion that may have become isolated, elongated, and cord-like, there will very probably be some matting together of parts in the immediate vicinity of the caput coli. Many cases, however, are reported where the only relics of a typhlitis have assumed the form of one solitary band. A single false ligament, the representative of a single adhesion,

may be produced by the very localised peritonitis that is sometimes associated with caseous degeneration of a mesenteric gland. I have met with several reported cases, and not a few specimens, that illustrate this circumstance. A single adhesion may readily follow upon the little speck of peritonitis that often attends an intestinal ulcer (Fig. 20). As the ulcer deepens it excites an inflammation over a very limited area of the serous surface. This inflamed spot adheres to some other point on the peritoneum; a single adhesion forms, which, becoming elongated by the method already described, forms an example of the solitary band. A great many of the cases of "solitary band" described are evidently instances of strangulation by Meckel's diverticulum, or by a diverticular ligament.

In some few cases there have been two or more false ligaments found in the abdominal cavity. Sometimes these would appear to have been produced by the thrusting of a coil of intestine through a broad peritoneal adhesion so as to divide it into two segments. In other instances the bands are independent of one another. Mr. Berkeley Hill reports a case of acute intestinal obstruction where two bands existed, both of which constricted knuckles of small intestine. One constriction was, however, comparatively slight, the other was severe. Laparotomy was performed, and unfortunately the band found and divided was that associated with the minor obstruction. The more serious strangulation was overlooked and the child died. The adhesions in this case appear to have been due to mesenteric gland disease.*

The false ligament, although single, may have a complicated arrangement, and lead to extraordinary forms of constriction of the bowel. Thus in the

* *Lancet*, vol. i., 1876, page 773.

specimen shown in Fig. 2* there was one isolated adhesion. It was, however, broad and Y-shaped; one end of the Y was attached to the uterus, while the two other ends were connected with points on the small

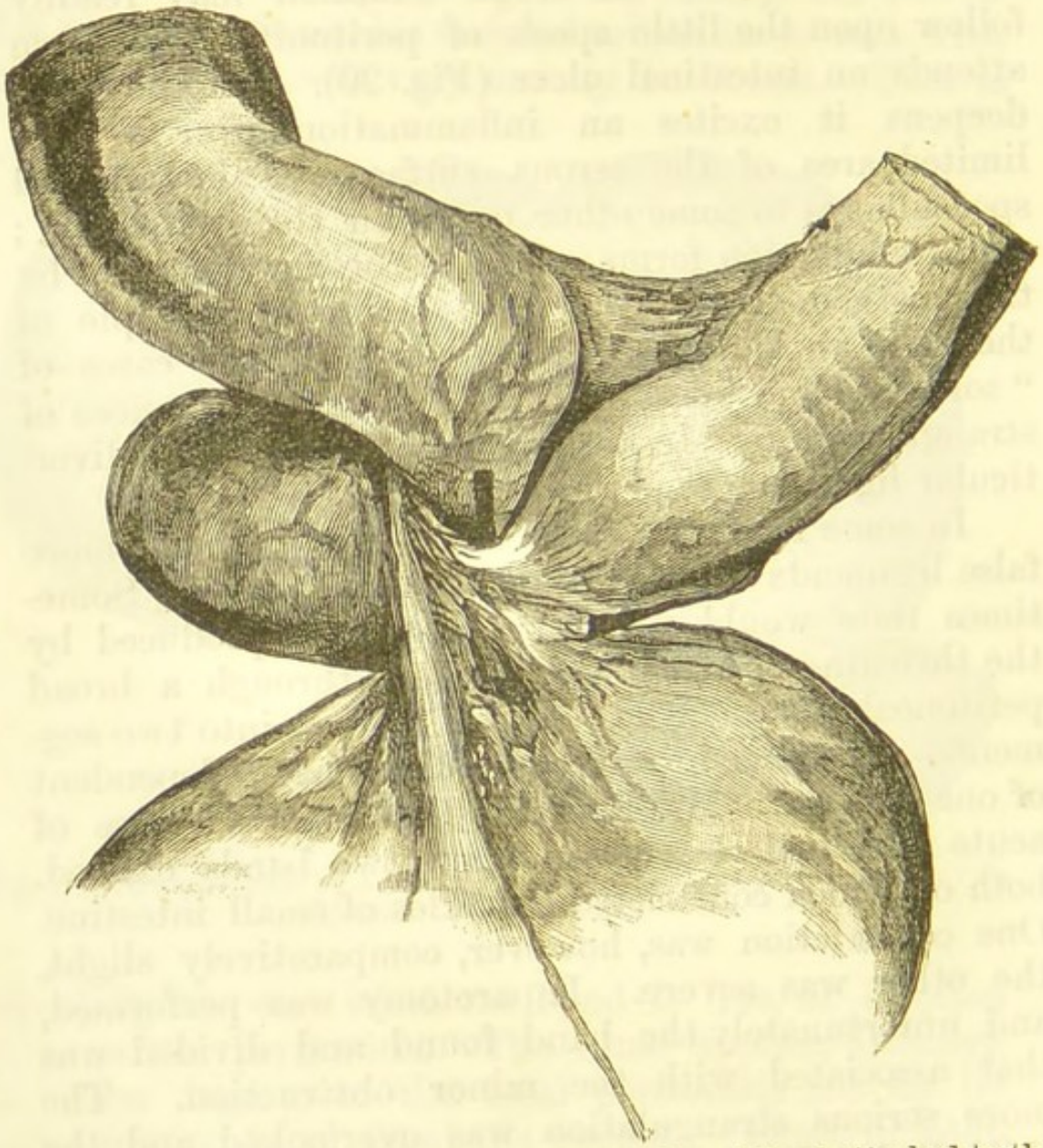


Fig. 2.—Strangulation of the Ileum by a Y-shaped Band attached to the Fundus of the Uterus.

The Uterus is shown at the lower part of the figure.

intestine about one and a half inches apart. There were many adhesions about the pelvic viscera. In Fig. 3 † it will be seen that an adhesion connecting the

* St. Bart.'s Hosp. Museum, No. 2,164.

† Guy's Hosp. Museum, No. 2,507 (50).

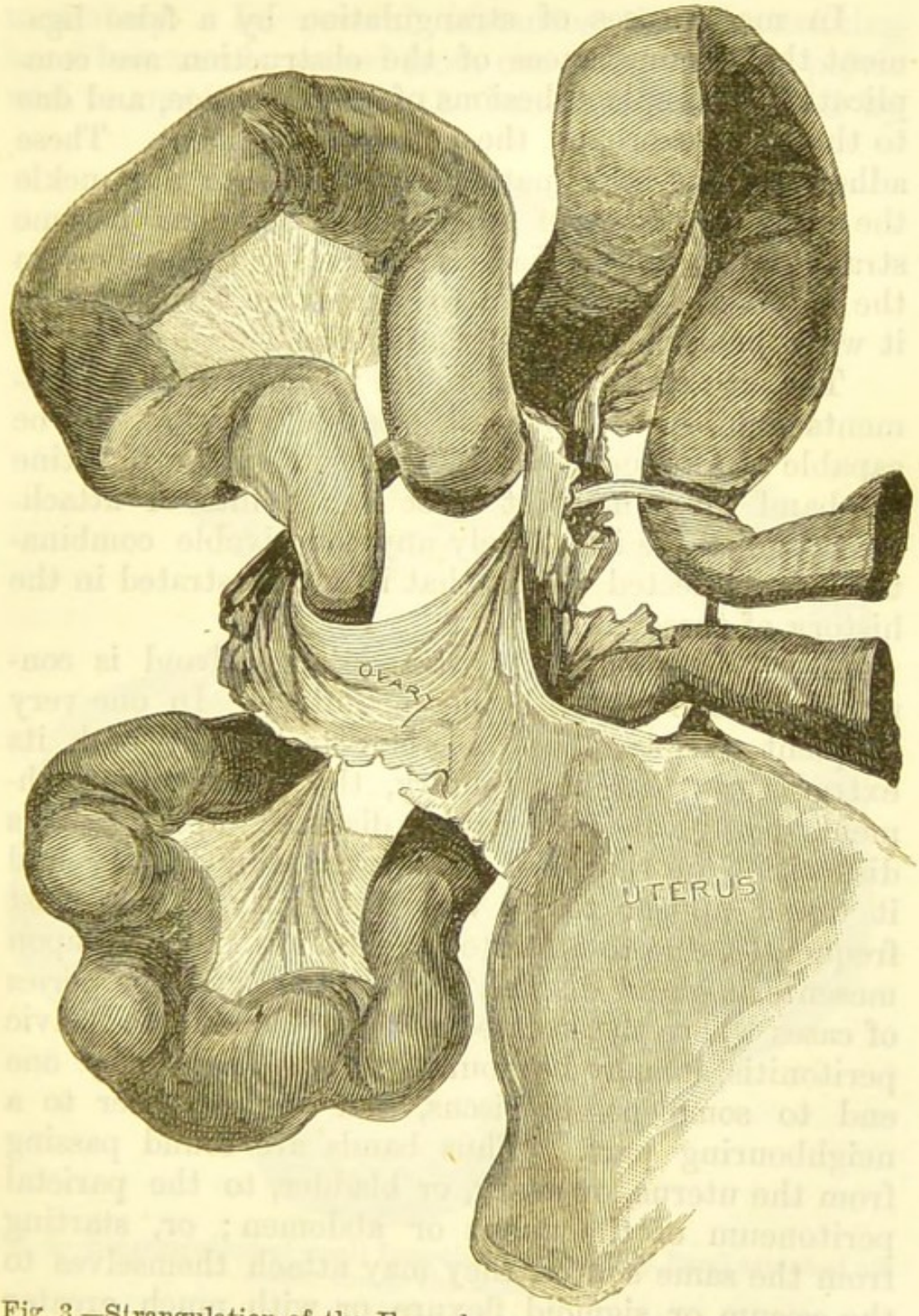


Fig. 3.—Strangulation of the Ileum by complicated Bands passing between the Uterus and Ovary.

uterus, ovary, and mesentery leads to a complicated form of strangulation and to a double constriction of the bowel.

In many cases of strangulation by a false ligament the circumstances of the obstruction are complicated by simple adhesions of the same age, and due to the same cause, as the so-called ligament. These adhesions may have matted together into a knuckle the very segment of the bowel that has become strangulated, or may have so attached themselves to the involved intestine as to encourage a volvulus of it when beneath the constricting band.

The attachments of these peritoneal false ligaments exhibit the greatest possible variety. To be capable of producing a strangulation of the intestine the band must have at least two points of attachment, and there is scarcely any conceivable combination of connected points that is not illustrated in the history of these adhesions.

Most commonly the strangulating band is connected by one end with the mesentery. In one very frequent variety the band is attached by both its extremities to the mesentery, the points of attachment being at a variable distance apart. This disposition of the band is illustrated by Fig. 4,* and it would appear to be very frequently, if not most frequently, due to a limited peritonitis incident upon mesenteric gland disease.† In that very large series of cases where the isolated adhesion is due to pelvic peritonitis, it may be found to be attached by one end to some pelvic viscus, and by the other to a neighbouring part. Thus bands are found passing from the uterus, or ovary, or bladder, to the parietal peritoneum of the pelvis or abdomen; or, starting from the same source, they may attach themselves to the cæcum or sigmoid flexure, or with much greater frequency to some part of the lower ileum or its

* University Coll. Museum, No. 1,164.

† *See* specimens St. Bart.'s Hosp. Museum, No. 2,165; and Lond. Hosp. Museum, No. Ad. 79.

mesentery. In several instances the constricting band has merely passed from one point on the pelvic wall to another. When the band has been caused by

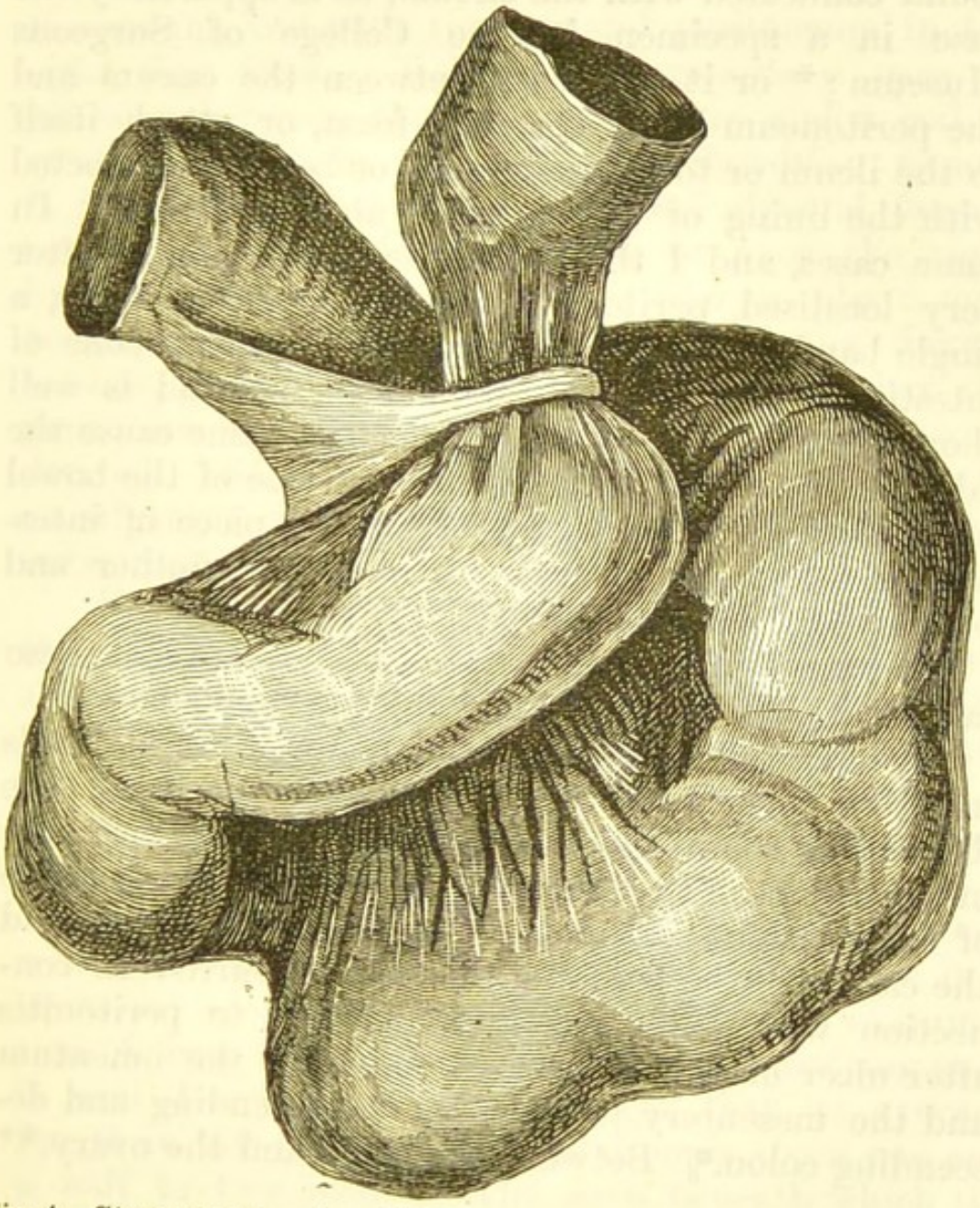


Fig. 4.—Strangulation of small Intestine by a solitary Band attached at either end to the Mesentery.

some local peritonitis in connection with hernia, one of its extremities may be found attached to the vicinity of the femoral or inguinal rings, while the other end may be fixed to the intestine, the mesentery,

or the posterior parietal peritoneum. When the band has followed after typhlitis (one of the common causes of false ligaments), both ends of it may be found connected with the cæcum, as is apparently the case in a specimen in the College of Surgeons Museum;* or it may pass between the cæcum and the peritoneum lining the iliac fossa, or attach itself to the ileum or to its mesentery, or become connected with the lining of the anterior abdominal wall. In some cases, and I think this especially occurs after very localised peritonitis due to intestinal ulcer, a single band passes between two neighbouring coils of intestine. The early stage of such a band is well shown in Fig. 20. Perhaps from the same cause the false ligament may pass from the surface of the bowel to be attached to the mesentery of the piece of intestine involved, or to the mesentery of another and possibly distant segment of the gut.

Whatever their origin, it must be owned that these last-mentioned forms of band are not uncommon.

Among the less usual attachments of these bands may be mentioned the following: Between the descending colon and the mesentery.† Between the mesentery near the cæcum, and the anterior surface of the rectum.‡ Between the transverse colon and the cæcum § (the band in this case occurred in connection with extensive adhesions due to peritonitis after ulcer of the stomach). Between the omentum and the mesentery.‖ Between the ascending and descending colon.¶ Between the colon and the ovary.**

* No. 1,360A.
† St. Thomas's Hosp. Museum, No. R 15.
‡ Mr. Ward; Path. Soc. Trans., 1852, page 362.
§ Dr. Hilton Fagge; Guy's Hosp. Reports, vol. xiv., 1869, page 272.
‖ Dr. Hilton Fagge, loc. cit.
¶ Seerig. Rust's Magazin für Heilkunde, band xlvi.
** Rokitansky; Brit. and For. Med.-Chir. Review, vol. iii.

In not a few cases isolated cords of adhesion are described as passing between the sigmoid flexure and distant parts. In this way the flexure has been connected with the cæcum, with the mesentery near the cæcum, and with the parietal peritoneum in the right iliac fossa. Rokitansky* reports a case of adhesion between the sigmoid flexure and a coil of small intestine in the right hypochondriac region. It is well known that the distended sigmoid flexure may reach the right iliac fossa, or even the right hypochondriac district, and cases like the above may be explained on the assumption that the flexure became greatly distended during the time that the peritonitis was active from which the adhesions were derived. Such distension may readily attend the constipation and intestinal paralysis of peritoneal inflammation.

Methods of strangulation.—When a portion of the intestine is strangulated by an isolated peritoneal adhesion the gut will be found to be constricted by one of two ways. 1. It may be strangulated beneath the band as beneath a shallow and narrow arch. 2. It may be snared and constricted by a noose or knot formed by the false ligament itself.

1. Strangulation beneath a band can only occur when the band is comparatively short, and when it is stretched along a firm surface. From an examination of some fifteen cases, where the constricting cord is well described, it would appear that its average length in this form of strangulation is about one and a half to two inches. The arch beneath which the implicated bowel passes is variously described as large enough to admit one, two, or three fingers. Larger arches have been formed permitting much intestine to pass beneath them, but these great apertures are exceptional in acute cases. Since the cord

* Manual of Path. Anatomy (Syd. Soc.), vol. ii., 1850.

must be stretched along a firm surface it happens that this form of strangulation is much more commonly found about the posterior abdominal parietes than elsewhere. It is often met with about the iliac fossæ, especially that of the right side, and about the brim of the true pelvis. When a band passes between two points on the mesentery a coil of small intestine may readily be strangulated beneath it, the resisting parts between which the bowel is compressed being the false ligament on the one hand, and the mesentery on the other. It will be readily understood also that a knuckle of the small intestine may be strangulated with little difficulty when it passes between a band and a solid viscus like the uterus. In some few cases the firm basis required for this form of obstruction appears to have been provided by a rigid mass of adhesions, across which the false ligament has been stretched.

2. Strangulation by a noose or knot requires a long false ligament which must lie loose and free in the abdominal cavity, being attached only by its two ends.

The snaring of a coil of small intestine by this means must be a matter of some difficulty, and must be almost impossible in cases where the bowel is perfectly normal. As Leichtenstern has well pointed out, the gut in these cases will usually be found to have been in an abnormal condition previous to the occurrence of the strangulation. A knuckle of gut may be rendered so adherent that it could not slip out of the way by peristaltic movement when it had become involved in the noose or knot. It is probably a still more common circumstance for two ends of a loop of intestine to be matted together by a little



Fig. 5.

mesenterial peritonitis, so that if a noose should slip over such a loop, the constricting cord will find at the

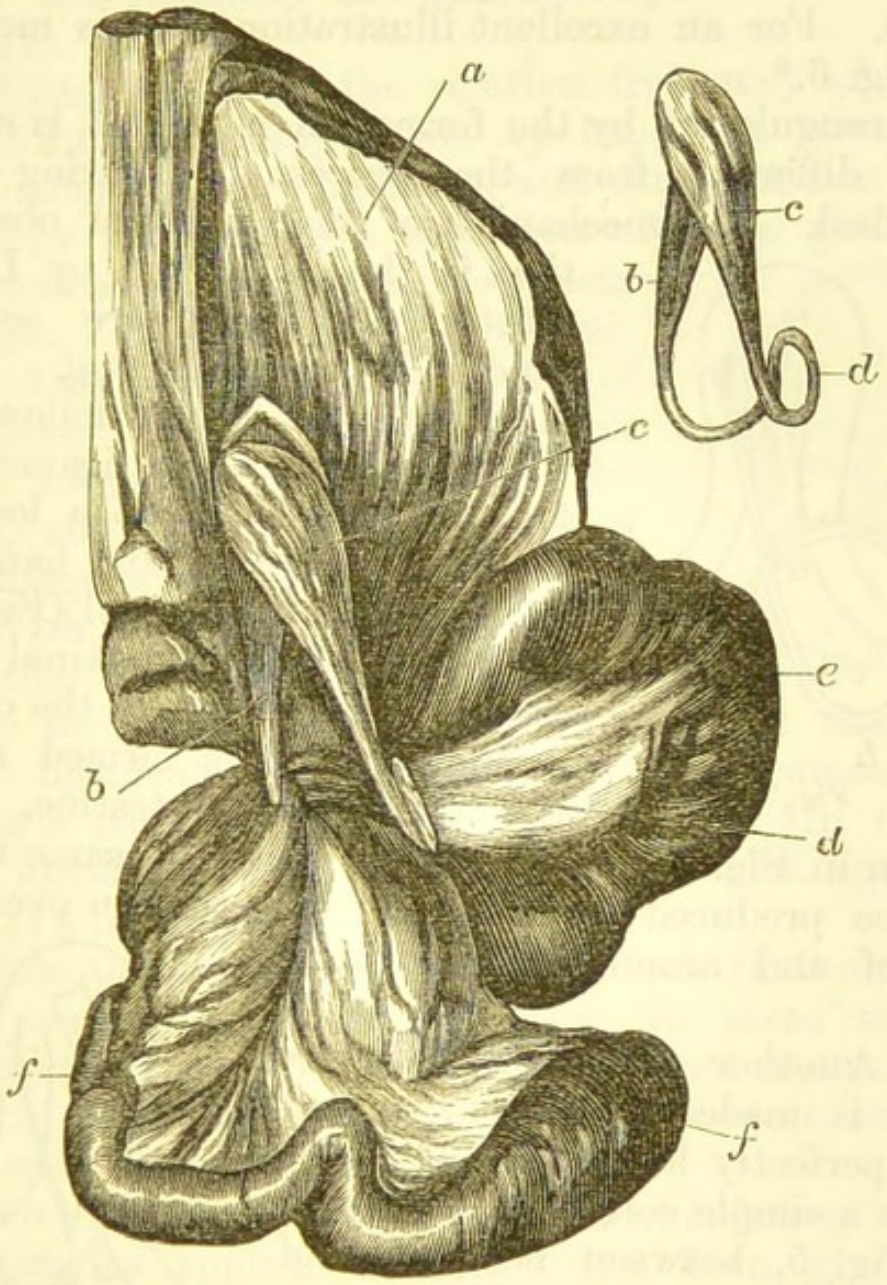


Fig. 6.—Strangulation by a Band. (Astley Cooper.)
a, anterior abdominal parietes; *b*, band passing from a hernial sac to surround the intestine; *c*, band returning to the hernial sac; *d*, loop or noose formed by the band; *e*, intestine strangulated by the noose *d*; *f*, intestine strangulated in a less degree by the portions of the band *b* and *c*.

base of the loop a narrowed neck around which it may take good hold. The most common method whereby a coil of intestine may be snared is when the lax band forms a ring or spiral between its fixed

points *a* and *b* (Fig. 5). Through this ring a loop of the small intestine slips, or over an abnormally fixed coil of that part of the bowel the noose passes. For an excellent illustration of this method see Fig. 6.*

Strangulation by the formation of a knot is somewhat different from the process of snaring just described. The mechanism of this variety of obstruction is thus described by Leichtenstern: "There are several kinds of this knotting. The most frequent is the following: The long and loose ligament is fastened at one end to a loop of the small intestine, and hangs in the form of a simple coil (Fig. 7). If the top of the intestinal loop passes directly through the coil *c*, a simple knot is formed about the piece of the intestine, as is shown in Fig. 8. It is evident that the same result can be produced by the coil being thrown over the top of and around the intestinal loop.

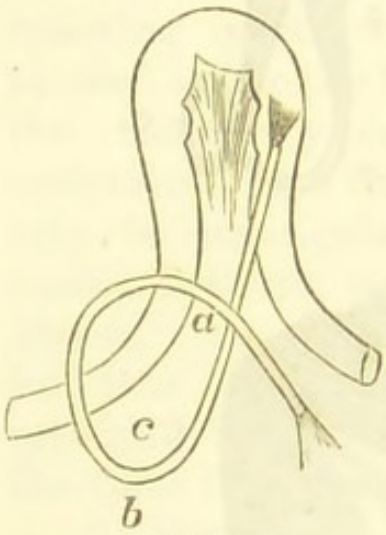


Fig. 7.

"Another and rarer form of knot is made as follows: a long and perfectly loose false ligament forms a simple coil, like that shown in Fig. 5, between its points of attachment *a* and *b*. If now one leg of the so-formed primary noose passes through it we have a knot like that shown in Fig. 9, and if now the intestinal loop passes directly through *c* (Fig. 9), it becomes firmly caught and strangulated.

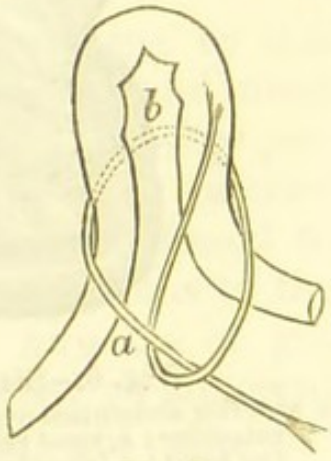


Fig. 8.

* From Sir Astley Cooper's Treatise on Abdominal Hernia, plate xxvi., Figs. 2 and 3.

. . . . A common characteristic of all described knots is, that when the strangulated intestine is freed the ligament can immediately be drawn out straight." *

With regard to the relative frequency of these two forms of strangulation by band, viz. strangulation under the false ligament, and strangulation by a noose or knot, my own collection of cases gives the proportion of the two as about six to one. Leichtenstern, however, who deals with a larger series of instances, has tabulated fifty-six cases of strangulation under the band, and twenty-six by means of knots and snaring.

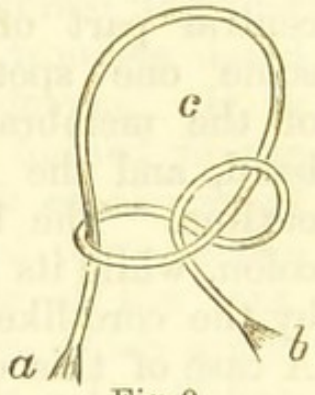


Fig. 9.

With regard to the amount of intestine that may be involved in a noose or knot, it must be remembered that the false ligament may, under certain circumstances, attain a considerable length. Thus, in Mr. Obre's case already alluded to (page 6), the false ligament was $17\frac{1}{2}$ inches long.

Into the precise physical conditions that underlie the production of strangulation in these and in analogous forms of strangulation it is not necessary to enter. Many theories exist upon the subject, and the matter is one rather of pure physics.

An excellent account of the mechanism of strangulation as applied to hernia has been given by Schmidt,† and an able account of the various theories that exist upon the question has been furnished by Hueter.‡ To the works of these authors the reader is referred.

* Loc. cit., page 528.

† Die Unterleibsbrüche. Handb. der Allgem. und Speciel. Chirurgie, Von Pitha und Billroth, 1882, page 146.

‡ Grundriss der Chirurgie, page 248. Leipzig, 1883.

2. **Strangulation by cords formed from the omentum.**—These cords are in all cases due to an adhesion or adhesions formed between the omentum and some other peritoneal surface as a consequence of peritonitis.

The form and arrangement of these omental cords show very considerable variety. Sometimes the lower border of the omentum, and probably the central part of that border, becomes adherent at some one spot. As a result the inferior part of the membrane is rolled up into a round solid band, and the whole structure assumes a fan-shaped outline. The base of the fan is at the transverse colon, while its apex or narrowed part is represented by the cord-like extremity of the adherent epiploon. A case of this character is reported by Dr. Hare, the point of adhesion being at the anterior abdominal parietes below the umbilicus.* In a somewhat similar case described by Mr. Avery the extremity of the omentum was twisted into a cord about the size of the little finger, and attached to the mesentery in the right iliac region.†

In other cases, especially where one of the lateral borders of the epiploon has become adherent, the attached portion separates as a cord, which becomes in time dense and fibrous. If the omentum has formed extensive adhesions, its whole substance may be changed into a series of cords passing between the transverse colon and various other parts of the abdominal cavity. Such was the condition of things, for example, in a case of Dr. Fagge's, the many false ligaments that had formed being attached to the abdominal parietes and small intestines in many

* Path. Soc. Trans., vol. ïii., 1851, page 111.

† Ibid., vol. iv., page 156. A case of a like character will be found in a paper by M. Berger, in Bull. et Mém. de la Soc. de Chir. de Paris, tome vi., 1880, page 601.

places.* In any case the omentum from which a band is derived is often found much altered in structure, having become thin and reticulate.

One of the most curious modes of forming omental bands is met with in a case described by Dr. K. Fowler. Here the epiploon was divided into two lateral cords, which, coming off from either side of the transverse colon passed down behind or among the intestines, and were found to be united together near the pelvis. All the patient's troubles dated from a kick received upon the abdomen. It is probable that in this case a rent had formed in the omentum, through which the great bulk of the small intestines had protruded. The lateral parts of the omentum, *i.e.* the parts on either side of the rent, had then shrunken into cord-like masses, which would be more or less hidden by the bowels. Dr. Hilton Fagge has put upon record an almost similar case in his monograph in the Guy's Hospital Reports.

When once a portion of the epiploon has become adherent the development of the attached part into a ligamentous cord is to be explained by the same process that fashions a broad ribbon-like adhesion into a fibrous thread. The segment of the adherent omentum is continually being dragged upon, especially when attached to a movable viscus; it tends to become elongated, while the rolling movements of the bowels around it help to mould it into a rounded cord-like ligament. (*See* page 6.)

As a rule the omental cords are much coarser and thicker than are the bands resulting from peritoneal adhesions. Many are nearly as thick as the finger, while only a few are described as being very fine. In the matter of length they usually have an advantage over the simple band, as may be expected from the dimensions and relations of the great omentum.

* Guy's Hosp. Reports, loc. cit.

The point of attachment of the epiploic band will obviously depend upon the situation of the peritonitis that renders it adherent. Such adhesion may follow after any form of peritoneal inflammation from which a patient recovers.

It may be due to a limited peritonitis following injury, as in Mr. Avery's case mentioned above, where the attachment was close to a slit in the mesentery, the result of violence. Pelvic peritonitis may lead to adhesions in and about the pelvis, and from this cause the omentum has been found connected with the uterus or the ovaries. In like manner typhlitis has led to attachments to the cæcum and to the peritoneum in the iliac fossa. In other and less well defined instances the abnormal attachment has been found upon the mesentery and upon the free surface of the small intestine. Undoubtedly, however, the most common cause of omental adhesion is some peritonitis set up about a hernia, and especially about a femoral hernia.* The frequency with which omentum is found in the latter form of rupture is well known, as is also its disposition to become adherent when once so herniated. Thus it happens that the most frequent point for the attachment of an omental band is in the vicinity of the femoral ring. Since the omentum lies more to the left than to the right side of the abdomen, omental herniæ are more common upon the left side, and it is therefore about the hernial orifices to the left of the middle line that the omental cords are more usually attached.

One of the least common aspects of the epiploic cord is shown in a specimen in St. Thomas's Hospital Museum, in which it will be seen that the cord passes merely from one part of the great omentum to another.

* Portions of omentum attached to umbilical herniæ rarely, if ever, form actual cords.

While, as above stated, only one peritoneal false ligament is usually found in a given instance, the omental adhesions may be met with in the form of two or even more cords. In the case of epiploic adhesions also two cords may be found apparently constricting the bowel at different points, and in performing laparotomy for the relief of such obstruction the wrong band may be divided. This circumstance happened to Mr. Bryant. He had divided an omental band attached to the left ovary that appeared to be obstructing the gut, but at the autopsy a second cord was found connected with the uterus, beneath which was a coil of ileum tightly strangulated.*

The modes of strangulation by omental cords are identical with those described in connection with peritoneal bands, although it would appear that the proportion of cases of strangulation by a noose or knot is greater in the former than in the latter class of adhesion. This circumstance is no doubt due to the greater average length, and the greater mobility of the omental false ligament.†

3. **Strangulation by Meckel's diverticulum.**—The true or Meckel's diverticulum is due to the persistence or incomplete obliteration of the vitelline duct. When met with in its most perfect condition it exists as a tube, having a structure similar to that of the small intestine itself, that extends between the lower part of the ileum and the umbilicus. The abdominal end of the tube opens into the lumen of the lesser bowel, while the umbilical extremity may be closed, or may open upon the surface and permit of the discharge of fæcal matter. I have myself met with two cases where such discharge took place. Once in a lad, aged seventeen, who had been troubled since birth with the occasional escape of fæces from a

* St. Thomas's Hosp. Museum, No. R 14.
† *Lancet*, vol. ii., 1873, page 773.

sinus at the navel, and once in a male infant a few weeks old, where a like condition existed, and upon whom I successfully performed a plastic operation for the closure of the abnormal passage.

This condition, however, of the diverticle is comparatively rare. Most commonly it exists as a blind tube coming off from the ileum. The length of this tube is on an average three inches, and in the great majority of the examples the measurement extends between one inch and four. Sometimes it exists only as a nipple-like projection.* On the other hand cases are recorded where the diverticle, in the form of a free tube, attained the length of ten inches. As a rule the abnormal tube is cylindrical in shape, with a conical extremity. In nearly every instance the intestinal end of the diverticulum is larger than its opposite extremity. In no case, as far as I am aware, has it been seen to assume a polypoid form, and present a comparatively narrow attachment. In diameter its base is usually less than that of the gut from whence it arises, although sometimes the diameters of the two tubes may be nearly identical.† It may retain the same width throughout, and thus resemble a glove finger. Much more frequently, however, its free extremity is considerably narrower than its base.

In structure the diverticulum is composed of all the layers of normal small intestine. Its mucous membrane is smooth, and possesses Lieberkühn's follicles. It often presents also a Peyer's patch (Cazin). The muscular coat is sometimes deficient at the apex of the diverticle, and at this spot, therefore, hernial protrusions of the mucous membrane under the serous coat are not infrequently met with.

* Guy's Hosp. Museum, No. 1,819 (45).

† For an instance of a very wide diverticulum *see* specimen No. 1,819 (50), in Guy's Hosp. Museum.

When this occurs the extremity of the abnormal tube presents an ampulla of globular shape, and the process is said to be "clubbed." In one dried preparation in the London Hospital Museum the ampulla at the end of a diverticulum has so peculiar an outline that the whole process, which is of no great length, looks hammer-shaped. The clubbed extremity of the diverticulum, when it exists, takes an important part in the production of strangulation by knotting. In cases where the diverticulum appears as a comparatively immense pouch there is little doubt but that the process has been exposed to a considerable degree of distension. Cazin figures a case where a species of valve or diaphragm existed between the diverticulum and the intestine.* Meckel alludes to a similar arrangement.

The diverticulum is always single, and arises from the ileum from one to three feet above the ileo-cæcal valve. It is extremely rare for the process to take origin beyond these limits. Cazin, however, alludes to a case where it is said to have arisen from the ileum, twenty lines from the cæcum. In a specimen in Guy's Hospital Museum † the process is described as springing from the middle of the ileum.

The process may come off at an acute angle with the long axis of the bowel, but more usually the angle formed is a right angle.

It is sometimes provided with a scanty mesentery, as is shown in a drawing by Sandifort.

The end of the diverticulum is, in the majority of cases, free. Very often, however, it is continued in the form of a solid cord. This cord should be attached to the umbilicus or to the abdominal parietes immediately below that cicatrix.‡ This attachment

* Étude sur les Diverticules de l'Intestin. Paris, 1862.

† No. 1,819 (50).

‡ St. Bart.'s Hosp. Museum, No. 2,168, and many other specimens.

is, indeed, very frequently met with. Often the cord is pervious for a little way, and presents a minute canal into which a bristle may be inserted. This diverticular ligament may break from its attachment to the parietes and may float free within the abdominal cavity. Under such circumstances, however, it is much more usual for it to acquire fresh adhesions to some point of the peritoneal surface.

These secondary adhesions of a free diverticulum, or of a diverticular cord at the extremity of one of the processes, are of considerable importance in the etiology of strangulation of the intestine. It is by the diverticulum that has acquired a fresh point of attachment that constriction of the bowel is most often effected. It is, in the great majority of cases, to the mesentery that the tube or the cord continued from it is adherent.* This adhesion may be found on a portion of the mesentery above the origin of the diverticulum, but somewhat more frequently it is on the mesentery of the ileum between the point of origin of the process and the cæcum.

The loop formed by such an adhesion presents the greatest possible variety. When the diverticulum is very small and short, the ring that it forms is quite insignificant, and incapable of engaging more than a slight portion of the intestine.† When, however, the

* In twenty-three cases collected by Cazin the points of attachment of the diverticulum were as follows:

Near umbilicus	3	To colon	1
Near inguinal ring	1	To mesentery	10
To small gut	6		23
To cæcum	2		

In nineteen additional cases collected by myself the attachments were as follows:

Near umbilicus	7	To mesentery	7
To femoral ring	1		19
To small gut	3		
To cæcum	1		

† Guy's Hosp. Museum, No. 1,819 (36).

process is long, and especially when it ends in an elongated cord or ligament, a loop of considerable size may be formed, and nooses and knots may be developed capable of snaring many coils of the bowel.*

In other cases the diverticle or diverticular cord is attached to some other part of the small intestine or to the omentum, or to some point on the abdominal parietes other than the immediate vicinity of the umbilicus. In many instances it is evident that the site of the adhesion has been influenced by some definite form of localised peritonitis. Thus the extremity of the diverticulum has been found attached to the pelvic viscera or pelvic parietes after peritoneal inflammation in that region, to the cæcum or peritoneum about the right iliac fossa after typhlitis, and to the vicinity of the femoral and inguinal canals after hernia. In some specimens the peritonitis causing the adhesion has evidently been set up by mesenteric gland inflammation.

In another series of cases the diverticulum does not exist as such, but is replaced in its entire length by a fibrous cord identical in aspect with the band so often seen attached to the apex of the tubular process. These cords may be found to extend between the parietes in the vicinity of the umbilicus and that part of the ileum from which the more familiar diverticle takes origin. They may be considered to represent an entirely obliterated diverticulum, or may be the remains of persisting omphalo-mesenteric vessels.† A case belonging to the latter category has been placed on record by Dr. Mahomed. In this instance a fibrous band extended from the middle of the anterior abdominal wall (midway between the pubes and the umbilicus) to the right iliac fossa. The

* Path. Soc. Trans., vol. xxi., page 185.

† *See* an exhaustive paper on Persistent Omphalo-Mes. Remains, by Dr. Fitz; *Amer. J. of Med. Sc.*, July, 1884.

deeper extremity of the cord had snared in a noose a large portion of ileum. It then attached itself to the mesentery, some three feet from the ileo-cæcal valve, and was found to be continuous with a branch of the ileo-colic artery. The more superficial extremity of the band divided, one part ascending to the navel with the obliterated hypogastric artery, the other descending to form the left superior vesical artery. The cord was quite impervious to injection.*

These diverticular ligaments may break loose from their connections at the umbilicus, and may, like the tubular processes, either remain free in the abdominal cavity, or form secondary adhesions at almost any spot.

To still further complicate this matter, the cord may retain its attachment to the anterior abdominal wall, and separate from its connection with the intestine. It may then either form no other attachment, or may adhere to a point somewhere within the abdomen.†

Finally, a cord may be found to stretch from the root of the mesentery to be attached to the margin of the ileum (close to its mesentery) opposite the spot from which the diverticle most commonly arises. Leichtenstern believes that such bands represent that part of the omphalo-mesenteric vessels that extends between the bowel and the main blood-vessels at the root of the mesentery. He gives a figure to show the continuation of this band with an ordinary diverticulum which is attached by a cord to the umbilicus. A false ligament described by Dr. David King may possibly have been of this nature. This band, which was an eighth of an inch in diameter, passed from the upper part of the root of the mesentery to a point on the small intestine. Beneath it a piece of bowel had become strangulated.‡

* Path. Soc. Trans., vol. xxvi., page 47.
† Spangenberg, Arch. f. Phys. v., Meckel, b. v., s. 87.
‡ St. Bart.'s Hosp. Reports, vol. xvii., 1881, page 277.

There can be little doubt but that these strangely attached diverticular ligaments have often been mistaken for isolated peritoneal adhesions; and, in any case, where a "solitary band" exists without a trace of ancient peritonitis, there are some primâ-facie grounds for suspecting the cord to be of congenital origin.

The diverticulum, as already stated, is always single. The same remark applies, with but few exceptions, to the diverticular ligaments. In a few instances the cord seems to have divided, so that an appearance as of two bands has been produced. Such is apparently the case in a specimen in one of the museums,* in which one ligament encircles a loop of bowel and strangulates it, while the other goes to be attached to the vicinity of the femoral ring.

It may be here mentioned that a free true diverticulum has in several instances been found in an external hernia. One of the earliest cases of this kind is described by Littre.† In this case a diverticle four inches in length was found in a scrotal hernia in a man aged 48. It is evident that Littre was unaware of the nature of the intestinal pouch.‡ Cazin gives a drawing to show a Meckel's diverticulum in a scrotal hernia from a case dissected by himself.§

Methods of producing strangulation.—1. A coil of small intestine may be strangulated beneath an adherent diverticulum precisely in the same manner as it would be when beneath a peritoneal adhesion.

* St. Bart.'s Hosp. Museum, No. 2,173.

† Mém. de l'Acad. des Sciences, 1700, page 300, "Observat. sur une nouvelle Espèce de Hernie."

‡ A full account of the relation of the diverticulum to hernia will be found in "Du Pincement Herniare de l'Intestin," by M. Loviot. Paris, 1879.

§ Loc. cit., Fig. 14. *See also* case by Busch, Central. für Chirurg., 1884, No. 23, page 69.

An illustration of this mode of constricting the bowel is shown in Fig. 10, from a case reported by M. Rayer.* It is scarcely possible to conceive that this method of producing obstruction can occur when the diverticulum simply extends between the ileum and the anterior abdominal wall. Yet several cases are recorded where the diverticulum had these attachments, and where it is vaguely stated that beneath the process some bowel was strangulated. In the absence of clearer evidence these cases must be accepted with some little doubt. Certainly, in nearly all reported instances of strangulation under a diverticulum, the process has been adherent to a point other than the vicinity of the umbilicus. When the adhesion is to the mesentery, as is so frequently the case, it will be readily understood that beneath the arcade so formed a loop of intestine may be with great ease engaged and compressed. This condition of the parts is often met with.

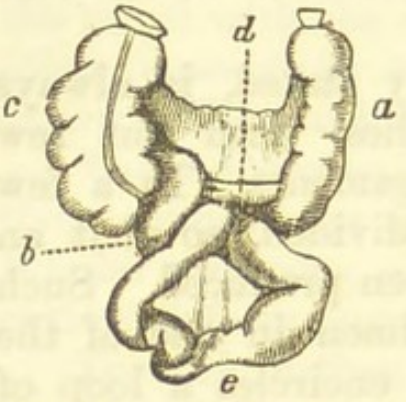


Fig. 10. — Strangulation by an adherent Diverticle. (Rayer.)

a, upper end of gut; *b*, lower end of gut; *c*, colon; *d*, the diverticle; *e*, the strangulated loop.

2. A diverticular ligament, whether attached to the extremity of a pouch-like process, or (in the absence of such process) connected directly with the gut, may form precisely the same kinds of noose and knot as are formed by isolated adhesions. The length and looseness of the congenital ligament render it well able to snare the bowel, provided that the position and circumstances of the bowel render it capable of being snared.

The strangulation of a loop of intestine by the simple noose or spiral, depicted on page 24, would

* Archiv. Gén. de Méd., tome v., page 68.

appear to be fairly common in the case of diverticular cords. The numerous specimens found in museums, where these cords are seen to have made one and a half or two turns round the involved bowel, are

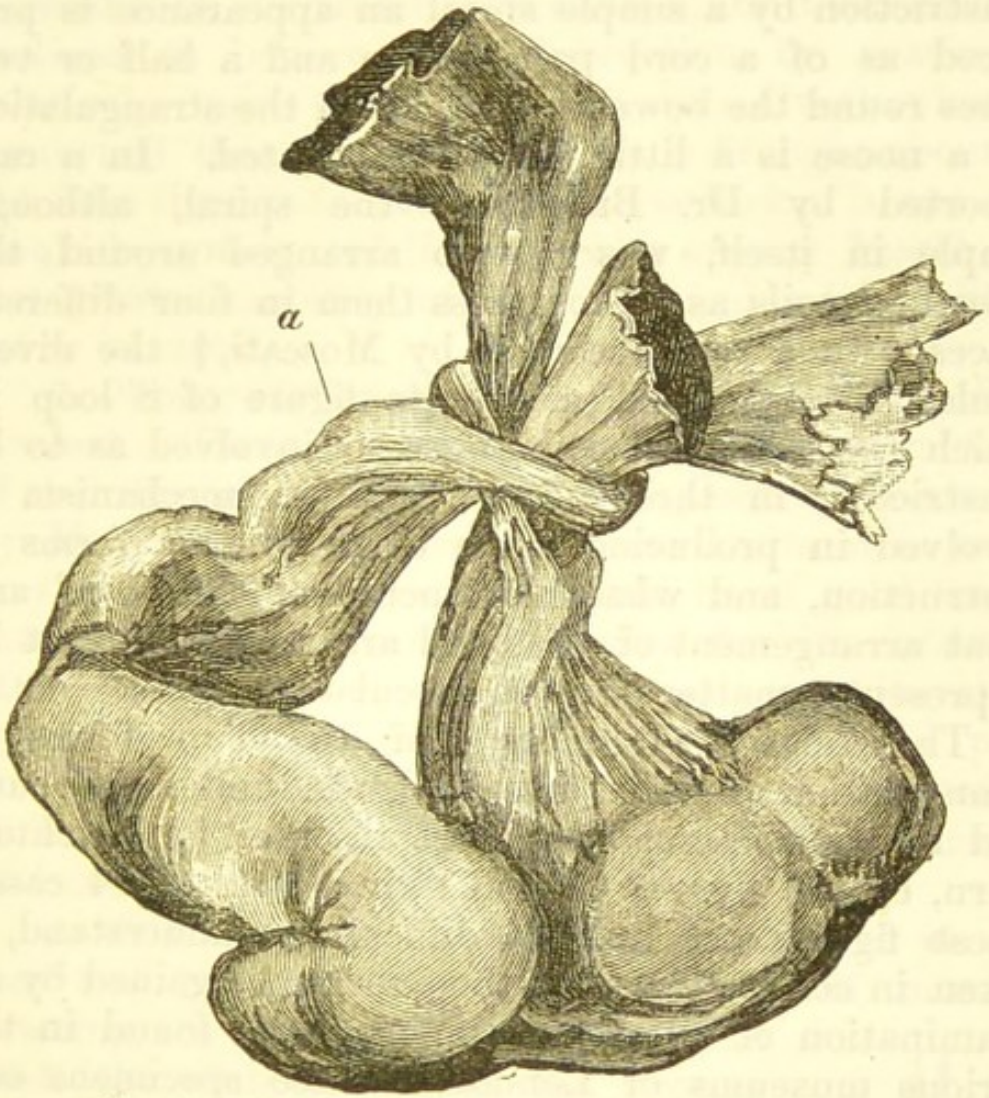


Fig. 11.—Strangulation by Meckel's Diverticulum.
a, point of origin of diverticle. The distal end is attached to the mesentery. The loop involved measured 12 inches.

probably of this character. An example of this variety of strangulation in its simplest form is depicted in Fig. 11.* In some instances the band will be seen to have passed twice round the bowel at the point of constriction.† In other specimens one

* Lond. Hosp. Museum, No. Ag. 2.
† For specimens see St. Bart.'s Hosp. Museum, No. 2,172, and University Coll. Museum, No. 1,167.

and a half turns are made. A reference to the drawing taken from Sir Astley Cooper's work (Fig. 6), will show the manner whereby the gut is snared in these nooses, and will also explain how in constriction by a simple spiral an appearance is produced as of a cord passing one and a half or two times round the bowel. Very often the strangulation by a noose is a little more complicated. In a case reported by Dr. Bristowe,* the spiral, although simple in itself, was yet so arranged around the intestinal coils as to compress them in four different places. In a case recorded by Moscati,† the diverticular band formed a definite figure of 8 loop in which the intestinal coils were so involved as to be constricted in three places. What mechanism is involved in producing these extraordinary forms of obstruction, and what movements of the bowel and what arrangement of the band are requisite, must be at present a matter of pure speculation.

The relative frequency of the two forms of strangulation already described, viz. under the band and by the noose or knot, is represented by Leichtenstern, by the figures 40 and 14 in a total of 54 cases. These figures are a little difficult to understand, if taken in connection with the experience gained by an examination of all the specimens to be found in the various museums of London. These specimens certainly appear to show that strangulation by snaring is by no means uncommon, and that this form of obstruction does not bear to the constrictions under the band so wide a proportion as 1 to 4. If one could judge from an inspection of museum specimens only, it would seem that strangulation under the diverticular band is only about twice as frequent as is the more complicated method of obstruction. According to

* Path. Soc. Trans., vol. xxi., page 185.
† Mém. de l'Acad. de Chirurg., tome iii., page 468.

Leichtenstern's figures, strangulation by the noose is relatively more frequent in the case of the peritoneal adhesion than it is in the case of the congenital band. This fact also is in direct opposition to the conclusions derived from the museum specimens, and I am strongly inclined to believe that obstruction by snaring is relatively more frequent when the diverticulum is concerned than when the trouble is brought about by the false ligament. This latter conclusion is one that would be anticipated if the greater average length and the greater mobility of the diverticular ligament be borne in mind.

3. *Strangulation by knots formed by a free diverticulum.*—These remarkable knots and the methods of their formation have been very exhaustively studied by M. Parise.* To produce these knots it is necessary that the diverticulum should be of good length, should be quite free (save only for its intestinal attachment), and should possess an ampulla at its extremity. The importance of the ampulla is paramount, and French writers are in the habit of speaking of it as *la clef de l'étranglement.* Three varieties of knot may be described :

a. The diverticle forms a ring into which its own free end projects (Fig. 12). A loop of intestine entering the centre of that ring will push the clubbed end of the process before it and so tie the knot by which the coil becomes obstructed.

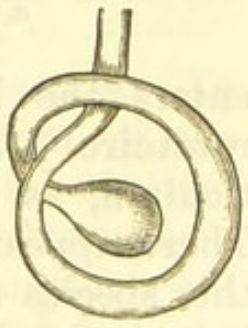


Fig. 12.

b. The diverticulum surrounds the pedicle of an intestinal loop in such a way as to encircle it with a simple knot. The mode of formation of the noose is shown in Fig. 13. Of this variety M. Regnault gave many years ago an excellent example. The diverticle was in this case six inches in

* Bull. de l'Acad. de Méd., tome xvi., page 373.

length, and by its means one and a half feet of intestine were strangulated.

c. In this form two loops of the bowel are involved (Fig. 14), one above, *a*, and the other below, *b*, the origin of the diverticulum, *d*. One of the loops

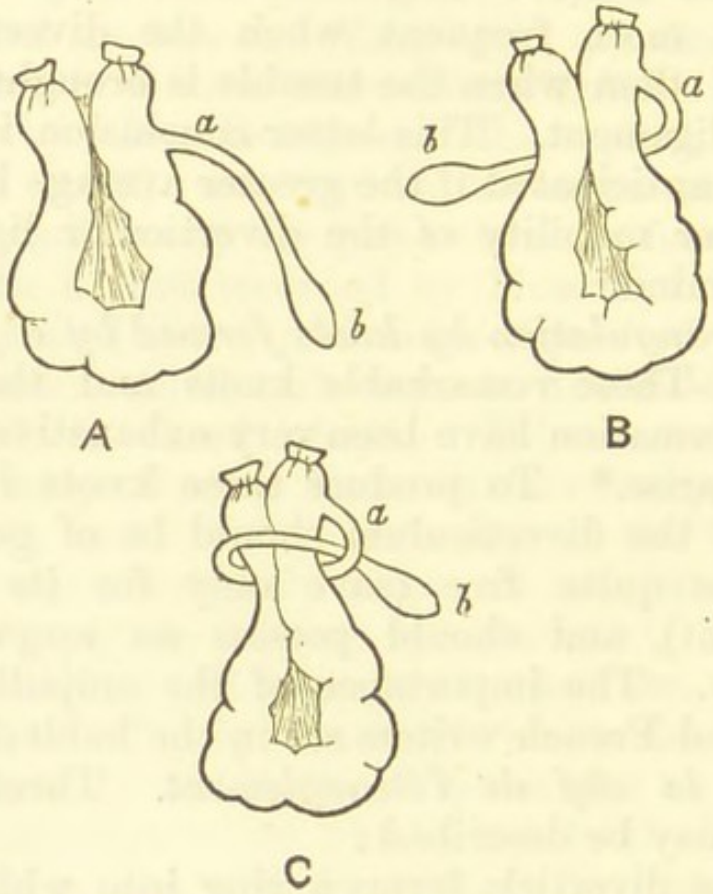


Fig. 13.—One mode of Strangulation by the Diverticulum. (Regnault-Béclard.)

a, origin of diverticle; *b*, its clubbed extremity.

enters the knot by a preliminary rotation ("anse rotatoire"), *e*, the other, is noosed by the diverticulum, as in the simple knot ("anse nodale") *c*. There appears to have been only one case recorded of this species of knot.* The commonest form of knot is undoubtedly the second of the three now given.

Diverticula and diverticular ligaments may lead to other forms of obstruction which do not, however,

* "Observat. d'une nouvelle Forme d'Étrang. dite par Nœud intestinal," by Dr. M. Lévy; *Gazette Médicale*, 1845, page 129.

come under the present category. These forms may be enumerated here for the sake of completeness, and will be dealt with in detail in subsequent paragraphs.

4. *Strangulation over a diverticular band.*—In this form a loop of intestine is thrown over a tightly drawn diverticular band as a shawl is thrown over the arm. Under certain conditions, which need not be here detailed, an obstruction follows in the bowel so displaced. The occlusion is somewhat similar to that that would take place in a coil of thin india-rubber tubing, if thrown across a tense wire cord and allowed to become dependent.

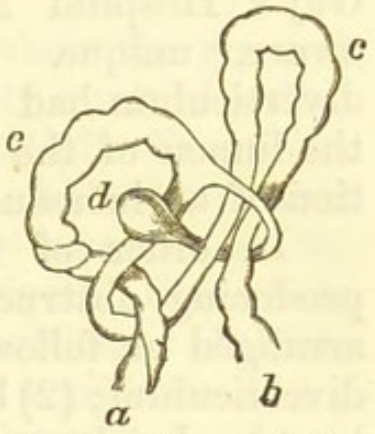


Fig. 14. — Strangulation by the Diverticulum by a double Knot.

5. *Strangulation by kinking.*—If, under certain circumstances, much traction be brought to bear on a diverticular ligament, the gut, without undergoing any structural alteration, may become so acutely bent at the point of origin of the abnormal band or process as to be occluded. It has been shown also that a free diverticulum, when of good size, and coming off at about a right angle with the bowel, may cause such bending of the bowel, when the pouch is much distended, as to cause obstruction.

6. *Strangulation by the effects of traction.*—In these cases the bowel at the point of origin of the diverticle undergoes certain gross structural changes which may, in time, bring about intestinal obstruction. There is evidence to show that these changes result from long continued traction upon the bowel, brought about by means of an adherent diverticular process.

It may be noted that foreign bodies that have been swallowed, and intestinal concretions of various kinds, may lodge within the pouch-like diverticula, and excite

in them an inflammation of like character and like tendencies to that set up in the vermiform appendix by identical substances.

One effect of the true diverticulum in producing intestinal obstruction is illustrated by a specimen in Guy's Hospital Museum, that is, so far as I am aware, unique. In this case a short finger-like diverticulum had become inverted, had projected into the lumen of the intestine and had led to the formation of an intussusception.*

In order of frequency the various methods of producing obstruction by the diverticulum may be arranged as follows: (1) By strangulation under the diverticulum; (2) by loops or nooses; (3) by diverticular knots. Leichtenstern's figures for these three varieties are 40, 14, and 12. Strangulation over a band or by kinking, and obstruction from the effects of long-continued traction, are all comparatively rare.

False diverticula.—It will be convenient to take note here of certain acquired diverticula that may, under some circumstances, be possibly confused with the congenital variety.

In all essential points, in structure, in position, and in number, these diverticula differ entirely from Meckel's process.

They are simply hernial protrusions of the mucous membrane of the bowel through the muscular coat, and hence the common name "distension diverticula." In structure they are composed simply of mucous membrane and peritoneum. They present in their walls no muscular fibres. The lining mucous membrane in the smaller pouches is quite normal, but in the larger diverticula that membrane becomes atrophied and its glandular structures tend to disappear. They may be met with in any part of the bowel, but are somewhat more often found in the large than in

* Guy's Hosp. Museum, No. 1,819 (45).

the small intestine. They have been seen in the duodenum, are comparatively common in the jejunum, and are encountered with still greater frequency in the ileum. They may appear in any part of the colon, but are most common in the sigmoid flexure and rectum.

In the matter of numbers they show the greatest variety, and are far more frequently multiple than single. The chief examples of multiple diverticula are met with in the large intestine. Alibert counted two hundred in one colon. In the museum of St. Thomas's Hospital is a sigmoid flexure, the whole surface of which is studded with a multitude of little hernial pouches, varying in size from a pin's head to a marble. Fig. 15, from Sir Astley Cooper's work on hernia, shows a jejunum, along the mesenteric border of which distension diverticula are crowded almost as closely as they can lie.



Fig. 15.

The chief examples of single pouches are met with in the lesser bowel. Thus Dr. Bristowe has reported an instance of a single diverticulum no larger than a horse-bean, situated in the ileum just above the ileo-cæcal valve.* In other cases only two pouches were found in the small intestine, as in an instance noted by Dr. Hilton Fagge, where the abnormal sacs were both in the jejunum.†

In size, the false diverticulum may also show any dimensions between that of a pin's head and that of a large apple. In shape they are usually globular, especially when small.‡ When of larger size they may become lobulated, as is the case with one of the

* Path. Soc. Trans., vol. vi., page 191.
† Ibid., vol. xxvii., page 147.
‡ Guy's Hosp. Museum, No. 1,819 (69).

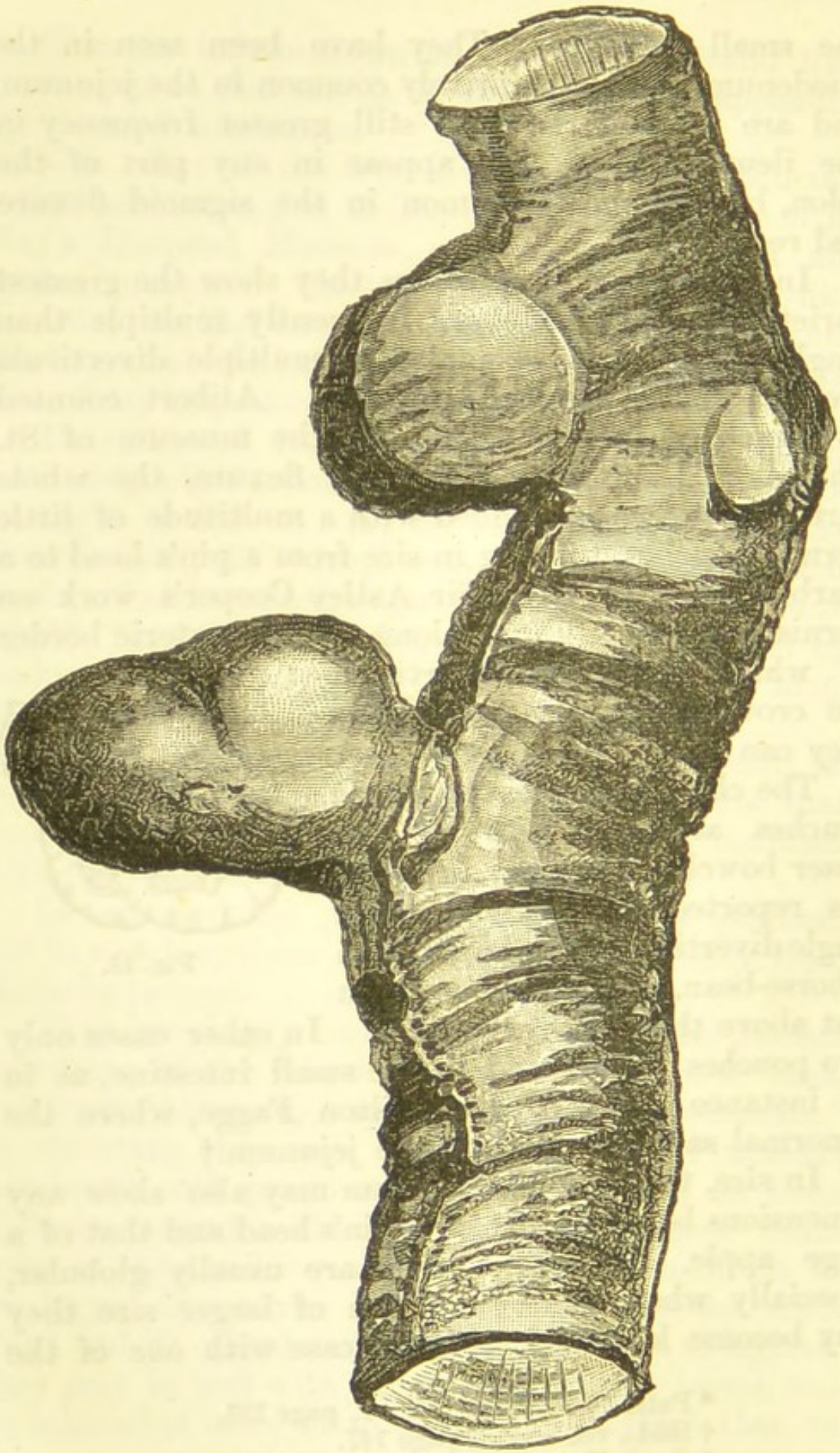


Fig. 16.—False Diverticula.

diverticula shown in Fig. 16.* It is extremely rare for them to assume the conical shape or finger-like outline so commonly met with in Meckel's diverticula. They are usually narrower at the attached extremity than at the fundus, and are apt, when of good size, to assume a polypoid outline.

As regards the relation of these hernial pouches to the intestinal wall, it will be found that in the lesser bowel they invariably appear along the mesenteric border of the gut, and force their way, as they enlarge, between the two layers of the mesentery. In the colon they are usually met with on those parts of the intestine to which the appendices epiploicæ are attached, and into the substance of these appendages the pouch will, as a rule, be found to have projected. This relation of the diverticulum to the appendices was admirably shown in the case reported by Dr. Bristowe.

It is probable that all these pouches are due to distension, and may be regarded as herniæ of the mucous membrane through the muscular coat. They occur, with but few exceptions, in old people; and those of the colon are usually associated with a history of chronic constipation. In the small intestine, also, the diverticula are as a rule attended with conditions bringing about great distension of the bowel. In Sir Astley Cooper's case the pouches were in the jejunum, while in the ileum was an obstruction of slight character, that had no doubt encouraged a long-continued distension of the intestine. In several other instances the protrusions were met with in patients who had suffered from hernia, the diverticula being situated in a part of the bowel above that involved in the rupture. Of the exact pathology of these little pouches it must be confessed that very little is known. If they are due to distension it is

* Coll. of Surgeons Museum, No. 1,177.

difficult to understand why they are not met with more frequently in cases of acute and chronic intestinal obstruction. In such cases they are indeed, with the exceptions above named, practically unknown. The formation of one diverticulum as a result of localised distension is not difficult to understand, but in those cases in which several continuous feet of the bowel present these pouches, conditions are involved that have certainly not yet been interpreted. Over and over again the gut is found at an autopsy enormously distended, sometimes in its entire length, sometimes in a limited segment, and yet no diverticula are present, although the distension may have been so extreme as to rupture the serous coat.

I have only been able to find one reported case of a false diverticulum in a child. The case is reported by Dr. Platt,* and presents some extraordinary features. The patient was a little girl aged nine. The autopsy showed that she had a stricture of the small intestine, due probably to the contraction of a tubercular ulcer. This stricture had become plugged by a hard fæcal mass, and the child presented the symptoms of acute obstruction. On examination by the rectum a soft elastic tumour was felt pressing upon the anterior wall of the bowel. At its lower extremity was an orifice like an os uteri, into which the finger could be introduced. This was supposed to be the orifice of an invaginated piece of bowel, and the case was presumed to be one of intussusception. The autopsy showed that there was no invagination of any part of the gut, and the tumour proved to be a false diverticulum of the rectum, into the orifice of which the finger had been introduced in the rectal examination.

In no case, I believe, has the distension diverticulum caused an intestinal obstruction. A specimen in

* *Lancet*, vol. i., 1873, page 42.

the Guy's Hospital Museum* shows an intussusception in the immediate vicinity of such a pouch, and from the condition of the parts there is every reason to believe that the diverticulum was antecedent to the obstruction. The connection, however, between the two might have been purely accidental.

These pouches, and especially those of the colon, are apt to lodge little fæcal masses and foreign matters of various kinds. Inflammation of the pouch may be induced by such lodgment, and peritonitis from perforation result, just as occurs in the appendix vermiformis. Notice has already been drawn to the fact that the colic diverticula are apt to project into appendices epiploicæ; and it is quite probable that in those cases where such an appendix has caused an isolated adhesion a pouch might have formed in the appendage, have lodged a foreign substance of some kind, and have been, in consequence, the seat of a limited peritonitis. Thus, Mr. Hulke records a case where an epiploic appendage was adherent to the pelvic peritoneum near the right sciatic notch. Beneath the arcade so formed a loop of bowel had been strangulated. The appendix was on the sigmoid flexure, which extended in an angular loop across the pelvis.† In a specimen in the College of Surgeons Museum it will be seen that an appendix has become adherent to the omentum in such a way as to cause stenosis of the part of the colon from which it arose. In this case the comparatively large size of the involved appendix is conspicuous.‡

I have found two cases on record where a false diverticulum in the sigmoid flexure communicated with the interior of the bladder by an ulcerated opening. Here also it is probable that inflammation was

* Guy's Hosp. Museum, No. 1,849 (10).
† *Medical Times and Gazette*, vol. ii., 1872, page 482.
‡ Coll. of Surgeons Museum, No. 1,362.

excited in the pouch by the lodgment of a fæcal mass; by the peritonitis set up the process became adherent to the bladder, and by the extension of ulceration from the diverticulum the bladder was perforated.* One of the patients passed fæcal matter by the urethra, while the other † seems to have been more troubled by the escape of urine into the rectum.

4. **Strangulation by normal structures abnormally attached.**

A. *The vermiform appendix* may become adherent to some point on the neighbouring peritoneum, and so form a band or arch beneath which a loop of intestine may be strangulated. The process is very commonly adherent to the mesentery of the lower ileum.‡ Less frequently it is adherent to the ileum itself,§ or to the cæcum, or to the peritoneum about the right iliac fossa and margin of the pelvis. In one instance, reported by Sir Risdon Bennet, the appendix was adherent to an enlarged ovary on the right side, and beneath the cord so formed a loop of the ileum and a part of the ascending colon were constricted.‖

In some rare cases the appendix has been described as wound in the form of a close spiral, or of a ring into which a loop of intestine has entered and has become strangulated. In other instances, equally uncommon, the appendix is said to have tied itself into an actual knot of a character similar to those sometimes formed by the true diverticulum. By such a knot the bowel has been constricted.

It must be confessed that this last-mentioned form of obstruction is a little difficult to credit. The

* Path. Soc. Trans., vol. x., page 131; Mr. Sydney Jones.

† Ibid., vol. x., page 208; Mr. Charles Hawkins.

‡ Guy's Hosp. Museum, No. 2,508 (50).

§ *See* a good case by Mr. Gay; Path. Soc. Trans., vol. iii., page 101.

‖ Path. Soc. Trans., vol. iv., page 146. The specimen is now in St. Thomas's Hosp. Museum, No. R 17.

average length of the appendix is three inches. It is often four or five inches, and has been found to reach and even exceed the length of eight inches.

B. In several instances *the Fallopian tube* has become adherent to some part of the neighbouring peritoneum, to that, for example, lining one of the iliac fossæ, and beneath the arcade so formed a portion of the small intestine has been strangulated.*

C. A few cases are reported where a loop of bowel has been strangulated beneath a band formed by *a fixed portion of the mesentery.* In these examples some coils of the small intestine become fixed at a distant spot. They may be involved in a large irreducible hernia, or may have hung down into the pelvis, and acquired adhesions when in that position. Under such circumstances the corresponding part of the mesentery may become tightly stretched across the posterior wall of the abdomen or the pelvic brim, and a bridge be thus formed beneath which some of the lesser bowel may become strangulated.† Duchaussoy appears to be of opinion, that when a large coil of the ileum simply hangs down into the pelvis, the arch then formed by the mesentery may be of such a character that intestine can be obstructed beneath it. Such a circumstance, however, must be extremely exceptional, in the absence of any adhesions holding the dependent bowel in place. In cases of acute obstruction it is common enough to find all the coils of small intestine below the point of strangulation hanging in a bunch empty and collapsed into the pelvis. If we except these cases, however, there must be very few conditions met with where large

* For cases *see* Bull. Soc. Anat. de Paris, 1841, page 209, by M. Gaubric; and Archiv. Gén. de Méd., 1829, by M. Rostun.

† *See* case by Dr. Hilton Fagge (Guy's Hosp. Reports, vol. xiv.), where the ileum was adherent to a tumour formed by an extra-uterine fœtation, while beneath its tensely drawn mesentery some jejunum was strangulated.

coils of the bowel hang listlessly in the pelvis, and so form from the mesentery a band sufficiently long abiding to allow gut to be compressed beneath it. When such dependent coils are fixed or adherent the mechanism of the obstruction is quite intelligible.

D. To the bands formed by adherent *appendices epiploicæ* allusion has already been made (page 49).

E. Dr. Hilton Fagge has recorded the case of a woman aged seventy-four, who died with symptoms of acute intestinal obstruction that had lasted for six days. The autopsy revealed a portion of the ileum strangulated by *the pedicle of a large ovarian cyst.* On moving the tumour a little the obstructed bowel was easily reduced.*

5. **Strangulation through slits and apertures.**

A. *Slits and apertures in the mesentery.*—Through holes formed in this membrane portions of intestine have frequently been strangulated. The holes are usually slit-like, and are most common in the mesentery of the lower ileum. In other parts they are rare. In many cases these slits can be more or less distinctly traced to an injury, and several specimens in the museums of London show that a limited rent of the mesentery may be the only visible lesion after violence applied to the abdomen. In other cases there is every reason to believe that the abnormal aperture is congenital. The edges in such instances are smooth, rounded, and regular; there is no history of injury and no trace of any previous peritonitis. In one case the upper margin of the slit appeared as a dense and distinct band containing in its substance a large branch from the superior mesenteric artery.†

The hole is usually situated near to the intestine.

* Guy's Hosp. Reports, vol. xiv.

† Contrib. a l'Étude de l'Occlusion Intest., by M. Le Moyne. Paris, 1878.

In size it shows great variation. It may be no larger than a sixpenny piece,* or it may be extensive enough to admit four fingers.† In the last-mentioned instance the portion of bowel involved was the sigmoid flexure, and so far as I can ascertain this is the only case on record where colon has found its way into the slit. Mr. Partridge has recorded a case, which is probably unique, of strangulation of a knuckle of ileum through an aperture in the mesentery of the vermiform appendix.‡ In a few instances the strangulation has occurred through slits in the transverse and descending meso-colon.

B. *Slits and apertures in the omentum.*—An example of this form of obstruction is shown in Fig. 17.§ These slits may be due to congenital defect, but in many instances they can be distinctly traced to an injury. M. Le Fort reports the case of a young man who developed symptoms of intestinal obstruction some little while after having received a kick on the abdomen from a horse. The autopsy showed two herniæ of portions of the small intestine through two slits in the great omentum.‖ In speaking of omental bands allusion has already been made to the circumstance that as a result of violence a mass of intestines may protrude through an immense rent in the omentum, and the two divisions of the membrane thus formed may develop into omental bands.

C. *Less common forms of slit.*—Mr. Holmes has placed on record a remarkable case, where a loop of

* Dr. Leared; Path. Soc. Trans., vol. xiv., page 156.

† M. Trélat; Bull. et Mém. de la Soc. de Chir. de Paris, tome vi., 1880, page 594.

‡ Path. Soc. Trans., vol. xii., page 110.

§ University Coll. Museum, No. 1,161. *See also* specimen in St. Bart.'s Hosp. Museum, No. 2,177.

‖ Bull. et Mém. de la Soc. de Chir. de Paris, tome v., 1869, page 635.

the lower ileum was strangulated through a hole apparently formed in an appendix epiploica. The appendix in question was attached to the sigmoid flexure and formed a fatty fibrous ring through which the loop had passed. There were several large and

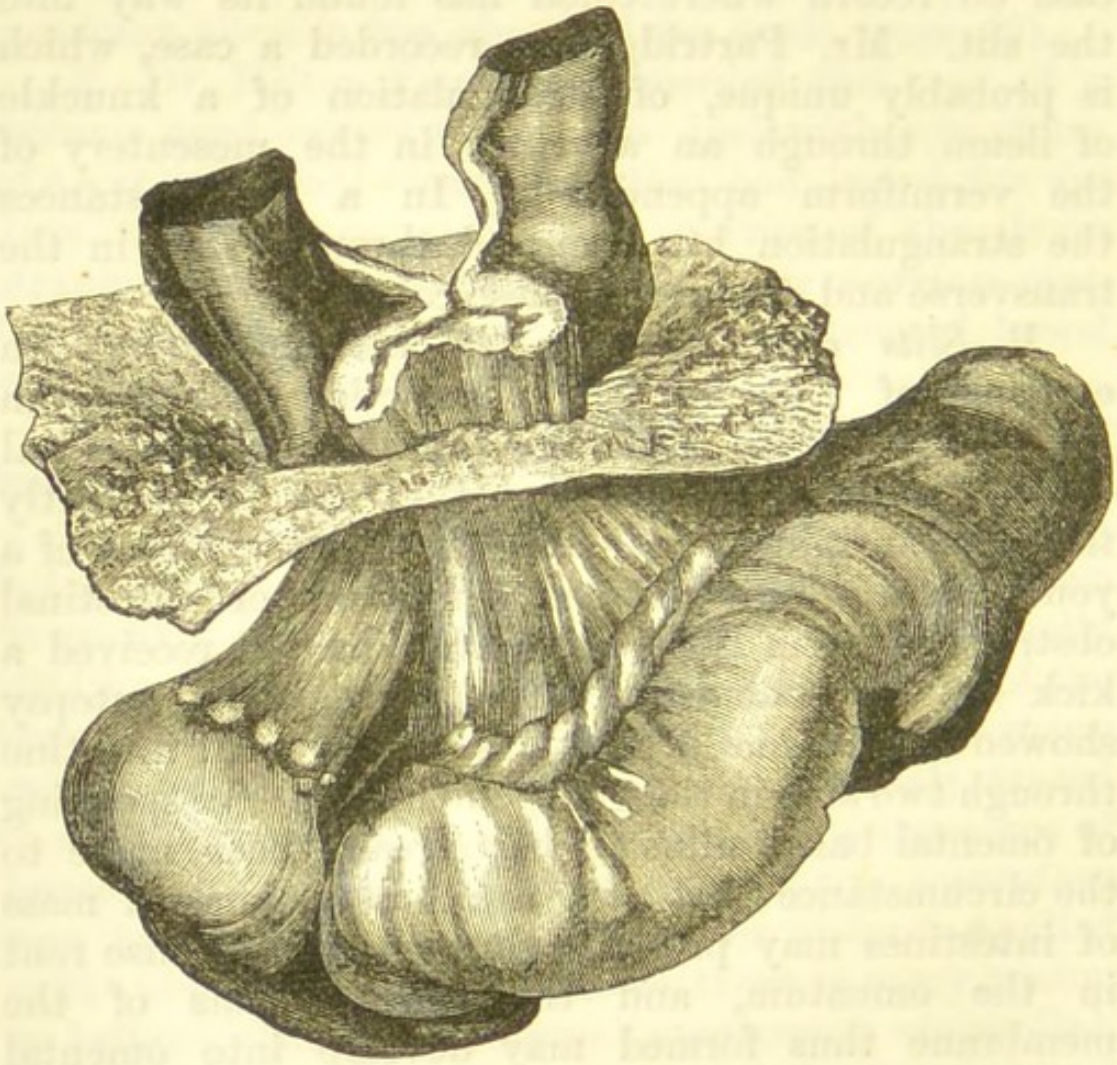


Fig. 17.—Strangulation of small Intestine through a Hole in the Great Omentum.

broad appendices upon the same segment of the colon, some of which were perforated near their bases, as if they also were capable of developing into rings.* It may be that the appearance of a ring had been brought about by two adjacent appendices becoming adherent at their extremities. Dr. Quain describes

* Path. Soc. Trans., vol. xii., page 3.

an autopsy where forty inches of the ileum were found to have passed through a slit in the broad ligament of the uterus. In this case, however, the gut was also held down by a band of old adhesions.* Barth reports a case of strangulation of the intestine in a slit in the suspensory ligament of the liver.† The small intestine has not infrequently been found to have passed through the foramen of Winslow, and Leichtenstern has collected three cases where the gut so placed became strangulated by the margins of the aperture.

In by no means a few instances a coil of intestine has been contracted by passing through a slit formed in a broad membranous adhesion. In other cases the bowel has protruded between two cord-like adhesions placed close together and parallel with one another. Mr. Hutchinson mentions an instance where the slit was formed between a false ligament and the edge of the broad ligament of the uterus, by the side of which the adhesion ran. ‡ In some cases rings and slits have been formed between intestinal loops that have become matted together, and through these apertures a non-adherent coil has passed and become constricted. In one case, briefly mentioned by Sir Astley Cooper, it was found that "two folds of intestine had adhered at one point only (as may be represented by bringing the points of the thumb and finger in contact); through the noose thus formed, another fold of intestine was passed and had become strangulated."§ The occasional gaps and slits that may be formed between adherent intestines, and the viscus or parietes to which they are attached, may serve as holes through which a coil of bowel may pass and be constricted.

* Path. Soc. Trans., vol. xii., page 103.
† Schmidt's Jahrb., b. 96, s. 207.
‡ *Med. Times and Gazette*, 1858.
§ Abdominal Hernia, chap. xxxv.

Into the complicated subject of internal herniæ there is no occasion to enter in this work. Of the numerous varieties described, one only is at all common, the diaphragmatic form; and diaphragmatic hernia, it must be owned, has little to do either clinically or pathologically with intestinal obstruction.

Of the other varieties, such as the hernia mesocolica, the hernia intrailiaca, the hernia intersigmoidea, and the like, it need only be said that they are very rare, that they become the seat of a strangulation still more rarely, and that whether strangulated or not strangulated, they cannot be diagnosed during life. Should the portion of intestine that they contain become constricted, the symptoms induced would be similar to those of strangulation under a band, while the treatment of the two cases would be practically identical.

RELATIVE FREQUENCY OF THE VARIOUS FORMS OF STRANGULATION DEPENDING UPON BANDS, APERTURES, ETC.

The seven most common forms met with under this heading may be arranged in the following order of frequency:

1. Strangulation under isolated peritoneal adhesions = 60
2. Strangulation under diverticula and diverticular bands = 40
3. Strangulation by knots and nooses formed by "bands"
4. Strangulation by knots and nooses formed by diverticula } = 25
5. Strangulation under an adherent appendix
6. Strangulation through slits in the omentum = 20
7. Strangulation under omental ligaments = 15

The figures may be taken as representing the probable relative frequency of the various forms.

THE PORTION OF INTESTINE INVOLVED.

In the form of intestinal obstruction now under consideration, although many very different methods

are concerned in the production of that obstruction, the part of the alimentary tube involved is, with scarcely an exception, the same, viz. the small intestine.

A case has already been incidentally alluded to where a part of the ascending colon was found compressed beneath an adherent vermiform appendix, and another where a loop of the sigmoid flexure was strangulated through a rent in the mesentery.

Instances may be given where a part of the colon has been obstructed beneath a tightly drawn mesentery (Duchaussoy), together with a few other isolated observations of the same character. So extremely rare, however, is it, for any part of the colon to be involved in the present variety of intestinal obstruction, that, so far as the general bearings of the whole subject are concerned, the few reported cases may be regarded as pathological curiosities. If it be borne in mind that the hernia-like strangulation of the bowel requires that the gut to be involved should be quite free and movable, and that it should be capable also of readily forming a knuckle or loop, it will be seen that no part of the normal colon, if we except, perhaps, the sigmoid flexure, has a disposition that will allow it to share in this form of obstruction.

In the great majority of all cases the segment of small intestine involved is the lower part of the ileum. In a fair number of instances the middle and upper portions of the ileum have been involved, but the examples of strangulation of the jejunum by the methods now under consideration are comparatively rare. Indeed, it may be said that, as one follows the small gut from the cæcum to the pylorus, every foot of the distance renders the probability of strangulation more and more unlikely. I believe that there is no recorded instance of implication of the duodenum in this form of obstruction; and, indeed, it would be

anatomically impossible for the "third part" of that segment of the bowel to be involved.

The frequency with which the last few feet of the ileum are involved is very intelligible. The coils of the lower ileum are the parts of the small intestine most apt to be found in the pelvis, and to be thus ensnared by those many adhesions that may result from pelvic peritonitis. They are, moreover, in the closest association with the cæcum and appendix, and are most likely, therefore, to be strangulated by adhesions that may follow upon typhlitis, and by the cord formed by the vermiform appendix when it becomes adherent. Then, again, the true diverticulum arises from the lower ileum, and, as may be expected, the obstructions that it causes have, with comparatively few exceptions, their seat in the last few feet of the lesser bowel.* In strangulation due to this process the part of the ileum involved may be either that above or that below the origin of the abnormal appendage. In most cases that portion of the bowel is engaged that lies between the diverticulum and the cæcum. It must also be noted that abnormal apertures in the mesentery, or such at least as are supposed to be of congenital origin, are most often found in that part of the membrane that is connected with the lower ileum. This part of the bowel, moreover, is often involved in herniæ of the right side, and may suffer in any trouble due to bands of adhesion following upon complicated ruptures. Lastly, it is to be observed, that while any coil of small intestine taken from the upper ileum or jejunum would be equally movable at both ends, one end of the terminal part

* I have not been able to find any case where a part of the small intestine has been involved in obstruction due to the diverticulum other than the ileum. The obstructed coil may not have been always a part of the last few feet of the gut, but it has still always been well within the limits of the ileum.

of the ileum, on the other hand, is more or less fixed by its connection with the cæcum.

As to the *amount* of small intestine that may be involved in a strangulation, the greatest variety exists. The involved piece, on the one hand, may be so small that only one half of the circumference of the gut is nipped,* while on the other hand it may measure four feet. Every possible variety exists between these two extremes. Taking an average of forty-five cases where the amount of bowel involved is stated, I find that it reaches 15·5 inches. The amount involved depends a great deal more upon the mechanism of the strangulation than upon the anatomical cause of it. When the obstruction is due to strangulation under a band or through a slit the average amount of bowel involved is small, often a mere knuckle. When, on the other hand, the strangulation is brought about by knots and nooses, it is usually found that large coils are involved, it being impossible, under ordinary circumstances, for a little loop of bowel to be so strangulated.

To these general observations there are, of course, many exceptions. For example, one of the cases in which an unusually large amount of intestine was strangulated was a case of strangulation under an adherent vermiform appendix, in which instance four feet of ileum were found to be implicated.† Examples, also, of strangulation of two and even three feet of bowel beneath a band are, although exceptional, by no means uncommon.

THE MECHANISM OF THE OBSTRUCTION.

The actual mechanism of the obstruction varies a little in different cases. In many instances, no doubt,

* Case of strangulation under an omental band, by Dr. J. Bœckel; Bull. et Mém. de la Soc. de Chir., tome iv., 1880, page 339.

† Dr. Hilton Fagge; Guy's Hosp. Reports, vol. xiv.

a knuckle or coil of gut is driven with such sudden and severe force beneath a band or through an aperture as to become practically strangulated at once, just as is the case in strangulated hernia, when the symptoms appear abruptly during some unwonted exertion. No force of equal magnitude being brought to bear upon the part so as to effect its reduction, it remains firmly gripped. When a comparatively large mass of intestine is involved, the strangulation need not be present from the first. But the band pressing upon the mesenteric vessels produces a congestion in the involved coils until at last the engorgement, aided by increasing distension of the loop itself, leads to a complete strangulation.

It must be observed also that engorgement of the veins, and a diminution in the arterial blood supply of the gut, with consequent deficiency of oxygen and excess of carbonic acid in such blood as occupies the intestinal walls, induces inordinate activity of the peristaltic movements. It is probable that these violent movements materially aid in producing a strangulation.

Many cases are on record, from the accounts of which it is to be inferred that vascular distension has been a conspicuous factor in completing the obstruction; cases where much gut is involved, where the mesentery is extensively compressed, and where a bloody fluid in the peritoneum, or many hæmorrhages beneath the serous coat, point to the severity of the congestion that preceded actual stopping of the circulation. Increasing distension, moreover, of the implicated bowel must always be an important feature. This distension is due not only to matters passed into the partly occluded intestine from above, but also to gas developed within the strangulated and paralysed loop. Certain simple experiments throw some light upon the matter. M. Le Moyne opened

the abdomen in the cadaver, and having drawn a little loop of the small intestine through a slit made in the mesentery, replaced the gut so arranged and closed the abdominal wound. He then made a second incision into the belly at a remote spot, and injected water or semi-fluid matter into the small intestine above the seat of the obstruction. The first matter that reached the loop in the mesentery passed through it, but as more was injected the little coil became rapidly distended, and was ultimately closed and entirely obstructed.* M. Anger, experimenting in another direction, drew a loop of gut out of the abdomen, and put a ligament lightly around its two ends. The ligature was loose enough to allow the gut to slide about within it, and to allow the tip of the little finger to be introduced into each end of the bowel. He then made a hole at the bend of the loop, at the part most remote from the ligature, and introduced a tube, through which air was blown. As the gut distended some air escaped, but the more swollen it became the more tightly was it gripped, until when fully distended it was found to be hermetically sealed; and, what is more interesting, *more gut had been drawn into the loop from the abdomen.*†

In a great many cases the final cause of the strangulation is a twisting of the involved coil of bowel. This is well shown in several museum specimens. Here the band would not have been of itself sufficient to produce a strangulation provided that the bowel had not become twisted beneath it. On the other hand, it is equally obvious that the volvulus could not have been produced without the band. The twist is given to the bowel partly by distension, partly by its

* Contrib. à l'Étude de l'Occlusion Intestinale, by M. Le Moyne. Thèse de Paris, 1878.

† De l'Étranglement Intestinale, by M. Benjamin Anger. Thèse de Paris, 1865.

own movements, partly by the dragging of the mesentery. In some cases, adhesions already existing above the implicated coil may have favoured the volvulus. There must be cases also, similar to that illustrated in Fig. 2, where the arrangement of the band is such, that it could never strangulate the bowel until the bowel itself had become twisted.

There are instances also where the arrangement of the band and of the mesentery are such, that the engaged loop as it becomes distended is soon so acutely bent over the band by the dragging of the mesentery that it becomes obstructed (in one end of the loop at least) before it is very tightly gripped.

CHAPTER IV.

STRANGULATION BY BANDS OR THROUGH APERTURES. SYMPTOMS.

Frequency.—The cases that come under this category form no less than one fourth of the total number of cases of intestinal obstruction from all causes.*

The high proportion here indicated depends partly upon the fact that several distinct anatomical conditions are comprised under one general heading, and partly upon the circumstance that a comparatively common ailment (local peritonitis) takes an important part in the production of the different forms of the obstructing agent.

Sex.—This variety of obstruction of the bowels is more common in males than in females in the proportion of 180 to 118. The distribution of these

* From this enumeration are excluded herniæ and affections of the rectum, both congenital and acquired.

figures among the different sub-varieties is shown in the following table from Leichtenstern :

	Males.	Females.
Strangulation by false ligaments . . .	52	59
,, by the omentum . . .	43	15
,, by the diverticle . . .	52	14
,, by the appendix vermiformis .	21	13
,, through slits in the mesentery and in other parts, excluding the omentum	12	17
	180	118

It will be seen that strangulation by peritoneal adhesions occurs with about equal frequency in the two sexes. The balance, however, is very strangely struck. The two forms of peritonitis that are answerable for the bulk of the adhesions that cause strangulation are pelvic peritonitis, and the peritoneal inflammation associated with typhlitis. Pelvic peritonitis is practically limited to women, and in the matter of strangulations due to pelvic adhesions females are of course enormously ahead of the males. Typhlitis, on the other hand, is much more common in males than in females, the ratio being, according to Bamberger, twenty-six to four. The cases, however, of false ligaments due to pelvic inflammation outnumber those due to inflammation of the cæcum, and the balance between the two sexes is made nearly even by the increased frequency of hernia in the male, and by the greater liability to peritonitis from violence in members of that sex.

The disproportion in the number of the cases among males and females due to strangulation by the omentum is readily explained. Owing to its limited length the omentum can contract adhesions about the right iliac fossa (typhlitis) with somewhat greater ease than about the pelvis. This circumstance would render omental adhesions a little more frequent in men. A more influential factor, however, is concerned.

The omental adhesions are very commonly, perhaps most commonly, brought about by external herniæ, and Mr. Kingdon's tables show that for all ages and all varieties, rupture is twice as common among males as it is among females. The formation of omental cords after injury must also be taken into consideration.

With regard to the diverticula, it is simply a matter of anatomical observation that they occur with much greater frequency in the male than in the female sex. Their situation about the cæcal region would also render the shorter of them more liable to form adhesions after typhlitis than after pelvic peritonitis.

The greater frequency of strangulation by the appendix vermiformis in males is explained by the ease with which that process becomes adherent after typhlitis, typhlitis being certainly the most common cause of adherent appendix.

The distribution of the few cases of strangulation through mesenteric and other slits and apertures calls for little comment. The slightly increased frequency in the female sex may possibly be due to the circumstance that obstruction through slits in broad adhesions has been met with most often in the pelvis among the results of peritonitis in that region.

Age.—Strangulation by false ligaments, by the omentum, by the appendix, and through abnormal slits and apertures occurs most frequently in persons between the ages of twenty and forty. This circumstance obviously depends upon the fact that the forms of peritonitis, with which these affections are so intimately associated, are most common between these ages. Typhlitis falls within this period of life.*

* "Typhlitis occurs most frequently between the ages of 16 and 35." Bauer; Ziemssen's Cyclopædia of Medicine, vol. viii., page 317.

Pelvic peritonitis occurs, with comparatively few exceptions, during the period of child-bearing, and as a rule early in that period, being frequent in primiparæ. Mr. Kingdon's tables show that the greatest number of cases of hernia appear for the first time during the twenty years in question. During the same period also strangulation of herniæ is common, and perhaps at no other period of life are injuries of a severe character more frequent.

Many cases are met with after forty.* Forms of peritonitis that may be recovered from, and that lead to adhesions, may occur after that age, and, moreover, strangulation of the bowel may not occur for many years after the peritonitis that renders it possible has passed away.

Before twenty these varieties of obstruction are comparatively uncommon, and before ten they are very rare. In one or two cases of incarceration by a false ligament in young children, the formation of the adhesion has probably depended upon an intra-uterine inflammation. Children are not liable to those forms of peritonitis that can be recovered from. In such subjects typhlitis is quite rare and pelvic peritonitis practically unknown. Infantile peritonitis and the tubercular form of the disease are uniformly fatal; although during the course of the more chronic forms of the latter affection strangulation may occur. Thus M. Larguier des Bancels reports the case of a boy, aged eight, who during the progress of tubercular peritonitis developed symptoms of acute obstruction, of which he soon died. The autopsy revealed a coil of the lower ileum strangulated by a band, one of the many resulting from the disease of the serous

* The oldest patient of whom I can find record is a woman aged 80, who died of acute obstruction due to an omental band after hernia. Lucas-Champoinniere; Bull. et Mém. de la Soc. de Chir. de Paris, tome v., 1879, page 645.

membrane.* When, therefore, strangulation due to adhesions is met with in the young, it is usually found that the adhesions have followed injury, or the slight peritonitis that may attend caseous degeneration of the mesenteric glands. The main number, however, of the cases of incarceration coming under the present general category are such as depend upon congenital abnormalities.

Strangulation by means of the true diverticulum occurs most frequently during the twenty years between 10 and 30. Of the two decades the latter presents the greater number of cases. Leichtenstern found the average age in seventy cases to be 25 years. He notes eight cases between the ages of 2 and 10 years, and Trier has recorded a case in an infant of 8 months.† Above the age of 40 strangulations due to the diverticulum are extremely rare. Incarceration by this process is to a great extent independent of peritonitis, since it can occur without the aid of acquired adhesions. Moreover, when a free process does acquire an attachment it seems to be capable of doing so without inducing a peritonitis of appreciable magnitude. A diverticular pouch or ligament, once free, is often found adherent to some spot on the serous membrane, while about that spot no trace of a previous inflammation will be found.

[The account of the symptoms that follows is founded mainly upon an analysis of fifty recorded cases of this form of obstruction. These fifty cases were selected from a larger number, upon the sole ground that the accounts of them were more or less complete, both clinically and pathologically. Imperfectly reported cases are, when not simply useless, actually misleading.]

* Sur le Diagnostic et le Traitement Chirurgical des Étranglements Internes. Thèse de Paris, 1870.

† Pfaff's Mittheil., Jahrg. iii., Heft 9.

The previous history.—This is a matter of some importance in the diagnosis, and may be considered under two heads: 1. History of previous peritonitis, injury, etc., *i.e.* of circumstances that may have rendered an obstruction possible: 2. History of previous attacks of abdominal disturbance, *i.e.* of symptoms such as may have been produced by the same cause that brought about the final strangulation.

1. Out of the fifty cases above alluded to, there was in thirty-four instances (68 per cent.) a history of such previous trouble as may have produced causes for obstruction. In seventeen cases (34 per cent.) there was a history of peritonitis; in eleven (22 per cent.) a history of hernia; in six (12 per cent.) a history of accident. In sixteen cases (32 per cent.) there was nothing in the previous history to note under this heading. These sixteen cases included several examples of the diverticulum, some instances of slit in the mesentery, and a few patients in whom adhesions had been found without any circumstances in their previous history to call attention to the occurrence.

As to the interval of time that may have elapsed between the causative affection and the actual strangulation, the greatest variety exists. The shortest period I have noticed is in a case where only five weeks elapsed between the peritonitis, that presumedly formed the band, and the strangulation of the bowel. The longest period was met with in a female aged 52, who died of strangulation of the ileum by a band connected with the pelvic peritoneum. Twenty-one years before she had had "inflammation of the womb" following labour.* In two cases, next to this in point of time, seven years had elapsed. Omitting the twenty-one years' case, the average duration of the

* Guy's Hospital Reports, vol. xiv., page 272.

interval between the causative peritonitis and the obstruction was three years.

With regard to internal strangulations, due directly to hernia, they were in all cases observed in connection with ruptures of many years' standing. In one patient aged 80, who died of incarceration of the bowel by an omental band, the hernia with which that band was associated had existed for sixty years.

In the twelve cases where an accident is credited with being the existing cause of a strangulation, the interval between the lesion and the intestinal trouble was in all cases short, and in two instances the development of strangulation was immediate.

2. Some of the patients who had died of obstruction had complained of previous intestinal troubles, such as severe indigestion, "spasms," bilious attacks and persistent pains in the abdomen. The number of individuals in whom such symptoms had been noticed was comparatively few, and it is questionable whether such symptoms were, or were not, dependent upon the same cause that ultimately brought about the obstruction. It can only be surmised that when adhesions are attached to the bowel itself they may, from traction or other causes, embarrass at times the peristaltic movement of the intestine and hinder the progress of its contents.

In six individuals (12 per cent.) there was a history of previous obstruction. These attacks were marked by the onset of a sudden and severe pain of a colicky character, associated with vomiting and constipation. Their duration was, as a rule, quite short, varying from one to three days. Usually there had been only one such attack previous to the final one. In rarer instances there had been two or three. In some examples these previous attacks had been very severe. Mr. Gay has given details of the case of a man aged 42, who died from strangulation of a coil of

ileum beneath an adherent appendix. During the four years that preceded his death, the patient had had no less than thirty attacks of severe pain, associated with vomiting and absolute constipation. This case, however, was complicated by a stricture of the small intestine, to the occasional plugging of which these thirty attacks were probably due.* The rarity of previous attacks in this form of intestinal obstruction compares strikingly with the great frequency of such occurrences in many of the more chronic forms of obstruction.

The mode of onset.—The attack, as a rule, begins suddenly with very severe abdominal pain, followed rapidly by vomiting and symptoms of constitutional depression. On analysing fifty cases, I find that in thirty-five instances (70 per cent.) the mode of onset was more or less distinctly sudden. In thirteen cases it was comparatively gradual, and in the remaining two observations the commencement of the attack is not described.

A study of the pathology of this form of obstruction would lead one to infer that its onset would be sudden. A loop or knuckle of gut is, in a moment, thrust beneath a band, or through an aperture, or is snared by a free noose or knot, and symptoms of strangulation follow almost directly. An examination of the cases of gradual onset often reveals some circumstance that may account for this somewhat unusual mode of commencement. In some instances the symptoms of absolute obstruction followed upon prolonged constipation, and the condition of the parts involved seems then to have borne the same relation to the conditions of acute strangulation that an "obstructed hernia" bears to a strangulated one. In one case the intestines were so matted together by numerous adhesions, that partial obstruction may

* Path. Soc. Trans., vol. iii., page 101.

have taken place at many points at once, so that the final incarceration would be, in a sense, cumulative. In another instance of gradual onset, a loop of the ileum and a part of the ascending colon were beneath the band, the large bowel apparently affording some temporary protection to the small. In other cases it would appear that a large quantity of intestine had passed beneath a band, but had not been at first tightly nipped by it. In such examples complete strangulation would follow slowly upon the gradual distension and engorgement of the compressed coils.

In the instances where the onset has been gradual, the patient has usually had some slight pain, often of an intermittent character, with trifling vomiting, and a constipation that has frequently not been absolute. Very soon, however, the symptoms increase in severity and assume all the characters of those of acute strangulation. The transition from subacute symptoms to acute is often coincident with the administration of strong aperients.

Evidence of any immediate exciting cause is very commonly absent. In probably about two-thirds of the cases the attack seems to have come on when the patient was in good health, or at least free from any abdominal disturbance. In three cases (out of fifty), it set in suddenly during the night while the patient was asleep. In about one-third of the cases some circumstances have immediately preceded the symptoms of strangulation that may have taken an active part in producing the obstruction. The fallacy, however, of the argument, "post hoc propter hoc," may enter into many of these relations, or the supposed exciting cause may have been really a part of the symptoms of the final malady. This would, perhaps, apply to those instances where strangulation has followed upon a "bilious attack" or upon severe "indigestion." Putting these cases aside, however, we find

that the obstruction has several times appeared after a hearty meal, and especially a meal of indigestible food, such, for example, as beans. In connection with hernia, it has come on when the rupture was down or giving trouble. In two instances it appeared while straining at stool. In one or two cases it came on after the administration of a purge. It has followed also upon a sharp attack of diarrhœa. In quite a fair number of patients the symptoms of strangulation have made their appearance either during or immediately after unusual exertion. In one instance a peculiar position of the body seems to have had some influence, as illustrated by the case, reported by Dr. Quain, where a coil of ileum was found strangulated through a slit in the broad ligament of the uterus. Here the attack came on suddenly while the patient was bending to unlace her boots. In a remarkable case reported by Mr. Bryant, a distended bladder was the immediate cause of a strangulation being produced. In this instance a coil of bowel was involved beneath a band that passed from the bladder to the lumbar spine. The patient had been out for a drive and had been compelled to retain her urine for some hours. Shortly after emptying her bladder, symptoms of acute obstruction set in. Here there is little doubt but that the distended viscus so raised the band out of the pelvis as to allow a loop of gut to pass beneath it.*

The pain.—The pain attending these cases of intestinal obstruction is among the most conspicuous and most constant of the symptoms.

It is usually the first manifestation of the attack.

It is generally at the commencement of great severity, and is of a griping or colicky character. In several instances the patients are spoken of as being bent double with the pain, or even as rolling on the

* *Med. Times and Gazette,* vol. i., 1872, page 304.

floor in agony. Often it appears to have been moderate, but in no case could it be described as trivial.

As to the situation of this early pain, Mr. Gay, in his well-known essay on "The Solitary Band," observes, "the localisation of the pain is ever at first due to the constricting agent, and marks its seat." In other works similar observations occur. With these statements I might be permitted to disagree. In examining into the clinical history of the fifty cases that form the basis of the present remarks, I find that in many instances the initial pain was distinctly referred to a spot that subsequent post-mortem examination proved to have corresponded to the seat of obstruction. But in a still greater number of the cases this pain is described as being located in a point more or less remote from the seat of strangulation. The proportion of the latter class of case to the former is nearly that of two to one. Taking all the cases together, it is seen that in the majority of them the pain is referred to the immediate vicinity of the umbilicus. In some of these examples the obstructed coil was, it is true, found to be placed near to the umbilicus, and in other cases the strangulating band had an attachment close to that cicatrix. But in still other and more numerous instances the situation of the intestinal lesion was found to be remote from the umbilicus, was located in the right iliac fossa, or deep in the pelvis, or close to a hernial opening about the groin. Still more marked examples of this lack of relationship may be given. A few of them are the following. The pain was on the right side just below the liver; the obstruction was in the ileum eighteen inches from the cæcum.* The pain was on the left side, and on a level with the navel, and in one case where it was so placed a coil of ileum had passed through a rent in the right broad

* *Med. Times and Gazette*, vol. ii., 1876, page 651.

ligament,* while in another the strangulation was deep in the right iliac fossa.† The pain was near the gall bladder; the obstruction was in the ileum.‡ The pain was in the epigastrium, and the trouble that caused it was due to a band passing between the urinary bladder and the lumbar spine.§

In speaking of the situation of the pain in intestinal obstruction in a subsequent chapter, I have pointed out the physiological improbability that a painful spot among a series of complicated and moving coils, like those of the smaller bowel, would be accurately localised. The pain in intestinal strangulation would often seem to be a referred pain, and it is needless to point out that in affections of other abdominal viscera, discomfort is often felt at a distant point. From the frequency with which the pain is referred to the vicinity of the umbilicus, it might be gathered that it has been conducted to the great abdominal nervous centres. It is complained of, with strange frequency, as being about the middle line. The solar plexus, through which the small intestine is supplied, is situated about four inches above the umbilicus, while the superior mesenteric plexus commences still nearer to the navel, and runs for some little distance almost directly in the middle line. Pain conducted along the latter plexus would probably be most definitely felt near the middle line, and about the umbilicus. It may be noted that the pain to which reference is now being made is a pain due to compression of a limited part of the gut, and not one depending upon disordered peristaltic movement. The pain caused by such movements could not well be localised, since its very occurrence involves a constant changing of position. From

* Path. Soc. Trans., vol. xii., page 103.
† Union Médicale, 1860, page 97.
‡ *British Med. Journ.*, vol. i., 1883, page 999.
§ Bull. de la Soc. Anat., 1843.

the facts themselves, however, I would maintain that the position of the pain in this form of internal strangulation is of no diagnostic value as a guide to the seat of the lesion; that it is more often complained of about the umbilicus than elsewhere, and that as a means of ascertaining the locality of the trouble it is actually misleading.

The pain that is so conspicuous a feature at the commencement of these cases persists throughout the course of them. It does not, however, retain its original intensity. It soon becomes less severe, and often undergoes considerable abatement. In some of the more acute cases, however, it has persisted with all its original intensity until deadened by the collapse that supervenes.

The pain often ceases shortly before death. This circumstance, however, is of no significance; it is usually coincident with a profounder collapse, or with gangrene of the bowel involved, or with advanced narcotism.

One or two cases have been recorded where the pain has been almost an insignificant feature, and of these extremely rare cases no satisfactory explanation can be given. The most striking one that I have met with is reported by Mr. Hulke.* The patient was a man, aged thirty-two, who, after a hearty meal, was seized with sudden abdominal pain and vomiting. The pain soon passed off, but the vomiting persisted and became very severe. Neither fæces nor flatus were passed by the rectum. On the tenth day the vomiting was feculent, but the patient still complained of little or no pain. Such pain as there was was about the umbilicus. Laparotomy was performed, and the man survived the operation fifty-three hours. The autopsy revealed a coil of the lower ileum strangulated beneath a band formed by

* *Medical Times and Gazette*, vol. ii., 1877, page 482.

an epiploic appendix of the sigmoid flexure that had become adherent to the peritoneum near the right sciatic notch.

The pain in the hernia-like strangulation of the bowel is continuous. It presents slight exacerbations, as do all "colicky" pains. It does not, however, intermit at any time, nor are there any intervals of calm between definite paroxysms.

I shall later on have occasion to draw attention to the fact that, speaking generally, paroxysmal pains indicate an incomplete occlusion of the bowel.* When the obstruction is absolute the pain becomes practically continuous. In the present form of incarceration the lumen of the gut becomes entirely obliterated, and the pain in consequence presents no paroxysmal character. To this statement there are but few exceptions to be made, and such as there are are probably susceptible of explanation. In Mr. Gay's monograph, already quoted, he states that he met with only six examples of paroxysmal pain among forty-one cases where the nature of the pain was indicated. Among my fifty cases I find eight instances of intermittent pain. The circumstances of these eight examples are worthy of brief notice.

1. Female, aged 53. Pain appears to have been only paroxysmal at the commencement. Case of strangulation beneath a band; laparotomy with cure on sixth day.†

2. Female, aged 23. Here only a single line of gut was found beneath a band, not a knuckle or loop; the obliteration of the canal was therefore apparently incomplete. The pain is merely said to have "persisted on and off."‡

3. Female, aged 26. Case of strangulation beneath a band. Here the strangulation does not appear to have been severe at first, and laparotomy was not considered necessary until the eleventh day.§

* *See* chapter xx.

† *British Medical Journal*, 1883, page 999.

‡ St. Bart.'s Hosp. Reports, vol. xvii., page 277.

§ Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 632.

4. Female, aged 21. Strangulation beneath a band. The incarceration was not severe, and when laparotomy was performed on the fourth day the involved coil was found in good condition. The patient recovered.*

5. Male, aged 42. In this case, already alluded to, there was, besides the incarceration, a stricture of the intestine, to which the paroxysmal pain was probably to no small degree due.

6. "A boy." Case of strangulation beneath a band.†

7. Female, aged 26. Mr. Bryant's case of band arising from the bladder. Each paroxysm was attended with stranguary, and the "play" allowed to the band by its mobile point of attachment probably prevented the obstruction from being very complete.

8. Female, aged 45. Paroxysms every half-hour. Two bands were found to hold down two portions of bowel. Neither band compressed the gut greatly, and the upper of the two involved coils was but very slightly pressed upon by the band.‡

In the majority of these cases, therefore, there is some reason to suspect that the occlusion of the bowel was not so complete as it may have been, nor so perfect as it commonly is.

During the early stages of the malady, before any abdominal tenderness exists, the pain is often described as being relieved by pressure.

There is a direct connection, more or less constantly observed, between the severity of the pain and the urgency of the vomiting, and especially between the pain and the degree of constitutional disturbance.

Tenderness of the abdomen.—This symptom, as demonstrated by pressure upon the abdomen, is, as a rule, entirely absent at first. It may never appear, especially in cases pursuing a rapid course. In a few cases of a less acute character it has been of trifling degree, or not sufficiently marked to attract

* Bull et Mém. de la Soc. de Chir. de Paris, 1879, page 564.

† Sur le Diagnostic et Traitement des Etranglement Internes. Thèse de Paris, 1870.

‡ *Lancet*, vol. ii., 1873, page 773.

notice. In the majority of cases, however, some part of the abdomen becomes tender during the course of the disease. This tenderness may be limited in extent, or diffused. Limited tenderness usually appears about the second or third day. It is a symptom that, when well marked, is of considerable diagnostic value, since it appears to be always restricted to the actual seat of the lesion. It depends, no doubt, upon congestion or inflammation of the involved coils, or upon some slight peritonitis excited in their serous coat. As a factor in diagnosis, therefore, it is of much more value than is the simple spontaneous pain always observed in these maladies.

A diffused tenderness of a marked nature indicates the onset of a peritonitis, and is also a symptom of much clinical value. When peritoneal inflammation has become diffused a general tenderness is practically constant, unless modified or concealed by profound collapse or narcotism.

In several cases, after the symptoms have lasted for a few days and the pain has been severe, the abdomen has exhibited a general but *slightly* marked tenderness on pressure. This is probably the result of violent peristaltic movements. In such movements the muscular coat of the bowel is practically in a state of cramp, and there is no reason why the involved gut should not become as tender after a prolonged attack of cramp as does the calf of the leg after it has been the seat of a like disturbance. This cause of tenderness may perhaps contribute to the production of the local "pain on pressure," but I presume that it would in no ordinary case attain to the marked character of the tenderness due to peritonitis. It is obvious that any fine distinctions on this score are impossible.

In several cases of localised tenderness pressure over the affected spot has caused an increase in the

colicky pains, and has induced an immediate attack of vomiting.

Vomiting.—Vomiting is a conspicuous and constant symptom. In an isolated case or so it has been the earliest manifestation of the obstruction. In the great majority of cases it comes on immediately after the appearance of the pain or within a few hours of that event. I have met with two instances where the vomiting did not appear until twenty-four hours after the onset of the pain.* It soon, however, became stercoraceous, and the patient died on the eighth day in one case, and was cured by laparotomy on the fifth day in the other. In both instances the initial pain had been sudden and severe.

As regards its character the ejected material consists first of the contents of the stomach and then usually of bilious matters. In its next stage it may be thin and of a brownish colour, or be comparable to pea-soup, or be of a yellow tint like the yolk of egg. Vomited matters with these characters are often described as possessing an "intestinal odour." Lastly, the vomit may become stercoraceous.

Stercoraceous vomit is common in this form of obstruction. In five of my fifty cases the character of the ejecta is not clearly described, but in the remaining forty-five cases the vomit became stercoraceous in twenty-eight instances, and remained non-stercoraceous in seventeen. These figures very closely correspond with those given by Mr. Gay. That surgeon found that the vomited material became stercoraceous in twenty-six cases out of thirty-seven.

The period in the attack at which the vomit assumed a feculent character varied from the second to the ninth day. An average taken from

* Dr. Hilton Fagge; Guy's Hosp. Reports, vol. xiv.: Dr. Boeckel; Bull. et Mém. de la Soc. de Chir., tome vi., 1880, page 339.

the twenty-eight cases gave the fifth day as the mean.

An examination of the seventeen cases where the vomit remained non-feculent revealed a striking fact. The cases separated into two categories: in one, death had taken place before the usual period for the onset of stercoraceous vomiting had been reached; in the other, the course of the attack had been less acute than usual, and the patient's life prolonged beyond the average duration. Thus feculent vomiting was absent in some of the most acute and in some of the least acute cases. In nine of the seventeen examples the patient had died within two and a half days of the commencement of the attack. In the remaining eight cases life had been prolonged on an average to the eighth day. In one instance the patient had died on the fourth day, but the matters vomited had not become stercoraceous. On an average, life was prolonged for three days after the onset of feculent vomiting.

Cazin observes that stercoraceous vomit is rare in cases of strangulation by the diverticulum. This is, to a certain extent, true, since these cases very commonly assume a rapid course, and end in death before the usual time for the occurrence of such vomiting has been reached.

I have only met with one instance where the vomit distinctly contained blood. It was in a case of acute strangulation of the lower ileum by a diverticulum. The patient lived two and a half days. The vomited matter was never feculent.*

When once it has set in the vomiting will persist until the termination of the attack. It is one of the most distressing of the symptoms. Everything swallowed is immediately ejected, and even when nothing is taken by the mouth the vomiting will continue

* *British Med. Journal*, vol. ii., 1882, page 785; by Dr. J. Cockle.

incessantly. Often a little movement or a little pressure upon the abdomen will excite an attack. When not actually sick the patient will commonly complain of a most distressing nausea and will be troubled by eructations of flatus. It is worthy of note that the patient is in no way relieved by the attacks of vomiting, as may be the case in other maladies associated with this symptom, and as is sometimes the case in other forms of intestinal obstruction.

With few exceptions, the longer the obstruction lasts the more violent and distressing do the attacks of vomiting become. Sometimes they may cease entirely a few hours before death, just as the pain may abate under the same circumstances. In other cases, however, there has been a sudden and profuse gush of vomit either just before death or in the act of dying, the fluid pouring, without effort, from the mouth and through the nostrils. This is observed also in other forms of obstruction and sometimes in death from peritonitis.

In a few isolated cases, where the obstruction does not appear to have been very complete at first, the vomiting has undergone distinct abatement after the violent attack marking the onset of the trouble has passed away.

Opium has often a very decided effect upon the vomiting. When the patient is well under the influence of the drug the symptoms of intestinal obstruction may be more or less efficiently masked. The pain abates, the pulse improves, the amount of urine, if lessened, increases, and the vomiting becomes less troublesome or ceases for a while. Under the influence of opium, stercoraceous vomiting even may cease, and on the reappearance of the symptom the ejected matters may be non-feculent. This is well illustrated by a case recorded by Mr. Berkeley Hill. The patient was a child aged ten, and the obstruction

was due to strangulation of the ileum under a band. By the third day of the attack the vomiting was severe and feculent. Opium was given. For four hours the vomiting ceased entirely, and when it returned was much less distressing, was less frequent, and was non-stercoraceous. Although laparotomy was not performed until the seventh day the vomited matter appears never to have again become feculent, except on one occasion.*

In this and like cases it is probable that the drug stills the peristaltic movement of the intestine, so that what is ejected is merely the contents of the stomach and of the highest part of the smaller bowel.

Peritonitis, presumedly by the paralysing effect it has upon the intestine, seems to have some influence upon the production of feculent vomiting.

When acute peritonitis sets in early there is certainly a much less tendency for the ejected matter to become stercoraceous. In some cases this has been very marked. The same may be said, perhaps, of chronic peritonitis. In one case where acute strangulation of the bowel occurred during the progress of a chronic peritonitis, the vomiting, although severe, never became stercoraceous. Yet the patient lived six days.†

In nearly every instance the act of vomiting is associated with much retching and distress. In one case, however (that of Mr. Hulke's, quoted on page 74), where the patient had little or no pain, the vomited matter appears to have gushed passively from the mouth with little trouble to the patient. The vomiting was in this instance copious, and in time feculent.

Constipation.—Constipation is, as a rule, absolute from the first, and continuous. Neither fæcal

* *Lancet*, vol. i., 1876, page 773.
† Case by M. Larguier des Bancels, loc. cit., page 64.

matter nor flatus is passed after the onset of the attack. It would seem as if all the bowel below the seat of the obstruction became instantaneously paralysed, since it would be absurd to assume that in every case the colon is quite empty at the time that the strangulation occurs.

The exceptions to this condition of things are very rare. In two or three instances a motion has been passed during or immediately after the occurrence of the initial symptoms, and was probably derived from the intestine below the site of the strangulation. Enemata administered almost at any time after the commencement of the attack may possibly bring away scybala from the colon, and in one case such scybala came away repeatedly. Flatus generated in the large intestine may also be passed, but the circumstance is quite exceptional.

I have met with two recorded instances where blood is said to have been passed. In one case, in a man aged 53, a coil of the lower ileum, eighteen inches in length, was strangulated beneath a band. The patient died, after laparotomy, on the sixth day. Constipation was absolute throughout, but the patient is said to have passed a little blood. It is not stated if the man had piles.* In the other case (the case by Mr. Berkeley Hill, alluded to on page 80) enemata on two occasions brought away scybala and blood. The patient was a child aged ten, and there is no evidence to show that the blood was derived from the seat of strangulation. It may have been produced accidentally by the enema tube. At autopsies blood is frequently found in the engaged coil and in the intestine above it, but not, so far as I am aware, in the bowel below the obstruction.

Out of my fifty cases, I have met with six

* Dr. Fincham; *Med. Times and Gazette*, vol. ii., 1876, page 651.

instances where a more or less copious motion or motions passed during the course of the disease. In all instances the event occurred shortly before death. In two of the examples the stool must have been derived from the bowel below the obstruction (which was found to be complete at the autopsy), and I believe that its evacuation was coincident with the appearance of general peritonitis. In both of these cases a single stool was passed on the day before death. In both there had been absolute obstruction for more than seven days. In both the peritonitis was very recent, and was not due to perforation.* It is not difficult to imagine that the onset of so grave a change as general peritonitis may produce such effect upon the abdominal nervous centres as to excite the passive bowel below the obstruction, although of the nature of that influence we may have no knowledge. The four remaining cases are more intelligible, and in each of them the unusual motion may have come from the bowel above the obstruction.

In two there was perforation, and in two there was volvulus. The first of these cases, in a man aged twenty-one, had assumed a subacute course, the patient dying on the thirteenth day. Constipation had been absolute throughout, but shortly before his death the patient passed a copious black liquid stool into the bed. The autopsy showed that eight inches of the lower ileum had become strangulated beneath a band passing from the transverse colon to the cæcum. An ulcer of the stomach was found to have perforated, and the relief thus given to the distended bowel had allowed the incarcerated knuckle to become partly withdrawn from under the band. In fact, the obstruction at the last moment had ceased to be complete.†

In the second case, an aperient given shortly before death led to some greenish loose motions being passed. The obstruction had been complete for nine days. The autopsy showed a perforation of the bowel above a coil of ileum engaged beneath

* Maunoury. Thése de Paris, 1819.

† Dr. Hilton Fagge; Guy's Hospital Reports, vol. xiv., page 272.

a band. The mechanism of the relief was probably the same in this case as in the preceding. *

In the two remaining cases, although the gut was in each instance beneath a band, yet the main cause of the obstruction was a volvulus of the engaged coil. Without the volvulus the obstruction would have been but partial. It will be shown in speaking of twist of the small intestine, that the constipation in such cases is commonly not complete, and to that variety of obstruction these two examples more properly belong. In one of the examples the patient, a man aged twenty-one, lived forty-three hours, and passed two liquid motions not long before death.† In the other case, that of a child aged four, constipation had been complete, and all the symptoms of incarceration were marked up to the fourth day, when a dose of croton oil produced a copious evacuation. The child lived until the tenth day.‡

GENERAL CONSTITUTIONAL SYMPTOMS.

Rigor.—In only one case among fifty can I find any mention of a rigor associated with the appearance of strangulation. In this solitary instance there can be little doubt that the rigors (for the patient had several) were connected with a circumscribed peritonitis which was developing at the time of the onset of the incarceration, and that they had no direct connection with the strangulation.§

Prostration.—Usually coincident with the onset of the attack the patient exhibits evidences of great prostration, and in severe cases this soon deepens into profound and even fatal collapse.

There is great muscular weakness, the face is drawn with pain and has an aspect of horrible anxiety, the features become pinched, the eyes sunken and surrounded by bluish rings, and the voice weak

* Bull. de la Soc. Anat. de Paris, 1861, page 118; by M. Brichetau.

† M. Le Moyne; Contrib. a l'Étude de l'Occlusion Intestinale. Thèse de Paris, 1878.

‡ Dr. Kernot; Path. Soc. Trans., vol. xv., page 101.

§ M. Terrier; Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 564.

and muffled. A cold sweat breaks out upon the surface, and in extreme cases the limbs become cyanosed and the complexion livid. The patient at last sinks, retaining his intelligence, as a rule, to the last.

The **pulse** is small, often becoming thready, as in peritonitis, and of increased frequency. It commonly rises to 120, 130, or 140. It may become much modified when opium is freely given.

The **temperature** is commonly throughout the whole case subnormal, being the temperature of collapse. Even when peritonitis sets in it may still remain subnormal. In acute cases it may be found to sink gradually, almost hour by hour, as the symptoms advance, and it may even continue to sink when peritonitis has set in. A gradual increase in the frequency of the pulse is often associated with this depression of the bodily heat. As a rule, however, the occurrence of acute peritonitis has an appreciable effect upon the temperature, provided that it has not been set up by perforation, and may cause it to rise from below normal to normal, and to reach 99° or 99·6°, or even 100°. When perforation occurs at the end of a case of intestinal obstruction a profounder state of collapse is as a rule at once induced, and upon the sinking temperature the inflammation has no influence.

A rise of temperature above the normal in a case of acute strangulation of the bowel may be said to, in all cases, indicate the appearance of peritonitis.

The **respirations** are increased in frequency, are superficial, and are often of a supracostal type. In this form of obstruction the embarrassment to the respiration caused by intense distension of the abdomen is very rarely met with.

The **tongue** is usually coated, being at first white and then becoming dry and brown. It exhibits, however, some few exceptions to this rule, as, for example,

in a case in which the tongue on the tenth day of the symptoms is described as being moist, white, and but slightly coated.

There is usually a very offensive taste in the mouth, especially after the vomited matters have become stercoraceous.

Intense thirst is usually complained of, especially in cases where vomiting has been very profuse. In one or two instances the occurrence of hiccup throughout the progress of the case has been noted.

Urine.—The quantity of the urine is very commonly diminished, and in the most acute cases may be entirely suppressed, the bladder being found empty. As will be subsequently explained (chapter xx.), the effect of internal strangulation upon the renal excretion is brought about mainly through the nervous symptom. A diminution, therefore, in the amount of the urine is most marked in the most acute cases, and in those attended by intense pain and much collapse. In many instances the excretion of the urine has been immediately increased on the patient coming under the influence of opium. The position of the obstruction in the small intestine has no effect upon this symptom. It may be absent when the strangulation concerns the jejunum, and present when it involves the ileum. The significance of this symptom is more fully dealt with in the chapter just alluded to.

In only two cases was *stranguary* noticed. In one of these the obstructing band was attached to the bladder. In the other, so large a mass of empty coils hung down into the pelvis that it may possibly have pressed upon the bladder. The patient was a girl aged ten, and the mass was found, during life, to press upon the rectum.

In not a solitary case was *tenesmus* complained of.

In a single instance the patient became delirious before death. He was a young man, the symptoms were very acute, and death ensued in less than two days.

In three cases out of the fifty the patients suffered from **cramps.** In two of these the cramps were complained of in the lower limbs, in the remaining case in the jaws and hands. In all three examples the symptoms of strangulation were very severe, and the progress of the case rapid. The subject of muscular spasm in connection with strangulation of the bowel has been fully investigated by M. Berger.* He finds that the cramping pains are usually in the feet and calves, that the symptom is limited to cases of severe strangulation, and is most common in adults. He has collected fourteen cases where this feature was noted. Eleven were cases of strangulated hernia, two of strangulation by a band, and one of obstruction by a diverticle.

It is in a case of this kind, associated with cramps in the limbs, attended by profound collapse, with a cold skin and cyanosed extremities that the mistake of diagnosing intestinal obstruction for cholera has occurred. This error may well be made when the strangulation has been preceded by an attack of diarrhœa.†

There is a case reported by Dr. Peacock that is, I should imagine, unique. It concerns a man, aged sixty-five, who died collapsed, and in whose abdomen a small knuckle of the ileum was found strangulated by a band. The involved gut was gangrenous. The patient is said to have been ill six days with constipation, but to have worked up to the morning of his death.

* Bull. et Mém. de la Soc. de Chir. de Paris, vol. ii., 1876, page 698.

† *See* case by M. Le Moyne, loc. cit.

THE CONDITION OF THE ABDOMEN.

The **abdominal walls** remain flaccid, or in their normal condition until such time as local tenderness becomes marked, or general peritonitis sets in, or distension reaches a considerable degree. Even in some cases where peritonitis was found after death, the parietes appear to have retained their normal suppleness to the end.

Meteorism.—Distension of the abdomen is in this form of obstruction comparatively slight. It usually appears about the third day. In no case could it be spoken of as excessive. The most extreme instance of distension of which I find a record was met with in a patient who was attacked with strangulation of the bowel when suffering from chronic tubercular peritonitis. It never approaches to the excessive degree of distension met with in cases of volvulus of the sigmoid flexure. It appears to be least marked in the rapid cases, and especially in cases attended by active peristaltic movements in the bowels and extreme vomiting. Meteorism to attain great magnitude requires the intestinal walls to be paralysed, and the presence of colicky pains serves to indicate that that paralysis has not yet supervened. Excessive vomiting also must tend to keep the intestine empty.

When peritonitis sets in the meteorism undergoes a considerable increase.

The swelling is usually first noticed in the epigastric and umbilical regions, and may form a very distinct elevation of the parietes in those districts. The regions of the colon remain flat, the meteorism being, of course, limited to the lesser bowel. When, however, the distension has reached any magnitude it practically occupies the entire abdomen. In one case there was very visible distension of the transverse

colon, but in this instance the great omentum had been much dragged upon. The connection between these two circumstances is discussed elsewhere (chapter vi.).

On percussion the abdomen is found to be equally resonant all over, although early in the case there may be less marked resonance or absence of resonance in the region of the colon. That part of the bowel must soon, however, become overlapped by the distended small intestine.

A careful **examination of the abdomen by palpation** usually reveals nothing, and a digital exploration of the rectum gives equally negative results.

There are, however, some remarkable and rare exceptions to these latter statements. (1) Some local dullness may be discovered in the otherwise tympanitic abdomen; (2) a tumour or swelling may be detected through the parietes; and (3) something may be revealed by an examination of the rectum.

It may be conceived that a localised area of dullness on percussion may possibly be due to one of three things: to an extravasation into the peritoneal cavity; to large coils of gut involved in the strangulation; or to the empty loops of bowel that may lie below the point of obstruction. With regard to a definite swelling or tumour, it will be reasonable to conclude that it could depend upon the second only of these possible causes. It must be no matter of surprise that both these phenomena (the dullness on percussion and the swelling) are very rare. Much effusion of fluid in the peritoneal cavity is very uncommon in these cases and has not the least tendency to become localised in any way. Extravasations of blood do take place, but never, I believe, attain such magnitude as to be the cause of dullness on percussion. In the second place the involved bowel is often a mere knuckle, and is very commonly found against

the posterior abdominal wall or within the pelvis. In any case it is very apt to be covered over by the distended coils above the obstruction. In the third place the empty coils of intestine below the site of the incarceration are found, with comparatively few exceptions, to hang down into the pelvic cavity, and to be thus removed from examination.

(1) *Localised dullness on percussion*, and (2) *a tumour felt through the parietes.*—In my fifty cases I find only seven examples of the first phenomenon and four of the second. With one exception, the dullness was localised in the right iliac region, the rest of the abdomen being tympanitic. In every instance it corresponded to the site of some tenderness on pressure. In one case it was due to the matting together of the ileum and cæcum by adhesions. In all the other examples it was caused by the engorged coil involved in the strangulation. This coil was always large, varying from eight inches in one case to two mètres in another. In the exception above alluded to the patch of dullness was just to the right of the right rectus muscle. It was caused by a loop of strangulated jejunum.

The tumour detected through the parieties was in each case caused by large loops of the intestine engorged by strangulation. In one example the incarcerated coil was filled with blood. In three cases the swelling was felt in the right iliac fossa. In the fourth case it was in the middle line and extended from near the navel almost to the pubes; it was not observed until after the general distension had been relieved by the trochar, and was caused by a large coil of bowel strangulated by a diverticulum adherent to the umbilicus. The swelling seems to have been, in each example, ill-defined, dull, tender, and about the size of the fist. It is remarkable that in every instance the mass was not felt until towards the end of the case,

or was discovered rather towards its conclusion than its commencement.

(3) *A tumour felt through the rectum.*—Although extensive coils of empty and flaccid intestine are often found hanging inertly into the pelvis, I know of only one instance where they were felt during life. This occurred in Mr. Hill's case already quoted (page 82). Here a soft round mass was felt through the rectum, and was found to press upon its anterior wall.

In only three cases out of fifty were any *coils of intestine visible through the anterior abdominal parietes.* One was a case of acute obstruction associated with a remarkable paroxysmal pain and demanding laparotomy on the third day. The other cases pursued a chronic course, death ensuing on the thirteenth and fourteenth days respectively. The movement of the intestinal coils were visible in both of these examples, in the former case on the tenth day, in the latter on the seventh. One of the patients is described as being much emaciated.

These cases form but a feeble exception to the rule that visible peristaltic movements are met with only in cases of chronic obstruction.

CHAPTER V.

STRANGULATION BY BANDS OR THROUGH APERTURES—COURSE AND PROGNOSIS.

The course pursued by this form of obstruction is always more or less acute and, so far as is at present known, every case, unless relieved, ends in death.

The duration of any given case depends, I think, neither upon the age of the patient nor the situation of the obstruction in the lesser bowel, but upon the

tightness of the strangulation and the amount of bowel involved. The most rapidly fatal cases are those in which a considerable quantity of intestine has been severely strangulated. The two conditions must be combined; for in some of the least acute cases large coils have been found to have been involved, but only moderately compressed. As a solitary factor, the rigour of the incarceration is the most important in bringing about a rapidly fatal termination. The larger the coil so involved the more severe the manifestations.

A sudden onset of symptoms need not mean a very rapid course. Some of the examples of abrupt onset show a period of ten to thirteen days before death ensued. As a rule, however, the more gradual the development of the symptoms the longer is the probable duration of the case.

Since in snaring by loops or knots larger coils are, on an average, involved than in the case of strangulation under a band, it follows that the progress of the malady is more rapid in the former variety of strangulation than in the latter. In the former class of case, moreover, the incarceration is usually more complete and more rigorous. Thus the average duration until death, in a case of strangulation under a band or through an aperture, is six days. The average duration in a case of snaring, whether by a false ligament or by a diverticle, is four days. Some of the most acute cases led to death in ten, seventeen, and twenty-four hours, while in the least severe instances life was prolonged to the thirteenth, fourteenth, and fifteenth day. Opium, if given in large doses, has, as already stated, a considerable effect upon the progress of any given case. Under its use the pain and vomiting have greatly diminished, the pulse has improved, the temperature has risen, and the patient has been placed apparently in a much more favourable condition.

Many of the patients die simply of collapse, others die later of exhaustion brought about by the intensity of the pain, the severe vomiting, etc.; others die of acute peritonitis.

Peritonitis is not very commonly found in this form of strangulation of the bowel. It is met with in a little more than one half of the cases. The period of its onset and the conditions under which it appears vary greatly. It has been recorded as present in a patient who died in seventeen hours after the commencement of the obstructive attack, while it has been found to be entirely absent in another case where the individual lived fourteen days. The average time for its appearance is about the fifth day.

Perforation of the bowel above the seat of obstruction is quite uncommon, and would not appear to occur in more than 10 or 12 per cent. of all the cases. It has caused death as early as the fifth day.

In speculating as to **the possibility of spontaneous recovery** in cases of this form of strangulation of the bowel, one cannot fail to note that patients who have ultimately died of acute obstruction have sometimes had previous attacks that, so long as they lasted, were as severe as the final one. It would not be unreasonable to assume that these previous disturbances were, in some cases at least, brought about by the same mechanism that caused at last the fatal attack. If so, they may prove to be instances of spontaneous relief of an acute obstruction. Then, again, an isolated case or so has been recorded where patients were attacked with symptoms of intestinal incarceration that could not be diagnosed from like attacks known to be due to "bands." These patients, after being almost in articulo mortis, after vomiting feculent matter for days, after presenting the phenomena of absolute obstruction, have at last recovered. So far as I am aware, no autopsy at a subsequent date has made clear

the nature of such cases, and therefore that they may have been cases of strangulation by bands must be a matter of pure conjecture.

In the face of instances like these it is well to observe what light the post-mortem examination of fatal cases can throw upon this question of spontaneous relief. There is not the least reason for supposing that the bowel, when it has been strangulated for *a certain length of time*, has the least power of removing itself from the constricting agent. What we know of strangulated hernia would support this impression. There is a circumstance, however, under which spontaneous reduction may occur in cases of incarceration of *recent* standing. It is when a loop of gut has passed beneath a band and has then become so twisted as to have its lumen closed. In such a case sudden and severe symptoms may appear and yet the band without the volvulus may not suffice to strangulate the gut. As the muscular vigour of the gut becomes impaired, or is rendered feebler by the action of opium, it is possible to conceive that the volvulus may untwist and the coil escape from the band that never held it other than slightly. This may be the explanation of some of the "previous attacks" noted in cases of fatal strangulation.

When the strangulation is well advanced recovery by this means must be practically impossible. I have alluded to two cases where the involved gut was found to be partially reduced after death; but in these cases the reduction had been effected by the sudden relief to distension caused by a perforation. The very cause that brought the relief but served to hasten the appearance of death.

One possible factor in spontaneous recovery may be the giving way, from gangrene, of the constricting band. Post-mortem examinations afford some support to any theory based upon this circumstance. Many

of the bands that cause obstruction are very thin, and have but a poor blood supply. They must be greatly compressed when they produce incarceration, and yet experience shows that they usually outlive the too vascular bowel. There are, however, cases where the patient seems to have been very near a prospect of spontaneous recovery when death occurred. Among these are the following: In one case of laparotomy performed on the third day of the acuter symptoms, the band on being handled was found to be so slender that it broke as it was being lifted up.* In two other cases a diverticulum that had caused obstruction was found to be so softened that it was partly torn away from its point of origin.† In another case of laparotomy, that ended in cure, the diverticulum was more livid than the gut that it was compressing; and lastly,‡ Dr. Servier quotes an instance where the constricting band was gangrenous and on the point of rupturing.§

In connection with the question of diverticula becoming gangrenous, it must be borne in mind that such an event may, instead of leading to cure, lead to death by perforation should the gangrenous part of the process be pervious. Indeed, the tearing away of the diverticle has caused fatal peritonitis, and Cazin notes a case where, through the rent so formed, some metallic mercury that had been administered found its way into the peritoneal cavity.

A specimen in St. Thomas's Hospital Museum ‖ shows another possible means of escape, although a very remote one. The specimen consists of a part of the small intestine of a dog, around a knuckle of which

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 564.

† Dr. Hilton Fagge, loc. cit.; and Dr. Wilks, Path. Soc. Trans., vol. xvi., page 126.

‡ Bull. et Mém. de la Soc. de Chir. de Paris, 1881, page 210.

§ De l'Occlusion Intestinale, page 42. Liege, 1871.

‖ No. Q 7.

Mr. Travers had, during life, firmly tied a ligature. The animal died on the third day. The ligatured part had separated and was found in a kind of cyst formed by lymph from the peritoneum. Into this cyst the two ends of the bowel opened so that the integrity of the tube was practically restored. It is conceivable that such a circumstance may occur in a young human subject when only a small knuckle of gut or a part of the circumference of the gut is very tightly strangulated.

It is not impossible that in a favourable case the canal of the intestine may be completed after obstruction by the formation of a "fistula bimucosa" such as has been formed in some cases of strangulated hernia.

From the above speculations the conclusion may safely be drawn, that while spontaneous relief in acute obstruction may not be impossible, it must at least be excessively rare.

CHAPTER VI.

ANOMALOUS FORMS OF OBSTRUCTION DUE TO ISOLATED BANDS AND TO ADHESIONS.

Under this heading may be grouped a remarkable series of cases, all more or less infrequent, in which an obstruction has been brought about by means of an adherent diverticulum, or by an isolated band, or by more extensive adhesions, but where the mechanism of the occlusion is unlike that involved in the class just described.

These cases are united by a common pathological bond, while clinically they present conspicuous differences. Unlike the form of obstruction just discussed,

they involve the large bowel with almost as great a frequency as they involve the small.

These anomalous cases may be classified under the following headings :

1. Strangulation *over* a band.
2. Occlusion brought about by *acute kinking* due to traction upon an isolated band or an adherent diverticulum.
3. Occlusion effected by adhesions which retain the bowel in *a bent position.*
4. Obstruction by means of adhesions that *compress* the gut.
5. Obstruction by the *matting together* of several coils of intestine.
6. Obstruction by changes effected in the intestinal walls due to *simple traction.*
7. Narrowing of the bowel from *shrinking of the mesentery* after inflammation.

1. **Strangulation over a band.**—If several coils of a thin indiarubber pipe, through which water was flowing, were thrown over a tightly drawn wire, the lumen of the tube would become more or less completely occluded at the spot where the wire was crossed. It is conceivable that a similar circumstance may be met with in the abdomen when a long loop of intestine is thrown across a more or less rigid band. Here the weight of the dependent loops would act as a compressing agent, and the interference with the circulation in the mesenteric vessels would induce an engorgement of the involved bowel. It is difficult, however, to understand how such a form of obstruction could occur in the living subject without some arrangement of parts that would permit the dependent coils to retain their position. One would imagine that a little vigorous peristaltic movement would soon overcome the occlusion, on the one hand, and withdraw the intestine from its abnormal situation, on the other; although it is more than probable that the intestinal contents could enter the involved loop with much more readiness than they could leave it. I have

found records of four cases where this form of obstruction seems to have taken place, and in one only is the mechanism of the occlusion uncomplicated. In the simplest case a diverticular band passed from the ileum to the umbilicus, and over it a coil of ileum from two to three feet in length was found to have been flung and to be hanging suspended. This coil was intensely congested, and numerous extravasations had taken place beneath its serous coat. Symptoms of obstruction appeared suddenly during perfect health, and the patient only lived ten hours.* In two other instances an extensive loop of the lower ileum had passed through a hole in the omentum. The loops were black with congestion, and were hanging down into the pelvis. In one case the coil was fixed in this position by recent adhesions. In neither of the cases was the obstruction effected by the aperture itself, the gut being very readily withdrawn at the autopsy. As the author of one of the cases (Dr. Fagge) observes, the strangulation was not due to the narrowness of the aperture, but to the hanging of the gut over its lower edge. In both cases the symptoms appeared suddenly; in both acute peritonitis was found at the post-mortem; in both the patient lived five days.† In the fourth case a diverticulum passed to be attached to the umbilicus, and over it two loops of the ileum, black with congestion, were suspended. They were found to be twisted upon themselves, and it is impossible to say which was the primary and most essential phenomenon, the volvulus or the hanging of the gut over the cord. The symptoms appeared suddenly, acute peritonitis set in on the sixth day, and the patient died on the ninth. ‡

* De l'Occlusion Intestinale, by Dr. Lusseau. Paris, 1879.

† Bull. de la Soc. Anat., page 252; Paris, 1864; case by M. Besnier. And Guy's Hosp. Reports, vol. xiv.; Dr. Hilton Fagge.

‡ Path. Soc. Trans., vol. vii., page 205; case by Mr. Ward.

In a drawing of a case of strangulation by an adherent diverticulum, given by Bouvier, it would appear as if this form of obstruction had had great influence in producing the fatal result.*

The four cases all occurred in males. The ages were respectively 22, 45, and 65, the fourth case being met with in "a boy."

So far as can be judged from these few cases, *the symptoms* resemble those of hernia-like strangulation, a sudden onset, severe pain, excessive vomiting (becoming stercoraceous in at least one instance), and absolute constipation. In the case fatal in ten hours there was diarrhœa and profound collapse. The main points of difference between these cases and those of incarceration under a band would appear to consist in the less continuous character of the pain and in the fact that the symptoms all advance with varying intensity. These features are intelligible in the light of the fact that the obstruction in these cases must be comparatively incomplete, while the interference with the blood circulation in the bowel would be of a character to excite inordinate peristaltic movements.

2. **Occlusion by acute kinking due to traction.**—In these cases a band attached to the bowel so drags upon its point of attachment that the gut becomes acutely bent at this spot, and is ultimately occluded by a process akin to the kinking that may close an indiarubber tube (Fig. 18). This condition is usually met with in the case of a diverticulum or diverticular ligament attached to the umbilicus, or in instances where an isolated adhesion is connected with the ileum on the one hand and some more fixed and distant point on the other. The shortness of the mesentery of the lower ileum favours the formation of a kink in that part of the bowel.

*Bull. de l'Acad. de Méd., tome xvi., page 683, 1851.

Dr. Reignier has shown that it is possible for an unattached diverticle to cause obstruction by kinking, if the process become much distended. He found in the body of an infant a free diverticulum 7 centimetres long. On injecting water into the gut above the process, he found that when the pressure was moderate the diverticle simply became filled and that the fluid passed readily by it. When, however, the pressure was much increased the process dilated enormously, and so pressed upon the gut below its point of origin as to bend the intestine tranversely and finally occlude its lumen.* He gives a case in the person of a man, aged 22, that illustrates this experiment in practice. This patient died after exhibiting for ten days the symptoms of acute intestinal obstruction. The autopsy showed a free diverticulum much dilated by liquid fæces, and which had so acutely bent the gut from which it arose, that the lumen of the intestine was quite closed. On lifting the diverticle and gently pressing it the obstruction was at once overcome.

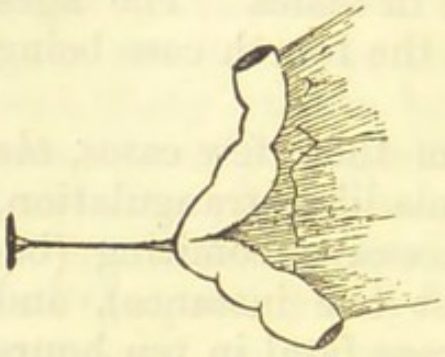


Fig. 18.

In cases of kinking by adherent diverticula and bands it is probable that distension of the bowel may be active in bringing the obstruction about. Moreover, distended coils of intestine may press upon the ligament itself and so cause it to be stretched.

The following are examples of kinking produced by isolated adhesions: In a case by Louis, a band was found to pass between an ovarian cyst and the lower ileum. When the cyst was emptied by the trochar the band was stretched and so dragged upon the bowel that it was closed, and symptoms of intestinal obstruction developed. Heller reports a case

* Bull. de la Soc. Anat., page 279. Paris, 1879.

where a loop of the lesser bowel was adherent to a gravid uterus. After delivery the traction upon the intestine was such that it became acutely bent and occluded. "Warren saw a pedunculated subperitoneal fibroid of the uterus so wedged in, in consequence of a sudden change of position, between the wall of the pelvis and a false ligament stretched from the lowest part of the ileum to the uterus, that the former was bent and occluded by the traction of the band attached to it." * Dr. Hilton Fagge records the case of a little girl, aged 9, in whose abdomen at the autopsy many old adhesions were found resulting from a local peritonitis set up by caseous degeneration of the mesenteric glands. Some adhesions passed between the sigmoid flexure and the ileum, others between the latter bowel and the omentum; while the mesentery was so much shrunken as to bind the small intestine closer to the spine. The immediate cause of obstruction seems to have been due to a band that fixed the small intestine to the liver, and that caused great angular bending of the bowel. At this bend the empty and the distended coils met, while above that point was a perforation in the jejunum. †

One of the best examples of obstruction by kinking due to an adherent diverticle is given by Dr. Wilks. The process in this case was attached to the umbilicus and had been so stretched, probably by the meteoristic state of the gut, that it had become torn and so had induced peritonitis.‡ The gut was normal at the seat of the acute bend, as indeed it appears to have been in all the cases belonging to this category. In Dr. Wilks' case the dragging of the empty and pendulous coils below the attachment of the diverticle appears to have helped in maintaining the obstruction.

* Leichtenstern, loc. cit., page 530.
† Path. Soc. Trans., vol. xxvii., page 157.
‡ Ibid., vol. xvi., page 126.

Dr. Quain* reports the following case in a woman aged 53: A large perinephritic abscess had been opened, to the wall of which the descending colon was adherent. The patient died with symptoms of obstruction lasting twelve days. The adherent colon was found to have been so bent by the collapse of the abscess wall as to have become occluded.

So far as can be judged from the few cases published, the *symptoms* due to kinking of the bowel are very nearly identical with those of strangulation under a band.

The onset is usually less abrupt and the progress of the case less acute, patients living eleven, fifteen, and twenty days in some instances. The symptoms also are such as would suggest that the occlusion is not absolute. Thus the pain, although severe, will present very unequal degrees of intensity; the vomiting, although often incessant and distressing and stercoraceous, may abate; the meteorism, even in cases of long duration, may be quite slight. The constipation, moreover, although usually complete, may yield a little, and the bowels be opened by an aperient even when the symptoms of obstruction have lasted eight days, as in Dr. Fagge's case.

3. **Occlusions by adhesions that retain the bowel in a bent position.**—In these cases, which concern both the large and the small intestine, the gut is found to have become adherent to some fixed point in such a way that a more or less acute bend is produced. The site of the adhesion is on the abdominal or pelvic parietes or the pelvic viscera. It may be on the liver. The usual cause of the adhesion is either pelvic peritonitis or hernia. In the case of the rupture, the part of bowel adherent is the same that occupied the hernia. The condition is met with, therefore, only after enteroceles, and only

* Path. Soc. Trans., vol. v., page 179.

after such as have been strangulated or inflamed. The bowel, presenting in any case some inflammation of its serous coat, is reduced into the abdomen, and instead of remaining free in that cavity, contracts adhesions by means of its inflamed surface with some other part of the peritoneum.

In every case of this kind, so far as I am aware, the adhesion of the bowel has been to the parietes in the vicinity of the hernial orifice.

The bowel, having been recently herniated, usually acquires an adhesion in a bent position, and when so fixed often leads to further intestinal troubles, in cases where strangulated or inflamed herniæ have been successfully reduced.

The condition usually occurs after femoral ruptures, inasmuch as such herniæ are peculiarly prone to become incarcerated or inflamed, while the comparatively small amount of gut they usually contain favours the formation of these particular adhesions. Among other, and less frequent, causes of these attachments may be noticed peritoneal cancer, and, so far as attachments to the liver are concerned, the local trouble excited by gall stones. It is a singular coincidence that pelvic peritonitis, femoral hernia, peritoneal cancer, and gall stones are all much more common in women than in men, and this serves to explain the fact that the present form of intestinal obstruction is practically limited to females. Out of the fifteen cases that I have collected there is one instance only in a male. In this isolated example the adhesions had followed upon some local mischief excited by tapping the bladder above the pubes.* All the cases occurred in adults, the youngest patient being a woman of thirty (pelvic peritonitis), the oldest a woman of fifty-nine (omental cancer).

* Dr. Briddon; *New York Med. Jour.*, vol. xxxii., 1882, page 116.

The involved gut is usually adherent at one isolated spot only, and a single and simple angular bend is thus produced. This is the condition met with in those cases that depend upon hernia. In other instances the attachment may be more extensive, as in a case of Dr. Fagge's, where one foot of the lower ileum was found adherent to the anterior abdominal parietes as a result of omental cancer. Moreover, the bends formed in the bowel may be by no means simple. There may be several angular bends, the loops being adherent at more points than one, and made to assume the outline of the letter **N**.* This arrangement may be still further complicated by the matting together of the three bars of the intestinal **N**, whereby the false position is perpetuated. In one case where **N**-like bends were produced only four inches of bowel were involved, so that the angles formed were very acute and abrupt.†

A few examples may be given to illustrate the varieties assumed by this form of intestinal obstruction. The convexity of the ascending colon may become adherent to the ovary, and the gut be so narrowed at the bend as barely to admit a crow-quill.‡ The transverse colon may become adherent to the fundus uteri.§ The rectum may attach itself to a cancerous ovary, and present in consequence a very angular bend.‖ The sigmoid flexure may adhere to a uterus the seat of a malignant disease, and present so abrupt a bend that fatal obstruction with symptoms like those of volvulus may ensue.**

* Case by M. Cossy, quoted by M. Nouet; De l'Occlusion Intestinale dans ses Rapports avec les Inflammations péri-uterines chroniques. Paris, 1874.

† Louis; Archiv. Gen. de Méd., 1re Serie, tome xiv., page 193.

‡ Duchaussoy, Mém. sur l'Anat. Path. des Étrang. Internes, 1860.

§ Dr. Hilton Fagge, loc. cit.

‖ Path. Soc. Trans., vol. xvi., page 197.

** M. Cossy; Mém. de la Soc. d'Observat, 1856, tome iii.

The period of time that may intervene between the formation of the adhesion and the occurrence of symptoms of intestinal obstruction varies greatly. In the case following aspiration of the bladder just alluded to, evidences of obstruction appeared within a few days of the original lesion. In the great majority of cases the intestinal symptoms do not make their appearance until months after the initial peritonitis. I think that in the cases due to hernia a somewhat earlier appearance is usual, a matter in most instances of weeks rather than of months. Sometimes years have elapsed between the causative inflammation and the symptoms of obstruction, such examples being most usual in the large intestine. Many of the patients have been the victims of chronic constipation for years before the final occlusion occurred. At the same time it must be noted that adhesions of the same character as those now under consideration have been met with in the autopsies of patients who presented no marked intestinal symptoms during life.

The mechanism of the obstruction in these cases varies, and may be conveniently considered under three categories, taken in order of severity.

1. The gut at the adherent point may become so bent that occlusion by kinking is produced. This is, as a rule, met with in the lowest part of the colon. The symptoms induced are severe and sudden in their onset. Their abrupt development possibly depends upon sudden occlusion at the bend, brought about by some distension of the bowel, or some change in its position.

2. The bowel (a portion always of the small intestine) is adherent over a small area, and symptoms of obstruction follow from certain effects of traction without conspicuous occlusion of the lumen of the tube. It is certain that, so far as the lesser bowel is concerned, mere adhesion over a limited district tends to cause an impediment to the passage of matter.

The gut at the adherent spot cannot exercise its peristaltic function. It becomes a more or less inert segment in an active tube. If a little acute mischief be excited about the seat of the adhesions, symptoms of an acute or subacute character may arise, the exact pathogenesis of which is a little obscure. That form of rupture known as Littre's hernia throws some light upon these cases. In this hernia the gut is tightly held down, a part only of its circumference is nipped, and yet symptoms of acute intestinal obstruction follow, the greater part of the lumen of the bowel being at the time often quite unoccluded. Supposing a patient to have a loop of intestine adherent to the parietes, and that some little inflammatory trouble is excited about the adherent knuckle, it would seem as if symptoms of subacute obstruction could arise somewhat upon parallel lines to those that produce the manifestations in Littre's hernia. In the case following aspiration of the bladder some local peritonitis kept up after the gut had become adherent was apparently sufficient to lead, in combination with the bent bowel, to rather acute evidences of obstruction. In other instances violent peristaltic movements, such as may occur during colic or diarrhœa, may cause a rough dragging upon the attached intestine, and so add, as it were, the fuse to a train already laid and prepared. The effect of a little local peritonitis in rendering a peritoneal obstruction an actual one is often illustrated. As one example I might cite the following: An old man was admitted into the London Hospital under the care of my colleague Mr. Rivington. The patient had received a blow upon the abdomen. A few days after admission he developed symptoms of acute obstruction, of which he died in less than two days. At the autopsy the transverse colon was found to be bent upon itself and retained in that position by old adhesions. In no place was the lumen

of the bowel occluded. The peritoneum was healthy save at one spot over the liver where there was a little local peritonitis.*

As regards the cases now under notice, it can only be said that patients may die of more or less acute obstruction, and exhibit at the autopsy an adherent and bent intestine about which some little peritoneal mischief is evident, while the lumen of the bowel is at no point wholly or even nearly occluded.

3. The adherent bowel may offer a more or less definite mechanical obstacle to the passage of its contents. A part of the colon may present so sharp and rigid a bend as to give to the involved intestine the properties of a stricture. This condition is well illustrated by a case reported by Dr. Owen Rees, where the rectum was so involved.† In other instances the bowel, and particularly the lesser bowel, is adherent over a wide area, and the mere inertness of the attached portion constitutes an obstruction. This is well seen in those cases where the bowel is adherent in a contorted position, as when it assumes an N-like outline and the limbs of the N are bound together, or when several inches of it are blended in a straight line with the parietes, as in Dr. Fagge's case quoted above. Here the bowel above the diseased part has not only to pass its own contents along, but has to force them also through the inert and adherent segment. The longer this segment the more marked the obstruction. When closely bound down, the involved gut must be practically incapable of peristaltic movement, and must be to the rest of the bowel as a piece of thin indiarubber tubing. Pathological reports and museum specimens well illustrate this. The adherent bowel is either of normal aspect or is abnormally thin, while the intestine above it shows a

*For an account of this case *see* par. 5 of this chapter.
† *Med. Times and Gazette*, vol. i., 1869, page 436.

hypertrophy of its walls that may, in some instances, be extreme.* The gut, moreover, just above the inert part often shows some ulceration of the mucous membrane, due presumedly to the irritation of accumulated matters. The hypertrophy is all in the muscular coat and compares conspicuously with the thin walls of the inert and adherent segment. Moreover, when there is much angular bending of the gut the contents of the bowel have to be not only forced through an inert tube, but have to take a devious course and encounter certain definite obstructions.

The *symptoms* associated with this form of obstruction will obviously show great variation. They may assume an acute, or a subacute or a chronic aspect, and may differ somewhat, according to whether the occlusion is situate in the large or the small intestine.

A. *In the colon.*—If the obstruction be due to a sudden closure of the gut by kinking at the already bent and adherent part the symptoms may be of a very acute character. This condition appears to most usually occur in connection with the sigmoid flexure or rectum, and the manifestations produced are identical with and cannot be distinguished from volvulus of the former segment of the bowel. I might give one illustration. A woman, aged forty-four, was admitted into the London Hospital under my care suffering from symptoms of acute obstruction. These symptoms had appeared suddenly after taking an aperient. They were precisely the symptoms of volvulus of the sigmoid flexure. The patient had been the subject of some constipation for years, and had had attacks of colic occasionally. In twenty-four hours after the onset the woman was in a precarious condition. I performed laparotomy, but she died twelve hours afterwards. The rectum was adherent to one

* *See* case by Louis quoted above.

point of the pelvic wall in a bent position. The bend here had become so extreme that the gut was entirely occluded. The colon above was enormously distended, and the sigmoid flexure reached to the right of and above the umbilicus. On emptying the colon by puncture, and breaking through the adhesions, the passage in the bowel was soon restored. The cause of the adhesion was a trifling stricture, which had helped to make the sudden closure by kinking more complete.

The symptoms may be subacute, as in a case reported by M. Cossy, where the sigmoid flexure was adherent to a cancerous ovary. Here the final attack lasted some eight or nine days, and was marked by paroxysmal pain with visible peristalsis, by slight non-stercoraceous vomiting, and by constipation relieved by an occasional stool. In other instances the manifestations may be quite chronic, and may resemble in all points those due to stricture of the rectum. A case of this character has been reported by Mr. Heath. He performed lumbar colotomy on the twentieth day of the constipation. The rectum was adherent to the uterus and ovary (which was the seat of cancer), and was bent into a sharp sigmoid form.*

B. *In the small intestine.*—The symptoms when the obstruction is in this part of the bowel may be acute or chronic. A more or less typical example of each form may be given. I saw, in consultation with Dr. Towne of Kingsland, a woman, aged 58, who three months previously had had some inflammation about a small femoral hernia. The bowel was reduced at the time, and, to her surprise, had never come down again, nor given her any trouble. She was, when seen, suffering from intestinal obstruction; the onset had not been sudden. She had much pain of a markedly paroxysmal character. She vomited at first at long intervals, bringing up large quantities of

* Path. Soc. Trans., vol. xvi., page 197.

matter. As the case progressed the vomiting became more frequent (every two or three hours) and feculent. She had constipation that was absolute but for one slight liquid motion passed during the first few days of the attack. I performed laparotomy on the seventh day, and found a coil of greatly distended ileum adherent in a bent position to the vicinity of the femoral ring. The adhesions retaining it were readily broken down and the abdomen then closed. She never vomited after the operation; a very copious motion was passed on the fourth day and the patient made a perfect recovery.

In Dr. Fagge's case, quoted above, where a foot of the ileum was adherent to the parietes, the symptoms lasted some five months. There was constipation that alternated with diarrhœa, vomiting that appeared late in the case, and that came on once or twice in the twenty-four hours, the patient bringing up immense quantities each time, and pain of a very marked paroxysmal character. There was a dragging pain about the lower part of the abdomen. The vomited matters became stercoraceous six days before death.

It will be seen that in both cases there are evidences of incomplete obstruction. The constipation alternates with an occasional motion. In some of the other less acute cases the patient, when not absolutely constipated, passed many scanty and very liquid stools. The vomiting is not severe at first, and occurs at long intervals. The abdominal pain is paroxysmal. There is a dragging pain about the part to which the gut is adherent. There is not much distension of the abdomen. In the chronic cases the movements of the intestinal coils are visible.

In one instance, where the ileum was adherent to the ovary and formed many angular bends, an irritable diarrhœa took the place of the more usual constipation, and the patient only vomited twice

during the month that immediately preceded her death. Such a case hardly comes clinically under the category of intestinal obstruction.

4. **Obstructions by means of adhesions that compress the gut.**—Peritoneal adhesions, when favourably placed, may undergo considerable contraction. When placed upon the bowel these false membranes may, by their shrinking, so compress the intestine as to seriously narrow its lumen. Experience demonstrates a fact that might have been anticipated, viz. that this form of constriction is most usually met with about the most fixed segments of the intestine, that is to say, about the ascending and descending colon, and the hepatic and splenic flexures. The process involved in certain of these cases where the colon is concerned is intelligible enough. Thus, says Leichtenstern, "A circumscribed, chronic, constricting peritonitis is sometimes found at the flexures of the colon. As the results of atony of the muscular coat repeated fæcal accumulations are found especially at the flexures, the points where the obstacles to the advance of the fæces are greater. The frequently repeated irritation of the peritoneum produced thereby excites chronic peritonitis, which may result in constriction. In other cases the chronic peritonitis starts from the concavity of the liver and extends to the flexura hepatica; it is set up at the former point by gall stones, neoplasms, etc., or is the continuation of a cirrhotic process in the liver, or of a portal periphlebitis. In the left hypochondrium we sometimes find, together with numerous splenic adhesions and fibrous perisplenitis, the splenic flexure adherent and constricted by chronic fibrous peritonitis."* In other instances the cause of the constricting peritonitis is not so evident. An example of such cases is afforded by a specimen in the London

* Loc. cit., page 632.

Hospital* (Fig. 22). Here the ascending colon just above the cæcum is narrowed by an isolated patch of contracting adhesions so as to produce considerable stenosis. It is probable that in this case, and in others like it, the limited peritoneal inflammation has been induced by an ulcer of the mucous membrane, although the evidence of this in the present specimen is not clear. The association of cicatricial strictures of the bowel with a constricting peritonitis is well known, and is illustrated by a vast number of recorded cases and museum specimens. A specimen in Guy's Hospital affords a good example of a constriction at the splenic flexure due to adhesions.† In some of these instances the patient has given a history of a previous attack of enteritis.

The extent to which the bowel is narrowed in these cases is often considerable. In some the affected colon would barely admit the tip of the little finger. In others it would only admit a crow-quill.

In a singular specimen from the College of Surgeons Museum, one of the appendices epiploicæ has contracted such an adhesion to the attached omentum as to cause constriction of the bowel.‡

I have found but few examples of this form of obstruction in the small intestine. In every instance there has been some complication in the case. The affected bowel is always adherent to the parietes or to the pelvic viscera. In two cases reported by Dr. Fagge (in one of which the ileum was involved and in the other the jejunum) adhesions existed elsewhere, and the final obstruction was complicated by angular bending of the intestine about the point of its attachment.§ Mr. Gay has reported a case where eight

* London Hospital Museum, No. Ac. 84.
† Guy's Hosp. Museum, No. 1,852.
‡ Coll. of Surgeons Museum, No. 1,362.
§ Loc. cit.

inches of the ileum were adherent to the fundus of a uterus "in a state of scirrhous degeneration." The intestine so involved was so narrowed as to barely admit a goose-quill.* It is doubtful if this case would fall under the present category.

As regards the *symptoms* incident to this variety of obstruction, it can only be said that they more or less completely resemble those due to stricture of the bowel. In the case of the colon this assertion may be made without reservation. In the case of the small intestine the manifestations of the disease appear to exhibit a more rapid development than is usual in stricture, the permanent stenosis being complicated by the effects of angular bending.

5. **Obstruction by the matting together of intestinal coils.**—The many cases that can be classed under this category present a protean aspect.

1. THE SMALL INTESTINE.—The coils of the lesser bowel may be matted together in many different ways. In one set of cases a small segment of the gut is so adherent as to form a permanent and unchanging loop. In another set of cases, many coils, involving often a considerable tract of the intestine, are matted together so as to form more or less complicated masses. In both instances the involved coils are usually quite free from adhesions to the parietes or to other viscera.

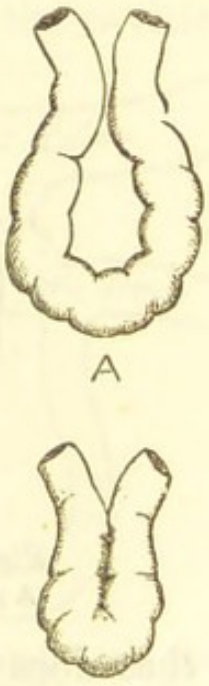


Fig. 19.

In the *first set of cases* a simple permanent loop is formed in the bowel. This loop may be open, the walls of the gut being adherent only at the extremities of the loop (Fig. 19A and Fig. 20),† or it may be closed, the walls of the involved bowel being

* Path. Soc. Trans., vol. iii., page 108.

† Guy's Hosp. Museum Reports, 1836, page 21.

adherent in their entire extent (Fig. 19 B). The latter variety involves a much smaller amount of intestine



Fig. 20.—Adhesions forming the Bowel into a Loop.
A probe is introduced into a perforation in the intestine.

than does the former.* There are several distinct conditions under which these distortions of the bowel may be produced. Many are the results of herniæ. If a coil of good size be involved in a rupture and much

* For specimens of these loops see St. Bart.'s Hosp. Museum, No. 2,100; Path. Soc. Trans., vol. x., case by Mr. Birkett; and St. Thomas's Hosp. Museum, Q No. 128.

compressed by the hernial orifice, adhesions may form at the point compressed, and a permanent open loop be formed after the gut has been reduced. If the herniated coil be small (a mere knuckle) a closed loop may result from the adhesions produced by inflammation of the serous coat.

Then again an ulcer of the mucous membrane may, by inducing a limited peritonitis, lead to the formation of a loop. If the adhesions are scanty and isolated, an open loop is produced as in Fig. 20; if extensive, a closed loop as in the specimen (No. Q 128) in St. Thomas's Hospital Museum.

In other cases the loop-producing adhesions are the result of mesenteric gland disease, and I have seen two preparations where a broken down or caseous gland has occupied the angle formed by the two limbs of the loop.

Sometimes a fistulous passage connects the cavities of the two portions of bowel at the root or narrow part of the loop. Such a passage is known as a fistula bimucosa. They most frequently result from idiopathic ulcers of the intestine, but may follow also from the destructive processes induced by compression.*

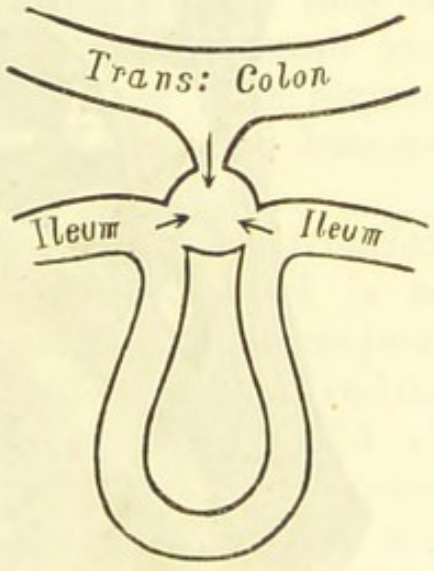


Fig. 21.—Fistula Bimucosa, with formation of a Loop in the Ileum.

One of the most remarkable cases of fistula bimucosa is afforded by a report of Dr. Bristowe's in the Pathological Society's Transactions† (Fig. 21). Here the transverse colon communicated with the ileum at two points through a cavity whose walls were formed

* Path. Soc. Trans., vol. x.; Mr. Birkett's case.
† Vol. xiv., 1863, page 201.

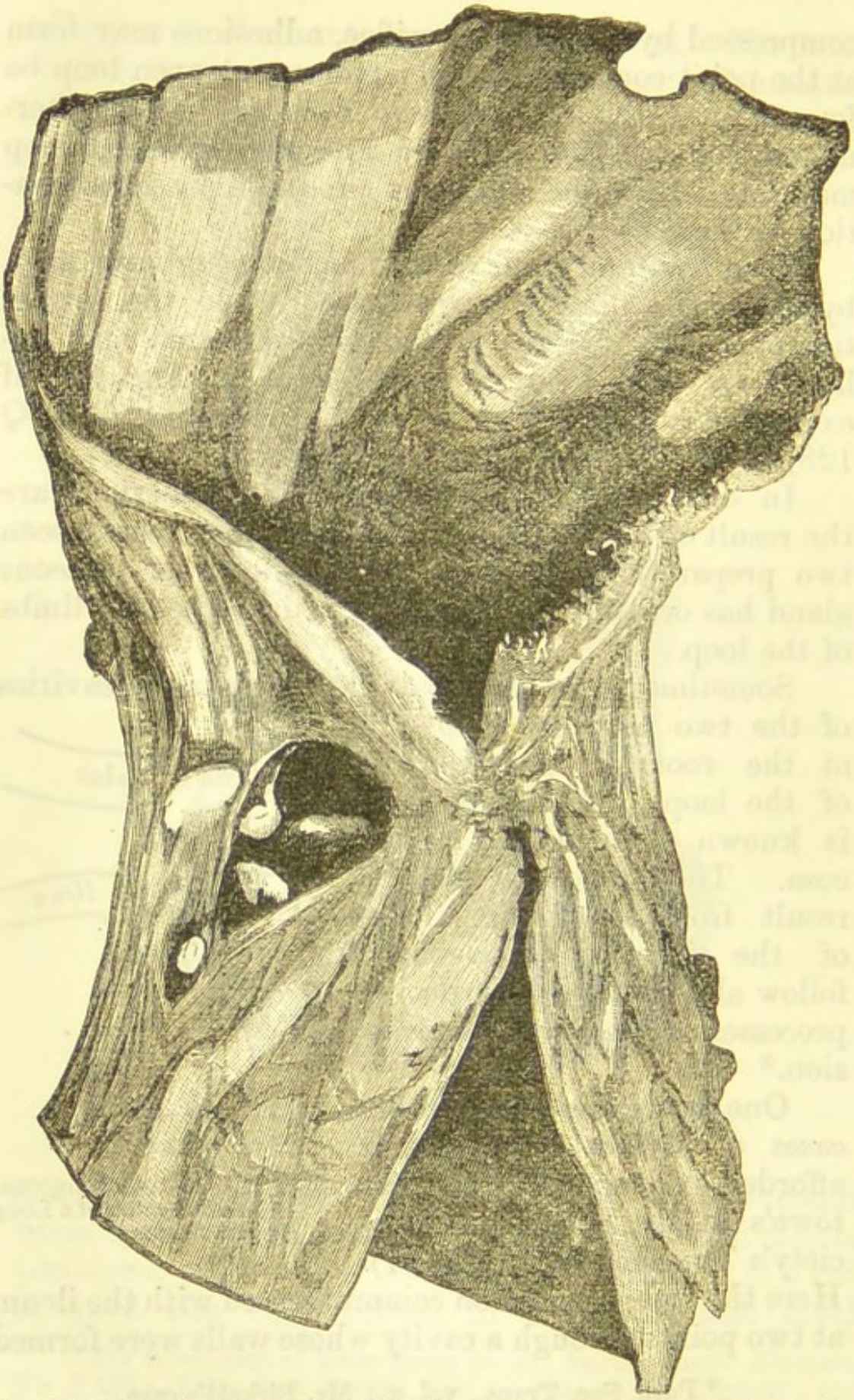


Fig. 22.—Stenosis of ascending Colon from the contraction of Peritoneal Adhesions.

by firm adhesions. The patient died with symptoms of phthisis and dysenteric diarrhœa, and there is little doubt but that the primary mischief was caused by a perforating ulcer of the transverse colon.

It does not appear that the open loop ever of itself leads to definite obstruction. In cases where a fistula bimucosa exists a fatal perforation may form in the gut above the seat of the sinus. This may be due to fresh ulceration of the bowel formed independently of any obstruction effects. In Mr. Birkett's example of a fistula bimucosa following a strangulated rupture, a like termination to the case ensued, although the cause of the perforation in this instance was not evident. The open loop may become twisted, and so cause obstruction, while it forms an excellent point d'appui around which a normal coil may become involved in a volvulus. Sir Astley Cooper, in his treatise on hernia, mentions a case where "two folds of intestine had adhered at one point only (as may be represented by bringing the points of the thumb and finger in contact). Through the noose thus formed another fold of intestine had passed, and had become strangulated."

The closed loop very usually leads to obstruction of the intestine. Here the adherent bowel is so acutely bent that a fold of mucous membrane projects into the lumen of the intestine, and offers a valve-like impediment to the passage of matters (Fig. 23 A). The gut above the bend in time enlarges from distension until it forms an actual ampulla (Fig. 23 B) and so renders the passage of the contents of the bowel still more difficult. A remarkable case fully reported by M. Nicaise * affords an example of this, and from his case Fig. 23 B is taken. In this case the ampulla was so large that the lower segment of the

* Bull. et Mém. de la Soc. de Chir. de Paris, tome vi., 1880, page 582.

bowel appeared to issue from the side of it rather than from the end. The parts are compared by M. Nicaise to the cæcum and the entering ileum. The aperture was valve-like, and just admitted the tip of the index finger. The patient, a man aged twenty-five, had been operated upon for a strangulated inguinal hernia five years before the fatal obstruction came on.

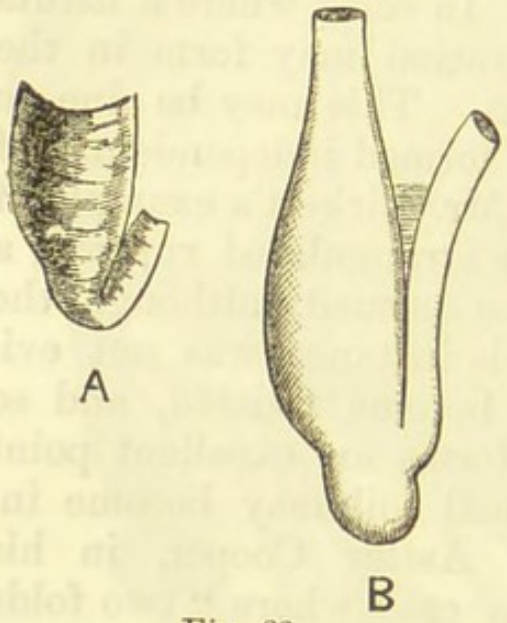


Fig. 23.

The *symptoms* in these cases may be classed with those that depend upon stricture of the lesser bowel, although they are perhaps liable to more acute modes of termination.* In M. Nicaise's case the patient had been troubled during the five years that followed the reduction of his hernia with attacks of colic, with occasional vomiting and with diarrhœa, alternating with constipation. Eight days before the man's death, which occurred shortly after an enterotomy had been performed, he was seized with somewhat acute symptoms associated with much vomiting, with occasional action of the bowels, but with no abdominal tenderness, and with little pain. The movements of the intestinal coils were visible through the parietes. The fatal issue had probably been provoked by the administration of purgative medicines which had hurried much intestinal matter into the ampulla and so produced the obstruction.

Apropos of these cases, one might notice an

* M. Bricheteau (Bull. de la Soc. Anat. de Paris, 1862, page 257) reports a case of occlusion by a closed loop, the exact cause of which is obscure, where the patient died with acute symptoms in twelve days.

instance of obstruction of the lesser bowel by a large gall-stone where the gut at the obstructed point was bent upon itself and the bend retained in a fixed position by adhesions, apparently of recent formation.*

In the *second set of cases*, alluded to at the commencement of this paragraph, certain coils of the intestine are found matted together in a confused mass. The condition is similar to that met with in chronic tubercular peritonitis, from which, however, it must be distinguished. The tubercular affection involves the whole mass of the intestine and is a diffused process. In the present set of cases the causative peritonitis is quite local and only a portion of the lesser bowel is involved. The adherent coils usually form a roundish mass, which may be almost as distinct as a tumour, and which compares conspicuously with the uninvolved and normal bowel. The matted intestine may also be adherent to the parietes, or it may be quite free. Sometimes the matting is brought about by a multitude of isolated adhesions. In other cases the coils are enveloped in fine membranous adhesions so that they may appear as if enclosed in a bag of tough tissue paper. An example of this latter condition is afforded by Fig. 24. Some of the coils in the mass may be of normal lumen, others may be dilated, and many may be compressed. They are commonly strangely distorted. When obstruction has been caused, the bowel entering the mass will be found dilated, while that leaving it will be more or less shrunken. The amount of gut involved varies. It may be but a few inches, as in a case reported by M. Julliard, where six inches only were involved,† or it may be several feet as in an

* Dr. Van der Byl; Path. Soc. Trans., vol. viii., page 231. An almost precisely similar case, minus the adhesions, is reported by Dr. Draper, *New York Medical Journal*, 1882, page 17.

† Bull. et Mém. de la Soc. de Chir., Paris, tome v., 1872, page 627.

instance recorded by Dr. Bristowe, where nearly one half of the ileum was found matted into a confused mass.* In several instances a part of the colon has been involved in the adhesions, as was the case in a specimen described by Mr. Sydney Jones, where the coils of the lower ileum were not only matted together but were adherent also to the cæcum.†

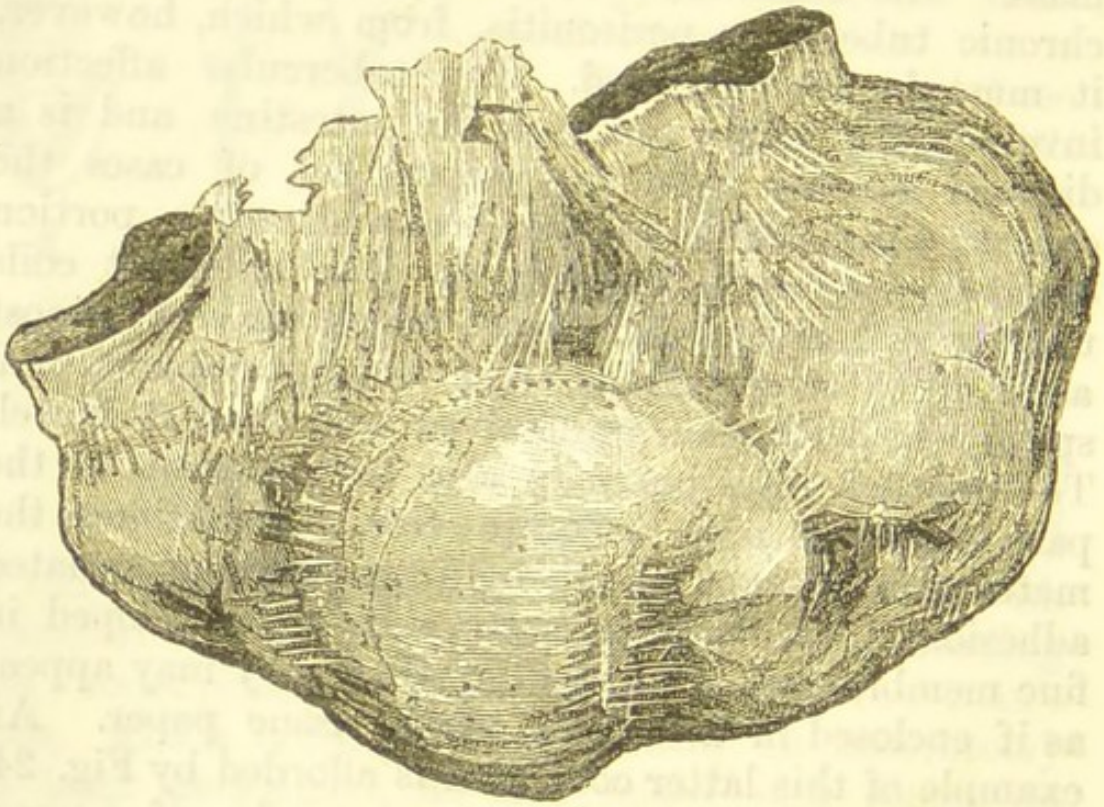


Fig. 24.—Diffused Peritoneal Adhesions.

Various forms of local peritonitis have led to this condition of the bowels. It has followed after operations upon strangulated hernia, after ovariotomy, after pelvic peritonitis, and peritonitis due to other lesions than operation wounds. In one case at least the intestines were found matted together by a peritoneal inflammation induced by cancer of the bowel itself.‡

* Path. Soc. Trans., vol. viii., page 200.
† *Lancet*, vol. i., 1883, page 818.
‡ Bull. de la Soc. Anat., 1877, page 473; M. Regeard.

The *symptoms* that arise are in the main identical with those associated with stricture of the small intestine. The onset is gradual, the progress of the malady is irregular, severe periodic attacks are common, and an acute termination to the case is not unusual. Constipation is partial, and often alternates with a copious diarrhœa. The vomiting is usually slight, irregular in occurrence, and uncertain in duration. During an exacerbation of the symptoms, and especially during a final acute attack, it may become stercoraceous. In one case there was constant feculent vomiting for fourteen days before death. The pain, such as it is, is paroxysmal, the intervals between the paroxysms decreasing as the case advances. Early in the case there may be an attack of colicky pain not more frequently than once or twice a week. Towards its termination the paroxysms may come on at intervals of a few minutes. The patient usually emaciates, and the movements of the distended and hypertrophied coils of intestine above the obstruction are, as a rule, evident through the parietes. There is little or no distension of the abdomen unless an acute form of obstruction supervene, and even in such a case the meteorism is usually by no means excessive. In two or three instances the mass of adherent bowel has been detected through the abdominal parietes as an ill-defined tumour. That the tumour, however, may be sometimes very distinct is shown by a remarkable case reported by Dr. Fleetwood Churchill in his work on the "Diseases of Women." The patient in this instance was a woman, aged twenty-three, who had a tumour in the lower part of the abdomen on the left side, that was dull on percussion. It was diagnosed to be an ovarian growth. She had never had any intestinal symptoms. The abdomen was opened by an operation intended to be an ovariotomy, but the

tumour was found to be composed of many coils of intestine matted together by old adhesions. The wound was closed and the patient recovered.

This form of obstruction seems to be as common in men as in women.

The *duration* of the cases when once symptoms have appeared varies, and may be reckoned in months rather than in weeks. In one case due to peritonitis intestinal symptoms were present for four years before a final and acute attack came on which ended in death. During the four years the patient had been liable to colicky pains, and to an obstinate constipation, which at the end of two years changed to an equally obstinate diarrhœa. In other instances symptoms resembling those due to stricture of the lesser bowel had existed for two, three, four, and six months respectively. As a rule they made their appearance very soon after the causative peritonitis. In one case, reported by Dr. Fagge, the patient died with symptoms of obstruction that had continued for twelve days after the relief of a strangulated hernia by operation. Here coils of gut were found matted together, but the cause of death was due most probably rather to the direct damage to the bowel inflicted by the strangulation, and to the peritonitis, than to the adhesions. These latter had formed since the operation.

As Dr. Churchill's case shows, even an extensive matting together of intestinal coils need not be attended by any evidences of intestinal disturbance.

2. **The large intestine.**—The colon being a more or less fixed part of the bowel, it follows that it is not susceptible to quite the same morbid conditions as have just been described as frequent in the lesser bowel. As a result, however, of distension, parts of the colon may become greatly elongated, and the abdominal coils thus formed may become matted

together by adhesions. The effects of colic distension are often well seen in the bowel above the seat of a chronic obstruction.

I can find no case where the descending colon, the most fixed part of this bowel, is stated to have altered its position to any conspicuous extent as a result of distension.* In one instance a dilated ascending colon appears to have become so curved that its convexity was found to be adherent to the ovary.† The sigmoid flexure when distended is apt to stretch towards the right iliac region, and then to mount up into the right hypochondriac region. The two limbs of the dilated loop may be found matted together, or the summit of the loop may be found adherent to the cæcum, to the peritoneum in the right iliac or hypochondriac regions, or even to the under surface of the liver. The transverse colon undergoes a peculiar and common change when much distended. Its central point tends to pass downwards towards the pelvis, so as to produce a V or U-shaped bend (Fig 25, B). The apex of the V or the bend of the U may become adherent to the mesentery, or to the peritoneum about the pelvis, or to a pelvic viscus, such as the fundus of the uterus.‡ One limb of the V may become adherent to the whole length of the ascending colon,§ and so produce a "double-barrelled ascending colon," or the other limb may attach itself to the descending colon in a like fashion, and produce a similar appearance on the left side.‖

* Mr. Curling reports a case of stricture of the rectum where the "descending colon" is said to have been coiled upon itself, and to have reached the right iliac fossa; but the gut in question appears to have been rather an immense sigmoid flexure (Path. Soc. Trans., vol. x., page 157).

† Duchaussoy; Mém. sur l'Anat. path. des Étrang. internes, 1860.

‡ Mr. Shaw; Path. Soc. Trans., vol. iv., page 147.

§ Dr. Hilton Fagge, loc. cit.

‖ *See* case of George Luff (page 125).

(Fig. 25, C and D). In most cases this deformity of the colon has been the result of chronic obstruction in the lower part of the bowel, such as a stricture of the sigmoid flexure or rectum.

In a few instances it would appear that the V-shaped bend may be rapidly produced. Thus, in a case of volvulus of the sigmoid flexure in a woman, aged twenty-seven, that ended fatally in four days, the transverse colon was found to have descended in an angular loop as far as the pubes.* It is quite common at autopsies to find this angular bend in the arch of the colon without intestinal obstruction of any kind or at any part. Such examples may be the result of chronic constipation, and so far as my experience extends are mostly met with in the aged, in those over sixty more often than in those whose ages fall between fifty and sixty.†

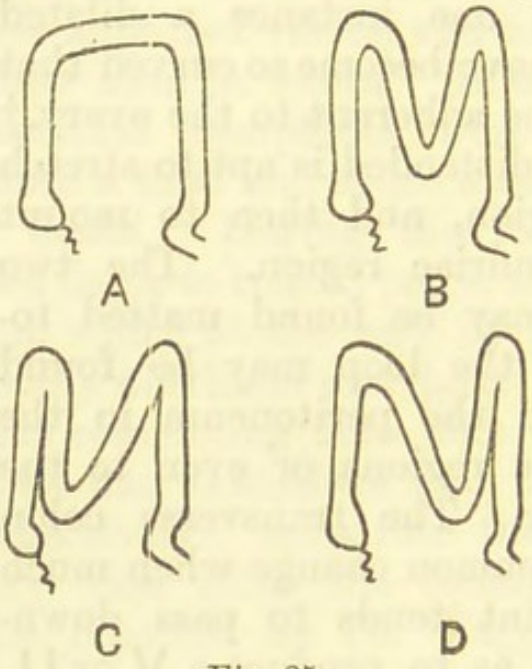


Fig. 25.

There are cases where one limb of the bent colic arch is found adherent to the ascending or descending colon for its entire length, but where no obstruction of any kind is found in the gut below the distorted segment. I am disposed to believe that such cases depend upon ulceration of the colon. The ulceration leads to peritonitis, distension and distortion of the transverse colon may follow, and then a part of the altered arch may become adherent to the inflamed

* Dr. Fagge, loc. cit. Assuming that the bend was not congenital.

† In several cases, appearing in young patients especially, there is no doubt but that the distortion of the colon is congenital.

serous coat of the ulcerated bowel. Thus, in the case reported by Mr. Shaw, the position depicted in Fig. 25 c was found, and along the whole length of the colon were discovered the cicatrices of ulcers. It is a conspicuous fact that in these cases no adhesions are usually found except between the two united segments of the colon. The deformity of the ascending colon and of the sigmoid flexure above alluded to is due probably in all cases to distension following obstruction lower down in the bowel.

No abdominal symptoms may be excited by these conditions of the colon, although there is more usually some evidence of simple chronic constipation. The matting of the sigmoid flexure in the way described is very apt to lead to volvulus of that part; and in the case of the deformed and adherent colic arch more or less acute obstruction may supervene from occlusion by kinking.

In Mr. Shaw's case subacute symptoms set in. The patient, a man aged sixty-three, had had severe constipation for some three weeks before his death. He obtained some relief by aperients, but for the last seven or eight days of his life the constipation had been absolute. He vomited; his abdomen was distended and tender and the seat of colicky pain. He died the day after a right lumbar colotomy had been performed. The case was complicated by the presence of a fistula bimucosa between the ascending colon and the jejunum. This accounted for the stercoraceous vomiting that set in some three or four days before death.

The following case may be quoted as presenting several points of interest:

George Luff, aged seventy-three, was admitted into the London Hospital on September 11th, 1882, with a fracture of the femur and a contusion over the region of the liver, the results of a fall. He is said to have never had any abdominal

troubles and to have enjoyed good health. His bowels were regular. On the 14th he vomited a little. On the 19th he developed some evidences of local peritonitis about the seat of the blow. He again vomited: his bowels became absolutely confined, and his belly was distended and tympanitic. He became rapidly worse, the vomiting became incessant, although never stercoraceous, the abdominal pain increased, and the patient died on the following day, the 20th. The autopsy revealed an enormous distension of the large intestine with a condition of the transverse colon similar to that shown in Fig. 25 D. The descending part of the colon and one limb of the distorted transverse colon were firmly blended by old adhesions. The hepatic flexure was connected by dense fibrous bands to the liver and gall bladder, and over this spot, which corresponded to the seat of the injury, was a trifling amount of recent peritonitis. The rest of the peritoneum was quite normal. The mucous membrane of the colon was unfortunately not examined; nor was the cause of the mischief about the hepatic flexure explained. All parts of the large intestine were equally distended, and the rectum was normal. Here it would appear that the old man suffered no inconvenience from his distorted colon while his health was good; but the shock of the accident, his advanced age, and the peritoneal mischief seem to have thrown the colon hors de combat, to have induced a paralysis of its walls, and a sudden cessation in its functions. Had such a man organic disease of his heart, or advanced disease of his kidneys, a similar combination of circumstances may have produced a like disturbance in the functions of those organs, and have led to a still more rapid death.

6. **Obstruction due to changes effected in the intestinal walls as a result of traction.**—The form of stenosis of the bowel to which I would here call attention has, so far as I am aware, not attracted the notice of those who have written upon the subject of intestinal obstruction, or perhaps it would be more proper to say that for a certain series of cases I have ventured to propound a new theory of causation.

It would be well to commence the consideration of this matter by an illustrative case that is fairly typical of the series.

Dr. Southey* reports the case of a boy, aged sixteen, who died with symptoms of intestinal obstruction that had lasted for ten days. The attack came on suddenly (during perfect health) with colicky pains, retching, and purging. The diarrhœa was soon replaced by absolute constipation that persisted until death. Vomiting came on, and on the sixth day was feculent. It was always copious, and occurred at long intervals. The pain also was intermittent in character. The autopsy revealed slight general peritonitis. A diverticulum, four inches long, passed from the ileum to be attached to the anterior abdominal wall just below the umbilicus. Immediately above the diverticle the gut was so contracted that it could only admit the tip of the little finger. It was also deeply ulcerated here. The two feet of bowel that extended between the abnormal process and the cæcum were intensely congested. The lumen of the diverticle was equivalent to that of a goose-quill. (*See* Fig. 26.) †

It is suggested in this case that the constriction in the gut was congenital, and that the ileum below the diverticle had been strangulated between that process and the abdominal parietes. With regard to the first suggestion, it must be allowed that congenital strictures of the small intestine are very rare, and do not seem to have been noticed in connection with the diverticulum upon which so many authors have written. If congenital, it is strange that it never produced any inconvenience until sixteen years had elapsed. With regard to the second suggestion, it can only be said that evidence is lacking that can demonstrate the spontaneous reduction of an acutely strangulated loop, except under the circumstances detailed in a previous paragraph (page 93). If the

* Clinical Soc. Trans., vol. xv., 1882, page 159.
† St. Bart.'s Hosp. Museum, No. 2,175.

gut had reduced itself in the present instance, it must have done so early in the case, and yet the symptoms

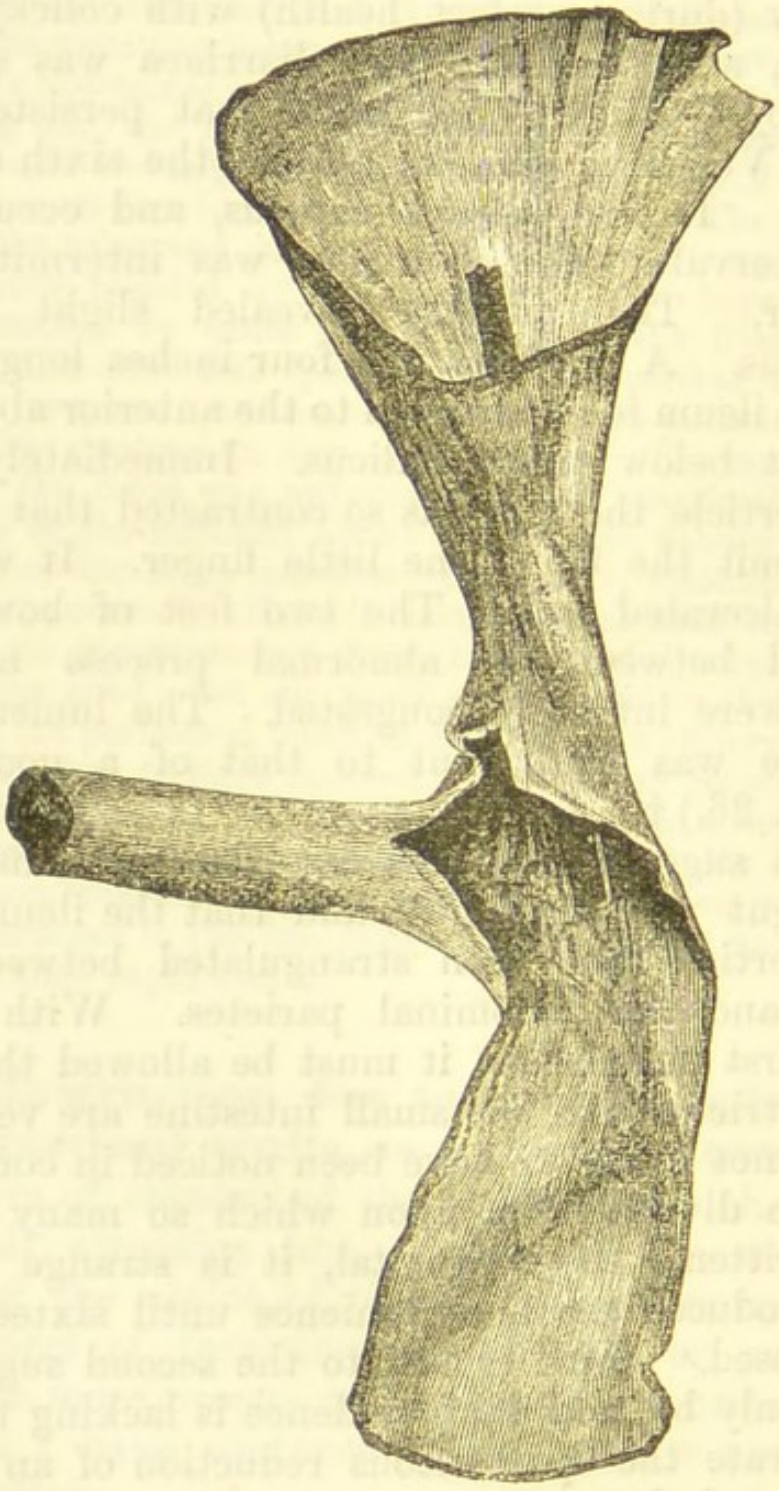


Fig. 26.—Stenosis of the Ileum above the origin of a true Diverticulum.

deliberately increased in severity until death appeared. It is, moreover, difficult to understand how the

strangulation could have been effected between the diverticle and the somewhat distant abdominal parietes.

I would rather venture to suggest that the case was one of sudden closure of the gut by kinking, brought about by traction on the diverticle and rendered possible, or more easy, by the stenosis of the bowel above that process. The more important inquiry relates, however, to the nature of this stricture in the intestine.

When a band or cord is adherent to some point on the bowel, that band, whether short or long, will tend to interfere with the action of the intestine if the least traction be brought to bear upon the band. It will tend to fix it more or less; it will interfere with the normal passage of a peristaltic wave through it, and it will prevent the bowel from straightening itself out as that wave goes by. Moreover, the traction must bend the gut a little, and so afford some obstruction to the passage of its contents, slight though that impediment might be in many cases. Intestinal matters will tend to linger about the adherent part, or even to accumulate there; increased action will be required in the gut above to prevent stagnation; more blood will be brought to the part, and it is conceivable that under these various influences the mucous membrane immediately above the point of attachment of the band may in time become ulcerated, and that following upon that ulceration, cicatrisation and stenosis may ensue. It is significant that in the present case the gut *was* ulcerated, and that the stenosis *was* immediately above the point of attachment of the diverticle.

Like cases belonging to this class show similar changes.

This theory as to the causation of these stenoses is illustrated and supported by the condition found in other forms of adherent bowel. It is extremely

common to find that an adherent loop is actually strictured at the point of its attachment, and equally common to discover that that stricture was the result of ulceration. Stenosis of adherent bowel may be due to three causes: 1. The gut may be occluded by actual bending, by the condition I have to ventured to describe as the "closed loop." 2. A primary ulcer may have formed in the bowel, which may have led to peritonitis of a limited character, and from that peritonitis the adhesion may have followed. 3. The ulceration may be secondary, as above described, and subsequent to the adhesion. In considering this matter I have carefully excluded the first two varieties; and have found many cases where a coil of normal bowel has become attached to some point within the area of a definite peritonitis, and has then become more or less extensively stenosed.

One singular case may be mentioned here that may throw, even if a little obliquely, some light upon this matter. A patient died after laparotomy performed on the thirteenth day for acute obstruction depending upon strangulation of the small intestine by an omental band. The band was composed of the free end of the great epiploon, and by the traction to which it had been subjected it is evident that the transverse colon must have been dragged upon. During the progress of the case a remarkable symptom appeared; a distended transverse colon became prominent and distinctly visible as to its outlines through the abdominal parietes. The autopsy showed that the only obstruction present was situated in the ileum.* Why, then, was the colon not in the usual state of partial collapse? Is it not possible that the sudden and severe traction upon the gut might have led to disturbance of its function, to a

* Bull. et Mém. de la Soc. de Chir. de Paris, tome vi., 1880, page 601.

species of paralysis of its walls, and so permitted the strange condition of distension that it exhibited?

To return to the original subject, some examples may now be given of this variety of obstruction. Dr. Southey reports another case (in the same paper) of a girl, aged 13½ years, who died with general peritonitis depending upon an acute obstruction of six days' duration. Four years previously she had been under treatment for severe constipation. At the autopsy a diverticulum extended between the lower ileum and the umbilicus. The gut immediately *above* it was so constricted as to have a diameter of only half an inch. No other cause of obstruction was found. Here also there is little doubt but that the final acute attack was due to kinking, rendered more possible by the stenosis, which had been in existence probably for some time. The symptoms, especially the intermittent pain experienced, and the fact that the constipation was not absolute from the first, well accord with the ordinary manifestations of occlusion by kinking.

In a case by Dr. Hare a diverticulum one and three quarter inches in length was adherent to the inguinal canal into which it had been herniated. The ileum immediately above the diverticle was so narrowed as to be only two-eighths of an inch in diameter. The mucous membrane was here ulcerated, and a fatal perforation had occurred.* The patient had had symptoms of some chronic obstruction in the small intestine. In a case placed on record by M. Carrière, a man, aged twenty-eight, had peritonitis eighteen months before his death. Since this attack he had had intermittent griping pains with constipation. He ultimately succumbed to an acute attack of obstruction lasting about ten days. A true diverticulum arose from the ileum and was attached to the gut

* Path. Soc. Trans., vol. viii., page 181.

lower down. Through the loop thus formed a coil of small intestine had been strangulated (the cause of the final acute attack). The ileum was so narrowed at the point of origin of the diverticle that it would barely admit the little finger.*

In the Museum of the Royal College of Surgeons is an interesting specimen (No. 1,361) which may, I think, be regarded as an example of the present condition. It shows a diverticulum, two inches in length and one inch in width at its base, that ends in a cord two and a half inches long attached to the mesentery one and a half inches from the margin of the gut. One inch above the origin of the diverticulum the gut suddenly becomes narrowed to a diameter of about half an inch, and remains this size down to the point at which the abnormal process comes off. Both above and below the narrowed segment the bowel is normal. Beneath the arcade formed by the adherent process two loops of intestine were strangulated.

Several cases very similar to these may be cited where the small intestine was greatly contracted about the point of attachment of an isolated adhesion. The relation, however, of the adhesion to the stenosis in these instances is open to doubt.†

The *symptoms* in these cases pertain to those associated with stricture of the lesser bowel. In some there is a continuous chronic course, with intermittent pain, partial constipation associated with occasional diarrhœa, slight sickness, some emaciation, and in time visible peristalsis. Other cases are mostly characterised by a final and acute attack due to kinking of the adherent bowel or to blocking up of the stenosed segment.

* Bull. de la Soc. Anat. de Paris, 1864, page 496.

† Mr. Gay; Path. Soc. Trans., vol. iii., page 101. Mr. Avery; ibid., vol. iv., page 156. M. Guiter; *Le Progrès Médical*, 1882, page 112.

7. Narrowing of the bowel from shrinking of the mesentery after inflammation.—When the mesentery has been extensively inflamed it may subsequently undergo such marked and extreme contraction as to greatly narrow the bowel to which it is attached. In such cases the involved coils are often found bound down to the spine by the shortened mesentery and much shrunken in appearance. This is very often the result of mesenteric gland disease. I might refer to four well marked examples, all in young patients, of this form of contraction.*

"We also meet," says Leichtenstern, "with an insidious process of chronic peritonitis in a diffuse form spread over the greater portion of the peritoneum, especially of that covering the mesentery, and then it often presents a certain independent character, and causes thickening and shortening of the mesentery, thus binding the convolutions of the small intestine down to the vertebral column. This cirrhosis of the peritoneum (peritonitis deformans, Klebs) results from chronic venous congestion in diseases of the heart, and sometimes exquisite examples are found with cirrhosis of the liver and atrophied nutmeg liver, and also occasionally with granular atrophy of the kidneys."†

The *symptoms* that arise in these cases are practically identical with those of stricture of the small intestine, or with those of matting together of many coils of the bowel. It would appear from Dr. Fagge's cases that the evidences of obstruction may extend over years, *e.g.* for four years in one case, for two in another.

* Dr. Hilton Fagge (loc. cit.) three cases; and a fourth case by the same physician, in Path. Soc. Trans., vol. xxvii., page 157.

† Loc. cit., page 632.

CHAPTER VII.

VOLVULUS.

UNDER the general term "volvulus" may be included two distinct methods of producing obstruction. In one the bowel is so twisted about its mesenteric axis, or even in rare cases upon its own axis, that it becomes occluded. In the other form two suitable coils of intestine are so intertwined or knotted together as to cause also an obstruction in their lumina.

The subject may be most conveniently considered under the following heads :

1. Volvulus of the sigmoid flexure.
2. Volvulus of the ascending colon and cæcum.
3. Volvulus of the small intestine.

1. **Volvulus of the sigmoid flexure.**—This part of the bowel may be occluded by either of the two methods just named.

(1) It may be twisted upon its mesenteric axis. (2) It may be intertwined with a suitable coil of small intestine.

(1) **The bowel is twisted about its mesenteric axis: Pathology.**—This is the most usual form of volvulus, and may, indeed, be said to be the only form that is at all common. If all the cases of volvulus of the intestine be considered collectively, it will be found that about two-thirds of the number are instances of twist of the sigmoid flexure about its mesenteric axis.

The normal flexure forms a loop that is more like a capital C than a Greek Σ. It first passes obliquely

upwards and inwards, then bends almost vertically downwards, and finally ascends in an upward and outward direction, to terminate in the rectum. Its curves and its outline vary greatly. Its meso-colon may be very long. In normal instances it has been long enough to allow the bowel to reach to the umbilicus, and even to stretch as far as the cæcum. This condition is not infrequently seen in newly-born children, in whom, as is well known, the sigmoid flexure is relatively very large. In the sigmoid flexure that is usually met with, a flexure of moderate size with moderate curves and with a short but wide meso-colon, volvulus cannot occur.

The arrangement of the gut that is necessary for the production of a volvulus is the following: The loop must be of considerable length, the meso-colon must be long and very narrow at its parietal attachment, so that the two ends of the loop may be brought as close together as possible. This condition is shown in Fig. 27 A, where it will be seen that the loose and free coil has practically a fixed pedicle around which it could with great ease be twisted.

This arrangement of the parts may be congenital, although such a circumstance must be uncommon since volvulus of the sigmoid flexure is extremely rare in the young. It may be brought about by peritoneal adhesions, especially by such as have been formed after great distension of the bowel. It may be readily produced by inflammatory conditions in the meso-colon leading to cicatricial contraction.

The commonest cause, however, is, without doubt, chronic constipation. In this condition the flexure is more or less constantly distended, its walls become partly paralysed by that distension, and becoming filled with fæcal matters and flatus, it hangs down into the pelvis an inert heavy mass. So placed it must drag upon its meso-colon, and while the position,

on the one hand, tends to elongate that membrane, it appears, on the other, to approximate the two ends of the loop. Possibly the slight chronic obstruction always present in the part may lead to a little local peritonitis which may tend to render permanent the deformity produced.

When the loop is in this condition it is easy to understand that a twisting of it upon its mesenteric

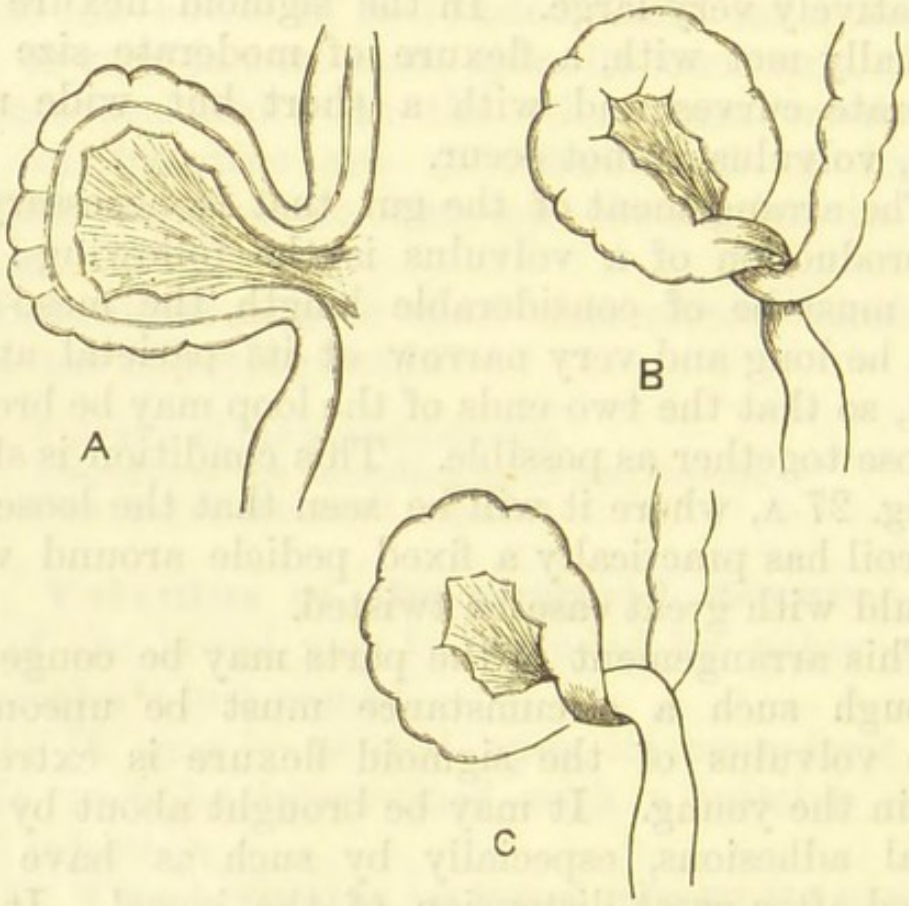


Fig. 27.—Volvulus of the Sigmoid Flexure.

axis may be brought about. Some irregular movement in the bowel may effect this, or fæces may accumulate in one side of the loop only, in such a way that the weighted end could fall over the less distended coil. When a heavy loop blocked with fæces is concerned, the position of the body may become a factor in the causation of the twist, a circumstance that certain cases would appear to illustrate. Lastly,

distension of the bowel alone has great influence in both producing and maintaining a volvulus, a fact to which further allusion will be made.

According to Potain there are two kinds of twist. In one the superior part of the loop is carried from above downwards, and from behind forwards, in front of the lower half of the loop, so that the end of the descending colon is brought into contact with, and *in front* of, the commencement of the rectum ("type rectum en arrière"), Fig. 27 B. In the second form the superior part of the coil is carried from above downwards, and from before backwards, behind the lower segment of the loop, so that the end of the descending colon is brought into contact with, and *behind*, the commencement of the rectum ("type rectum en avant"), Fig. 27 C.

Of these two varieties the former is by far the more common. The twist may extend through an arc of 180° to 360°, or the bowel may be twisted twice or even three times about its mesenteric axis. Since at the root of flexure the two ends of the loop are nearly parallel to the mesenterial axis, it follows that when the latter is twisted the former also must be twisted upon their own axes.

When the volvulus has once formed it is soon made permanent. The heavy and distended coil has no power of straightening itself. Its ends being closed it begins to increase rapidly in size from distension with gas, and becomes moreover engorged by blood from pressure upon the vessels that enter at the pedicle of the loop. The more the bowel becomes distended the more fixed is the volvulus. In the autopsy the twist may be almost entirely unrolled by main force, but the moment the hand is removed the loop springs back into its former distorted position. On evacuating the gas, however, that distends the coil the volvulus can be readily reduced,

or may even become reduced spontaneously. In other experiments where the volvulus has been reduced, it has been made to immediately reappear upon distending the bowel from above.

The unyielding abdominal parietes (anterior) take some share in the production of a volvulus. Melchiori has demonstrated this by experiments made upon a body that presented a volvulus. As he inflated the now untwisted flexure with air from the colon it began to form a volvulus, but as the coil increased in size and mounted up in the abdomen it gradually unwound itself again. When, however, pressure was applied that would correspond to that exercised by the anterior abdominal walls the volvulus was rendered permanent.* In some cases the volvulus may be held down by adhesions, upon the division of which it becomes readily reducible.† In other instances a coil of small intestines with a long mesentery may be thrown across the pedicle of the volvulus and so help to maintain its permanency.‡

In volvulus the occlusion of the bowel is brought about by the mutual pressure that the two ends of the coil exercise upon one another. The loop is therefore closed at both ends. Cases have been recorded where extensive degrees of volvulus have been associated with a narrowing of the lumen of the gut of so slight a character as to cause no symptoms. Leichtenstern reports a case where such a condition was met with and where distension actually relieved the volvulus. The specimen was from the body of a boy, aged eleven, who had had no intestinal troubles. He presented a chronic twisting of the flexure, with close approximation of the ends of the loop. "If air is

* Quoted by M. Liébaut, Du Volvulus de l'Iliaque du Colon. Thêse de Paris, 1882.

† Case by Dr. Atherton; *Boston Med. and Surg. Journ.*, 1883, page 531.

‡ Case by M. Léger; Bull. de la Soc. Anat. de Paris, 1875.

forced in from the side of the colon, the S loop untwists, and again resumes its twisted position when the air is allowed to escape, a proceeding that must have been repeated during life with every passage of fæces."

At the autopsy in fatal cases the sigmoid flexure is found to be enormously distended. It seems to occupy the whole abdominal cavity. The rest of the colon and the small intestines lie behind it and are more or less hidden by it. In cases of slight distension the loop about reaches to the umbilicus. As it becomes more distended it tends to move towards the right hypochondriac region. It then lies in front of the stomach and ultimately reaches the liver. In severe cases the diaphragm is much pressed upon and may be pushed up to within 16 cm. (6¼ inches) of the clavicle, or even up to the level of the third or fourth rib.* In one instance, fatal at the end of seven days, the diaphragm had been raised to the level of the third rib, the lung had been much compressed, while its lower parts were hepatised and empty of air.†

The twisted coil is more or less intensely congested. In colour it may present any depth between a dark red and a black. Its walls are often much thickened by infiltration, and are softened and friable. The serous coat is very commonly found to exhibit a rent, or even several rents. These may be extensive and often involve the muscular coat also, whilst the mucous membrane escapes. I am not aware that these rents have ever led to actual rupture of the twisted loop during life, nor can I find any case where perforation of the loop has occurred from ulceration of its mucous lining. If the patient lives long enough and the case is severe, the walls of the flexure

* Liébaut, loc. cit.

† Dr. Esaü ; Deutches Archiv für clinische Med., b. xvi., 1875, page 474.

become gangrenous. This gangrene is met with in the form of one or more patches that involve all the coats of the bowel.

The twisted loop will be found to contain much flatus, and to be otherwise occupied by fluid fæcal matter mixed with harder masses. Sometimes the contents are entirely solid, and in other instances entirely liquid. Blood, often in considerable quantity, may be found mixed with these contents.* The twisted meso-colon will be of a violet or purple colour and engorged with blood.

The rest of the intestines, and especially the colon, are distended. The distension seems to be only limited by the size of the sigmoid flexure. In cases where the involved loop is of enormous size the distension of the rest of the intestine is usually comparatively slight, the gut actually lacking room within which to expand. The descending colon is often much enlarged and congested. I find that only twice, in twenty recorded cases that I have collected, has perforation occurred. In one instance the perforation was in the cæcum, in the other in the bowel just above the volvulus. In one or two instances the mucous membrane in the lower part of the descending colon is described as being rent.

Peritonitis is singularly constant in this affection. It develops early, commences upon the involved bowel and then spreads over the rest of the serous membrane. In seventeen of the twenty cases just alluded to the state of the peritoneum is described. In only two cases out of this number was there no peritonitis. In one of these examples the patient had died in forty-eight hours, in the other he died suddenly at the onset of the attack. In the remaining fifteen cases there was peritonitis. In one of these instances

* In a case by Dr. Crisp, the coil contained a pint of thick blood; Path. Soc. Trans., vol. xxiii., page 112.

it was still limited to the sigmoid flexure (the patient had died on the fourth day). In two instances there was perforation. The remaining cases were simple examples of acute diffused peritonitis.

In many instances there was much bloody fluid in the peritoneum.

Symptoms. Frequency.—Volvulus of the sigmoid flexure forms about $\frac{1}{40}$th part of all cases of intestinal obstruction.*

Sex and **age.**—It occurs much more frequently in men than in women. Of my twenty cases, sixteen were males and four females. The great bulk of the cases fall between the ages of forty and sixty. The average age in the twenty cases was forty-nine, the youngest patient being twenty-seven, the oldest seventy-two. It is rare before thirty, and extremely rare before twenty. Leichtenstern mentions one case in a child aged ten. This circumstance of age has been explained by the greater frequency of constipation in those past middle life, and by the possibility that the condition of the gut that favours volvulus may require some years for preparation.

Previous history and mode of onset.—In no less than fourteen out of the twenty cases collected there is a history of a previous chronic constipation. Many of the patients had suffered from obstinate constipation for years, others for months only. In several instances there had been attacks of colic, associated with some swelling of the abdomen and with nausea, if not with actual sickness. In a few examples diarrhœa had now and then alternated with constipation, the purging being probably of a spurious character, and akin to that associated with the constipation in stricture of the rectum. In no instance had these previous symptoms been of a very

* Excluding hernia, diaphragmatic hernia, and affections of the rectum.

severe character, nor reached the gravity often observed in attacks of obstruction that have preceded fatal strangulation by bands and diverticula.

The mode of onset is usually abrupt, often sudden. This was observed in twelve out of eighteen cases where the precise manner in which the disease commenced was noted.

The symptoms begin with sudden pain in the abdomen, with some slight degree of collapse in many instances, and are soon associated with swelling of the abdomen and nausea or even vomiting. In some cases the attack had been preceded by an unusually long period of constipation. In two instances out of the twenty cases it had followed upon an attack of diarrhœa. In several examples it came on after a meal, or some time after eating indigestible food. Thus a case is reported of fatal volvulus after eating many cherries together with their stones. In this instance many stones were removed by enema and ejected by vomiting, the total quantity thus evacuated being "about a quart."* In several of the cases of sudden onset no cause, probable or improbable, could be assigned for the attack. In one case the patient had had many previous attacks of colic with distension, which were always relieved by lying in a particular position upon his back with the legs bent. In the last attack the position failed to give relief. In the cases where the onset is not sudden there is usually a history of obstinate constipation for days, associated with distension of the abdomen, with a feeling of malaise, and loss of appetite. Then nausea appears, or the patient is troubled with eructations, colicky pains gradually develop and the symptoms rapidly progress as in the more acute attacks.

In several instances an acute aspect has been given to the case by the administration of an aperient.

* Dr. Atherton; *Boston Med. and Surg. Journ.*, 1883, page 531.

Pain is usually the earliest symptom, and is a marked feature of the affection. As a rule, however, it is neither so conspicuous nor so severe as it is in cases of strangulation by bands. One does not read of the patient being "bent double" by it, nor of his "rolling on the floor" in pain, nor of his "writhing in agony," expressions that are not uncommonly met with in the description of the latter form of obstruction. The pain is often paroxysmal at first; a feature that probably indicates that the obstruction is not at the onset quite complete. In some marked cases of paroxysmal pain the patient has passed a motion after the commencement of the attack. The pain soon becomes constant but presents exacerbations. The constant pain may be due to the volvulus itself, the exacerbations to an increase in the twist from peristaltic action. The more acute the case the more severe the pain. It is at first complained of about the umbilicus, or, less frequently, I think, about the seat of the sigmoid flexure itself. As the case advances, and as peritonitis sets in, the pain becomes more diffused, being often, however, most felt about the region of the distended coil. It appears to diminish rather than to increase as the malady advances. There are cases where most pain has been experienced about strange parts, such as the pubes and the upper and left-hand side of the abdomen.

Tenderness on pressure is absent at first, although when the early pain is felt about the region of the volvulus, pressure there may add to its intensity. As peritonitis commencing in the distorted loop is very constant, it happens that tenderness soon develops over the region the gut occupies, and as the peritonitis becomes general so also does the tenderness become diffused. There is no form of intestinal obstruction where marked pain on pressure is elicited

earlier than in the present cases, if exception be made of certain examples of acute intussusception.

Vomiting is by no means so conspicuous a symptom as it is in strangulation by bands. It appears less early and may on the whole be spoken of as not being very severe. In six cases out of twenty vomiting may almost be said to have been absent. Three of the patients did not vomit at all; of the others, two only vomited after food, and one patient was sick but once, and that was after a dose of castor oil. These patients lived respectively forty-eight hours, sixty-four hours, four days (two), seven days, and eleven days after the commencement of the attack. In the first of these cases there was no peritonitis, in the rest it had not reached a severe grade, while the last patient died of perforation. The vomited matters are at first alimentary, and then bilious. Very rarely are they feculent. In the twenty cases there are only three instances of stercoraceous vomiting. In one case it appeared on the fourth day, the patient dying on the seventh; in another instance it appeared on the sixth day, the patient dying on the eighth; in the third example the symptoms were very acute, the vomiting was incessant and soon became feculent, although the duration of the attack was only two days. In some cases the vomiting abated considerably, or was even absent for a while. As already stated, it may be absent at first, and I find instances where the vomiting did not commence until the third, fourth, fifth, or sixth day of the attack. Liébaut alludes to a case where vomiting appeared for the first time on the eighth day.

Frequent eructations are singularly common in this form of obstruction.

Constipation exists, as a rule, from the first, and is absolute. In many cases scybala have been removed by enemata, but they have evidently been

derived from the rectum below the volvulus. In a few instances a motion has been passed during the progress of the case, as, for example, on the second or third day. In one case scanty motions were evacuated during the first three days of the attack. A purge has produced a slight stool after the symptoms of vomiting have set in, but, as a rule, aperients add to the severity of the manifestations of the malady, and to the completeness of the constipation. In these exceptional cases it may be assumed that the occlusion of the two ends of the loop is not complete, or is, at least, not complete at all times. The scanty stools that may be passed are probably derived from the contents of the flexure itself, and depend upon imperfect closure of the lower end of the loop, the upper end being still entirely occluded.

General condition.—When the symptoms are severe there is some degree of collapse established, although it is seldom so marked as it is in cases of strangulation by bands. It depends to a great extent upon the suddenness of the onset, the severity of the pain, and the rapidity of the progress of the disease. In two instances, where the patients died in forty-eight hours, death appears to have been due to a gradually deepening collapse. In any case there is usually great prostration, great and sudden loss of muscular strength, a pinched face, sunken eyes, a cold or clammy skin, and a sensation of anxiety and alarm.

The *pulse* is small and rapid and is apt to soon assume the character of the pulse in peritonitis.

The *temperature* is usually below normal at first, and may remain so until death. In any case it will probably be found to be subnormal until peritonitis sets in. Even when peritonitis occurs no appreciable rise in temperature may be noted, and acute peritonitis has been found in the autopsies of patients who,

throughout the whole progress of the attack, never recorded a temperature above 98·6. As a rule, however, peritonitis will be associated with an increase in the bodily heat, an increase that may bring it up to the normal level or a little above it. The thermometer as a means of indicating the accession of peritonitis in these cases is of little value.

The *respirations* are usually much increased in frequency, a symptom that depends mainly upon the great and often abrupt distension of the abdomen. Dyspnœa has in many cases been a marked feature, and a great sense of suffocation and of discomfort about the thorax have been complained of.

As will be pointed out below, death from interference with the functions of the thoracic organs is not infrequent in volvulus of the sigmoid flexure.

The *tongue* is coated, and often much coated; being at first moist, and then usually becoming dry and brown. Great *thirst* is not usually complained of unless there has been severe and copious vomiting or much collapse.

In the acuter cases the quantity of *urine* is as a rule diminished, although this feature is not so marked nor of so frequent occurrence as it is in cases of strangulation by bands. As occurs in that form of obstruction, so in this; the more marked the pain and collapse and evidences of general constitutional disturbance, the more likely is the quantity of urine to be diminished, while under the influence of opium the diminished excretion may again attain to its normal proportions.

In only one case in the series of twenty does *stranguary* appear to have been a symptom. In this isolated instance the patient was seized on the second day of the attack with such a very frequent desire to urinate, that he was thought to have cystitis. He died sixty-four hours after the appearance of the first

symptom. The distended sigmoid flexure was found to have reached the diaphragm. He never vomited except to reject some oil he took. If vomiting is in these cases, to a great extent, the result of reflex nerve disturbance, it would appear as if in this instance the nerve apparatus of the bladder had been irritated instead of that of the stomach. The man might almost be said to have vomited with his bladder instead of with his stomach.

Tenesmus, as may be expected, is often noticed in volvulus of the sigmoid flexure. In three of the twenty cases alluded to this symptom was very marked, incessant, and severe.

The condition of the abdomen.—One of the most conspicuous features in volvulus of the sigmoid flexure is the enormous distension of the abdomen. This distension appears very early and attains very considerable proportions. It depends mainly upon the dilatation of the sigmoid flexure itself, although there is much distension of the rest of the intestine. The rapidity with which the meteorism develops is considerable. In patients who have died in sixty-four or sixty-eight hours the twisted bowel has been found to reach the diaphragm, and has appeared at first sight to occupy the whole of the abdomen. The swelling is usually localised at first, appearing as a rounded elevation in the left segment of the umbilical region, and then occupying the whole of that region together with the epigastric. In the matter of locality, however, it shows much variety.* Very soon the swelling becomes uniform and the abdomen appears as evenly blown out as a distended bladder.

The swelling that forms early in the case may be

*In one case at least the swelling was most conspicuous in the right iliac region. The twisted gut usually passes towards that fossa before it mounts up in the abdomen.

dull over some part of its extent and of well limited outline. Such was the case in a patient whose history is recorded by Mr. Spencer Watson. Here a dull rounded swelling was detected, which the autopsy showed depended upon a volvulus of globular outline and about the size of a child's head.* Much thickening of the wall of the volvulus from infiltration would obviously tend to diminish its resonance on percussion. Since the volvulus always extends in front of the other intestines, all its parts must be more or less exposed to examination through the parietes.

The abdominal walls are at first more or less flaccid, and in a normal condition when manipulated. As the distension increases they become of course tenser, and as the peritonitis advances, more and more rigid.

In a few cases the movements of coils of intestine have been visible through the parietes before the distension had reached a great magnitude. This visible peristalsis cannot be regarded as associated with the volvulus, but rather as due to a long continued obstruction in the bowels upon which the twist itself had probably depended. In the twenty cases alluded to I have met with only two instances of this. In both the attack came on gradually, and in both there was a history of long continued previous constipation. One of the patients lived seven days, the other eight.

I know of no instance where the hand has been introduced into the rectum in these cases for the purpose of diagnosis. If such manœuvre were adopted there is no doubt but that the obstruction could be felt.

The use of enemata as a means of diagnosis is of much value. It shows that the bowel will hold no more fluid than a rectum could accommodate, and

* *Med. Times and Gazette*, vol. ii., 1879, page 31.

auscultation would demonstrate that the injected matter did not pass the region of the sigmoid flexure. It is said that about one and a half litres of fluid can without difficulty be introduced into the rectum alone.

Course, duration, prognosis.—Volvulus of the sigmoid flexure is, so far as is known, invariably fatal unless relieved by surgical interference. The case progresses from bad to worse, as a rule uninterruptedly, but sometimes with remissions in the severity of the symptoms.

The average duration of the attack in my twenty cases was six days. The longest period during which the patient lived was twenty days,* the shortest sixty-four hours.† The only circumstance that appears to influence the rapidity of the case is the severity of the twist. It is unaffected by the age of the patient and by the preceding symptoms. The cases that set in abruptly usually display the most rapid course. In the patient, however, who lived twenty days the onset was sudden. In another case, on the other hand, where the onset was gradual the patient died in three days. The causes of death in the more rapid cases are collapse and interference with the thoracic organs, in the more chronic cases peritonitis and exhaustion. The two patients who lived for the shortest periods (sixty-four and sixty-eight hours respectively) are both said to have died asphyxiated. In cases that have survived for a longer time the fatal issue is often somewhat sudden; and here it may be surmised that the greatly distended flexure has interfered with the action of the heart or lungs by actual pressure through the diaphragm. Before death the patient has, in more than one instance,

* Contrib. a l'Étude de l'Occlusion intestinale, by Dr. Le Moyne. Paris, 1878.

† A case by Melchiori quoted by Dr. Liébaut in his monograph.

complained of great pain in the chest and of trouble in the cardiac region.* An instance of sudden death reported by M. Potain may here be noticed. A man, aged thirty-three, who had been long troubled with constipation, was admitted into hospital with simple obstruction. His bowels had not been relieved for eight days. An enema merely brought away a few scybala. His abdomen was swollen, but it was neither tender nor painful. He had not vomited. He had no dyspnœa. The morning after his admission he was found dead in his bed. His decease had not been observed by the patients lying on either side of him in the ward. The autopsy revealed a double twist of the sigmoid flexure but with no peritonitis. The gut was fully distended. All the other viscera were healthy. Two patients out of the twenty cases died of perforation of the bowel above the volvulus.

There is no evidence to show that a volvulus of this part can ever spontaneously relieve itself when once the twist is well established. The case alluded to above of a patient who had had previous attacks of pain with obstruction, and who on each occasion but the last obtained immediate relief by assuming a peculiar posture, suggests a possible means of spontaneous relief in slight and recent cases. When the gut has become twisted it is conceivable that a change in the patient's position, or some shifting in the position of the irregularly placed contents of the coil, or some unusual movement of the bowel itself may unwind the volvulus. When, however, the occlusion has lasted long enough to allow the bowel to become distended the volvulus is almost certain to be rendered permanent.

I have already alluded to the fact that when the lower part of the sigmoid flexure or the upper part of

* *See* for example a case by Mr. Gay; Path. Soc. Trans., vol. x., page 153.

the rectum become suddenly occluded by the process known as kinking, symptoms may be induced that precisely resemble those of the present form of obstruction. I have mentioned an example of this where all the symptoms closely resembled those of volvulus. The patient was middle-aged; she had been troubled with constipation for some time; the onset of the attack was sudden; swelling of the abdomen was rapid and marked; the pain was constant, with exacerbations; the vomiting was not severe and not feculent; peritonitis was developing. The rectum had been closed by kinking and the sigmoid flexure filled a great part of the abdomen (page 108).

(2) **The bowel is intertwined with a suitable coil of small intestine.**—In these cases the sigmoid flexure must have the anatomical arrangement described in the preceding paragraph, *i.e.* it must form a long, free loop with a narrow pedicle. The loop of small intestine should possess also an unnatural mobility, and should have an unduly long and narrow mesenteric pedicle. In cases where two such coils have become intertwined it is found that the loop of the lesser bowel varies in length from four to twenty-one inches, while that of the sigmoid flexure measures from twelve to forty inches (Leichtenstern). The usual mode of intertwining is as follows: The loop of small intestine falls in front of, or across, the pedicle of the sigmoid flexure. The flexure then winds itself around the axis formed by the lesser coil. It passes upwards in front of the loop of small intestine and then moves backwards and downwards so that its free end passes behind the pedicles of the two coils. In this way the abnormal sigmoid flexure forms a complete turn around the coil of lesser intestine. Both segments of the bowel become strangulated, but the occlusion will be most severe in the axial loop.

According to Leichtenstern, this variety of intertwining occurs in more than one half of all the cases belonging to this species of volvulus. Three other methods, however, of intertwining occur. In one the loop of ileum lies in front of the pedicle of the sigmoid loop, which in this instance forms the axis. In the remaining two cases the small intestine passes *behind* the pedicle of the sigmoid flexure, when the loop of ileum may form the axis around which the flexure is entwined.

In all these examples strangulation is very severe, and is marked by great vascular engorgement of the involved loops. Such engorgement is met with in all cases where an extensive mesenteric pedicle is pressed upon. Not only are the walls of the engorged bowel infiltrated with blood, but much hæmorrhage may take place into its cavity, and there is usually an abundant sero-sanguineous exudation into the peritoneal cavity.

Leichtenstern has collected no less than twenty-one examples of this form of obstruction. With one exception only the patients were all males. They were, moreover, all adults, the ages ranging between twenty-four and seventy-three.

The *symptoms* that attend these cases are those of strangulation of a very acute character. The onset is more or less sudden, a marked degree of collapse is soon developed, vomiting is incessant and profuse, there is great pain and absolute constipation. The symptoms, indeed, are those incident to acute strangulation of the small intestine. Diarrhœa is apt to precede this kind of incarceration of the bowel, and a loose stool may be passed after the onset of the symptoms. It is evident that the great engorgement of the involved coils in these cases would lead to a copious discharge of fluid into the cavity of the intestine. In the matter of diagnosis it would be

practically impossible to distinguish these cases from cases of strangulation of a large loop of intestine by a "band," or through an aperture.

Death is very rapid. In only one case out of the twenty-one just alluded to did the patient live until the sixth day. All the rest died within the first two days, and many within the first twenty-four hours.

It will be seen from this that the present form of obstruction constitutes one of the most acute forms of strangulation of the bowel that is known.

2. **Volvulus of the ascending colon and cæcum.**—Volvulus occurring in this part of the intestine may assume a variety of aspects, and is, in any case, apt to adopt a very complicated arrangement.

It may be considered under three categories. (1) A twist of the ascending colon around its own axis. (2) Twists brought about by an abnormal loop formed by the ascending colon and cæcum with a long and distinct meso-colon. (3) Twists of the cæcum "upon itself" or about its own axis.

(1) Occlusion of the bowel may be brought about by a twist of the ascending colon around its own vertical axis. It would appear that this condition may be found in a colon that presents no anatomical abnormalities. It is extremely rare. I have been able to find but one distinct instance of it. This was in a case reported by Mr. Curling. The patient was a man, aged twenty-seven, who was attacked with symptoms of intestinal obstruction that ended fatally in eight days.* More than one writer on intestinal occlusions refers to this variety of volvulus, but gives no case.

The two other varieties of twist met with in this region depend, so far as I can ascertain, upon certain congenital abnormalities in the bowel, without which neither form of volvulus could have been possible. I

* Path. Soc. Trans., vol. ix., page 317.

have collected seven cases of these species of twist, and in every instance there was some congenital malformation of the parts involved. Before considering the matter in any detail it would be well to take a brief glance at the commoner congenital malformations of the colon.

In the fœtus the small bowel occupies at one time the right side of the abdomen, while the large gut is represented by a straight tube that passes on the left side vertically from the region of the umbilicus to the pelvis. The cæcum is at first situated within the umbilicus, and then ascends in the abdomen towards the left hypochondrium. It next passes transversely to the right hypochondrium, and then descends into the corresponding iliac fossa. It may be permanently arrested at any part of its course. Thus the cæcum may be found about the umbilicus, or in the left hypochondriac region (the ascending and transverse parts of the colon being absent), or it may be found in the right hypochondrium, the ascending colon only being unrepresented. The whole of the large intestine has at one time an extensive mesentery, and in some rare cases this condition may persist throughout life. It will be seen that in the forms of volvulus now to be noticed certain of these abnormal conditions are present.

(2) The ascending colon and cæcum may be provided with a very long meso-colon, as long, or even longer than the mesentery. The abnormal coil thus produced is very apt to get into difficulties. It may become twisted about its own mesenterial axis, just as is the case with the sigmoid flexure. An instance of this is recorded by Mr. Avery. Here the distended ascending colon formed an enormous loop. The patient, a man aged fifty-five, died after nine days of almost complete obstruction.* Left lumbar colotomy

*Path. Soc. Trans., vol. xii., page 222.

had been performed, and the portion of gut opened was found to be the extremity of the loop formed by the ascending colon.

When this part of the large intestine is practically free, and has a large and long mesentery, it may form an axis around which a suitable coil of small intestine may be entwined, or, on the other hand, it may itself wind around any loop of the lesser bowel that is in a position to be so engaged. The arrangement of parts is, indeed, precisely the same as has been described in connection with the sigmoid flexure. The latter form of volvulus, where the large gut winds round the small, is the more common. A good instance of it has been recently placed on record. In this case "the cæcum was found lying under the diaphragm, close to the spleen, the large intestine attached to it having been twice twisted round the lengthened mesentery of the small intestine, causing a double obstruction."*

The *symptoms* in these cases are not so acute as in corresponding examples of volvulus implicating the sigmoid flexure. In Mr. Firth's case, for example, the attack began with sudden pain, followed by vomiting, which, however, did not become severe until the next day. The abdomen became distended and tender, and the bowels absolutely confined. On the fifth day laparotomy was performed, but the obstruction was not found. Feculent vomiting commenced. On the evening of the sixth day the vomiting abated and ceased to be stercoraceous. On the seventh day the bowels were opened eight times. The patient became gradually worse, and died collapsed on the

* Case by Mr. Charles Firth; *Brit. Med. Journ.*, vol. ii., 1882, page 166. *See* case by Dr. Sands, where the cæcum was in the right hypochondrium, and where the mesentery and small intestine were encircled and constricted by the meso-colon. *New York Med. Record*, vol. xxxi., 1882, page 427.

eighth day. Perforation of the cæcum had occurred. There was commencing general peritonitis.

(3) In this variety of volvulus the cæcum has been described either as "bent upon" itself or as twisted upon itself. The difference between these two very similar terms is really greater than perhaps the terms themselves would permit. In the former instance, the cæcum is bent about a line at right angles to its long axis. The result is that the lower part of the caput coli is found in front of the ascending colon, its posterior surface becomes anterior, while the appendix and the lowest point of the cæcum become uppermost. At the angle of the bend there is of course a deep crease across the bowel, and by the bending in of the mucous membrane at this crease the lumen of the gut is occluded. Two good examples of this volvulus have been described, one by Dr. Fagge,* the other by Dr. Handfield Jones.†

In the other variety the cæcum is twisted around its own long or vertical axis so that its relations to the ascending colon are practically undisturbed. Three examples of this form have been recorded by Dr. Fagge.‡

In all of these five instances of volvulus the cæcum presented some abnormality that may be safely regarded as congenital. In one instance it was found in the right hypochondrium, in another in the left, in a third example it occupied the pelvis, and in a fourth it was found to the left of the umbilicus. In each of these cases the ascending colon, or the gut that should represent it, presented a corresponding anomaly, while the mal-placed bowel was provided with an extensive meso-colon.

These forms of twist must be classed among the

* Guy's Hosp. Reports, vol. xiv.
† *Med. Times and Gazette*, vol. i., 1872, page 3.
‡ Guy's Hosp. Reports, vol. xiv.

least common varieties of intestinal obstruction. Of the mechanism involved in their formation nothing appears to be known, although many speculations have been vouchsafed upon the subject.

The *symptoms* of volvulus of the cæcum vary greatly, and even among the five instances just alluded to there are examples of an acute, of a subacute, and of a chronic case. Four of the patients were males, one a female. Their ages ran between twenty-eight and fifty-five. The fatal attack had in one case been preceded by severe diarrhœa, and in the other instances by obstinate constipation. In two examples the onset may be said to have been sudden, while in the remaining cases it was gradual. Dr. Jones' patient was seized suddenly, soon after a meal, with pain, followed by vomiting and constipation. On the third day of the obstruction, as the patient was getting out of bed he became suddenly collapsed and died in a few minutes of syncope. In one of Dr. Fagge's cases the attack ended fatally in three and a half days. In another case the attack was subacute. There was pain which subsided once and then returned; constipation which yielded once and then persisted; vomiting which became feculent on the twelfth day and fæcal shortly before the patient's death about the eleventh day. In another instance the patient died four months after admission into hospital, the chief symptom during that time being obstinate vomiting. In one other patient there had been severe constipation for two weeks, but vomiting did not set in until the day before death.

The symptoms, therefore, show every variation between acute obstruction of the colon on the one hand and chronic or partial obstruction on the other.

Distension of the abdomen, often of an irregular character, was constant. In all cases peritonitis was found at the autopsy. The cæcum was, in every

example, of enormous proportions. In one case it is said to have filled nearly one half of the abdomen, and in another instance to have apparently occupied the greater part of that cavity. Once it is spoken of as gangrenous, and in two instances it was either ruptured or perforated.

3. **Volvulus of the small intestine.**—Twists of this part of the bowel may be considered under two categories. In one a loop of the small intestine is twisted about its own mesenteric axis, in the other a suitable coil or loop of the bowel is engaged in a volvulus with another suitable coil.

(1) *A volvulus of the small intestine about its mesenteric axis.*—Here a loop of the bowel is twisted around an axis represented by a line passing along the mesentery from its root at the spine to the intestine. It has already been pointed out that this form of twist is quite common in cases of strangulation by bands and through apertures. Many instances of such strangulation are recorded where the occlusion of the involved bowel has been brought about rather by its having become twisted upon itself than by its being actually pressed upon by the band or by the margin of the aperture. On relieving the volvulus by perforating the bowel the gut has been found to be so lightly held that the slightest degree of traction has served to reduce it. These cases are often associated with evidences of incomplete obstruction, with pain that is paroxysmal, with vomiting that is irregular in amount and intensity, and with constipation that need not be absolute.

Many instances also may be alluded to where adherent loops and coils of the lesser bowel have become so twisted upon themselves as to produce occlusion, and such a circumstance has often given an acute ending to a chronic case.

In the present set of cases the gut is entirely free

from adhesions and the volvulus entirely independent of any constricting band. The condition of the intestine that favours twisting is identical with that that predisposes to volvulus of the sigmoid flexure. A certain part of the bowel has an unduly long mesentery whereby it becomes to some extent separated from the remainder of the intestine. The two ends of the coil so individualised are brought more or less together, so that a possible pedicle is formed, about which the gut may be twisted. This condition of parts may be found in a loop of ileum that has long been herniated and then reduced. The approximation of the two ends of a coil may be brought about by mesenteric peritonitis due to glandular disease or to other causes. In cases where the elongation of the mesentery is a conspicuous feature a congenital origin may probably be ascribed to the condition. In a case of volvulus reported by Dr. Fowler, the mesentery of the involved coil measured from seven to eight and a half inches from its root to its attachment to the bowel.* The mechanism of the volvulus and the exact means whereby it is brought about are still matters of speculation. The twist is usually from left to right, and as a rule represents one complete turn. Fatal obstruction may, however, follow in instances where the bowel has described but half a turn.† Distension of the involved coil has evidently much to do with the volvulus. In two or three instances it was noticed at the autopsy that the twist became spontaneously reduced when the bowel was punctured, but reappeared when it was again inflated.‡

The general appearance of a simple volvulus of

* *Lancet*, vol. i., 1883, page 1119.

† *See* case by Dr. Sutton; *Brit. Med. Journ.*, vol. i., 1881, page 848.

‡ As an instance, see case by Dr. Verneuil; Bull. de la Soc. Anat., 1870, page 411.

the small intestine is well shown in Fig. 28 from a specimen in St. Thomas's Hospital.

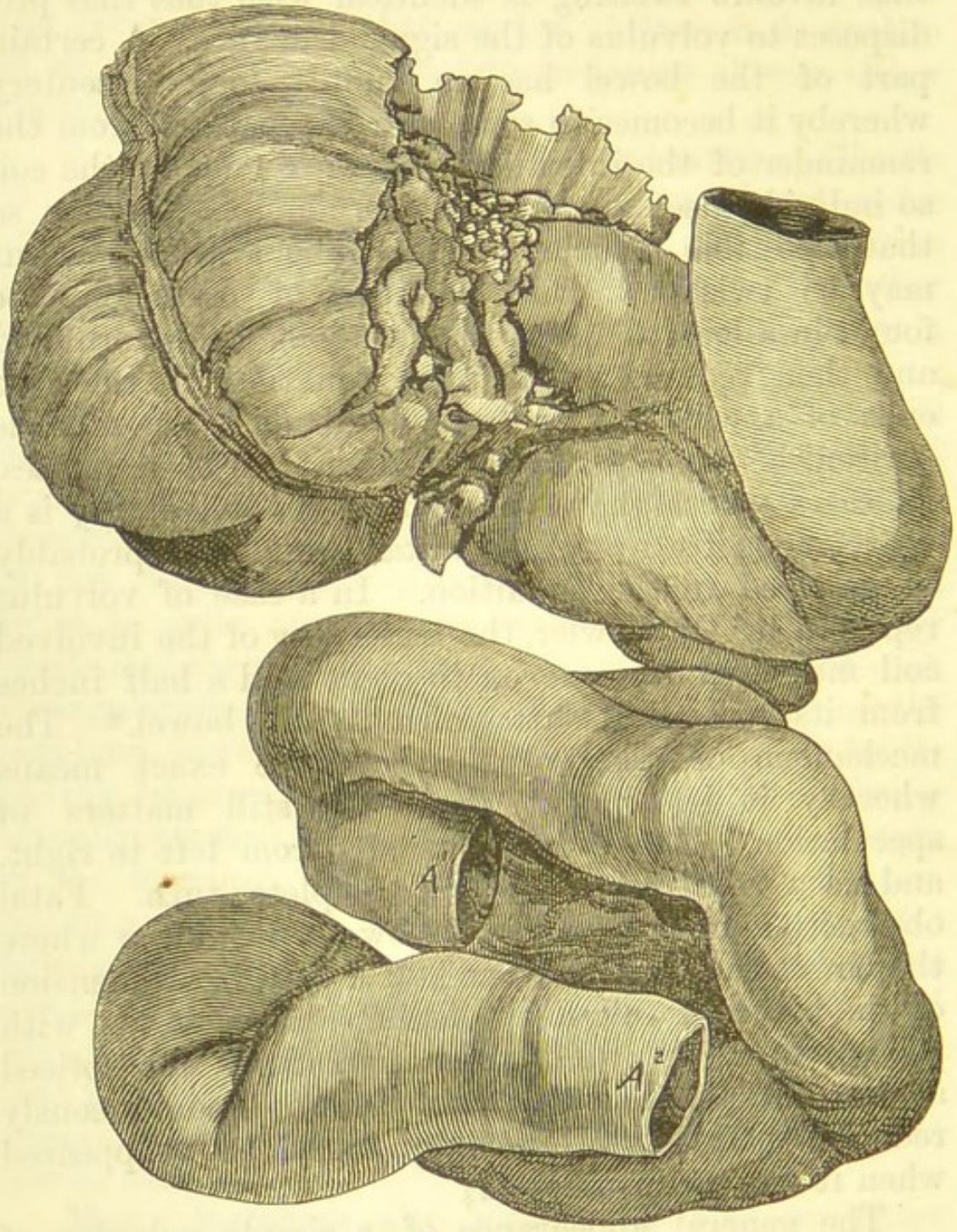


Fig. 28.—Volvulus of lower Ileum.
A^1 and A^2 join one another after many convolutions.

The involved coil, being closed at both ends, becomes greatly distended. This distension may cause it to attain huge dimensions, as in a case of

volvulus of the duodenum recorded by Dr. Rombold, where the twisted loop looked like the stomach, and is said to have been larger than an adult's head.*

The walls of the distorted loop are deeply congested, may be black in colour, or in a condition of approaching gangrene. I have met with no instance where the intestinal wall had given way during life.

I have only been able to collect ten examples of the present form of obstruction. The amount of bowel involved varies greatly. In the majority of the cases a large loop, probably about one foot to two feet in length, is implicated. In one instance five feet of bowel were discovered to have been twisted.†

As regards the segment of the bowel involved, in no less than seven cases out of the ten the volvulus was in the lower ileum. In the three remaining cases the twist was respectively in the duodenum, in the upper jejunum, and in the lower jejunum. Seven of the patients were males, while only two were females. In one case the patient is merely described as "an infant." The average age of nine patients (omitting the case of the infant) was twenty-three years, the youngest individual being ten years old and the oldest forty.

The *symptoms* met with in this form of volvulus vary considerably. The course of the malady may be acute or chronic. One patient out of the ten above alluded to exhibited symptoms of partial obstruction for thirty-six days, while another was troubled with abrupt attacks of obstruction at uncertain intervals, for more than a year before death occurred. In the remaining eight cases the average duration of the attack was five days, the extremes being thirty-two hours and nine days.

* Oestreichische Zeitschrift für prack. Heilkunde, 1865. N. 6.

† Dr. James Wilson; *Amer. Jour. of Med. Sciences*, July, 1879, page 78.

In five of these eight cases the attack came on suddenly. In several instances no cause could be assigned for the intestinal trouble. In other cases diarrhœa, or less frequently constipation, had preceded the symptoms of obstruction. Pain appears to be always the first symptom complained of. It is severe and of a colicky character, and at first usually localised about the umbilicus. As the case progresses, and probably as some local peritonitis sets in, the pain may become more definitely localised. In several examples it is described as continuous but with exacerbations. There is usually no tenderness at first, although that symptom may appear before the termination of the case. It depends probably upon the development of some peritonitis.

Vomiting appears early. It is a marked symptom, but would seem to occur rather at long intervals and in large quantities than to be incessant and less copious. Out of the eight cases, the vomited matters became stercoraceous in two instances, in five instances it is described as non-stercoraceous, and in the remaining case all description is lacking. In one of the cases where the vomiting was non-feculent the duodenum was involved, and in another the jejunum.

Constipation is usually complete from the first. The lower bowel may, however, be emptied by enemata of any contained fæces, and occasionally a motion has been passed that may have been due to some temporary relaxation of the volvulus. The abdomen soon becomes swollen, and an indistinct mass or tumour may be felt within if the twisted bowel be of good length and in a position to present itself beneath the parietes. Auscultation during the administration of an enema will, as a rule, demonstrate readily that the colon is uninvolved. In one case where the lower ileum was implicated the patient complained of severe tenesmus and of a sensation as of a cord encircling the body.

Mr. Harrison Cripps has recorded a case of congenital volvulus of the ileum that is probably unique. The child had had no action of the bowels, suffered from obstinate constipation and frequent vomiting. Littre's operation was performed on the third day of life under the impression that the rectum was malformed. The infant died of peritonitis. The colon was found to be normal, and the volvulus to be slight and very readily reduced.

In one of the chronic cases (in a girl aged ten) the attack came on suddenly with intense pain, vomiting and tenesmus. The acute symptoms soon subsided and the case became chronic. The somewhat obstinate constipation was interrupted by an occasional stool, the vomiting became stercoraceous, the abdomen was much distended, and showed through its parietes the peristaltic movements of the bowels. The child was much emaciated, and died at the end of thirty-six days, after twenty-four hours of intense abdominal pain. There was a volvulus of the lower ileum but no peritonitis.* In the other chronic case the patient had no less than seven severe attacks of obstruction in a little more than twelve months. These attacks were somewhat sudden in their onset and associated with constipation, vomiting, and severe pain. They were relieved, as a rule, at the end of a few days by means of enemata, the patient recovering often very slowly. Here the volvulus was in the upper end of the jejunum. This case suggests the possibility of spontaneous cure in cases of volvulus, and it may be that several of the examples of acute intestinal obstruction that have either ceased spontaneously or yielded to some nostrum, have been instances of volvulus of the lesser bowel.

Out of the ten cases, acute general peritonitis was

* Dr. Handfield Jones; *Med. Times and Gazette*, vol. i., 1872, page 3.

met with in four instances, in an equal number of autopsies the serous membrane was found to be healthy, in the remaining two cases its condition is not described.

Leichtenstern describes a volvulus that implicated the whole of the jejuno-ileum. As I have been able to find no other cases than the few to which he alludes, I might give the account of this form of twist in his own words: "If the root of the mesentery be unusually short, while its height and the length of the intestine are normal, if the radix mesenterii runs more vertically than usual, if the mesentery attains its full height at the jejunum suddenly, and loses it just as abruptly in the neighbourhood of the cæcum, then the small intestine is in a condition to undergo twisting as a whole about its mesentery. The twist is usually 180 degrees, and the direction such that the upper end of the intestine is carried to the left and downwards, the lower end to the right and upwards. The right side of the mesentery faces to the left, and the left to the right. This twist does not always cause absolute occlusion, often only a constriction at each end of the twisted convolution, the beginning of the jejunum and the end of the ileum, the latter of which, when occlusion takes place, is often twisted at the same time about its own longitudinal axis. Twisting of this kind has been seen in very young children, and it seems as if that variation in the development of the mesentery in which the ileum, cæcum, and ascending colon possess a common mesentery, especially disposed to it." * Dr. Whipham reports a case where "the small gut with the cæcum and ascending colon were attached by their mesenteric envelopes to the same point near the last dorsal vertebra; so that the usual attachment of the colon to the right iliac fossa was deficient. The pedicle of

* Loc. cit., page 565.

conjoined mesentery was twisted from left to right across and around the union of the duodenum with the jejunum, so as to compress that part firmly." The jejunum was in the early stage of gangrene. The patient, a female, aged nineteen, had presented symptoms of intestinal obstruction for twelve days before her death. She suffered from severe vomiting that was never stercoraceous, and from constipation that was relieved once during the twelve days. There was no swelling of the abdomen save a little in the epigastric and hypogastric regions. She had had previous attacks of constipation attended with colic and sickness.*

(2) *Two suitable coils of small intestine are twisted together*, the one acting as an axis about which the other is wound. The suitability consists in the involved loop being possessed of a long and narrow mesentery, or of the loop that forms the axis being fixed by its extremity to some point on the parietes. Such a case is shown in the accompanying diagram from Leichtenstern, where the axial loop was adherent to the parietes at the point *a* (Fig. 29); *b* points to the coil that was twisted about the axial loop.

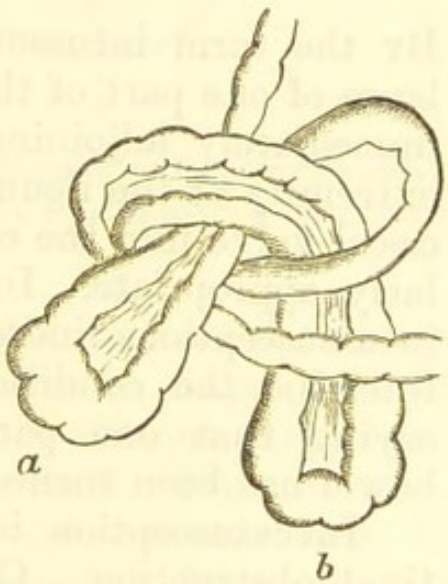


Fig. 29.—Volvulus of small Intestines. (Leichtenstern).

This form of volvulus is very rare. It would appear that the symptoms to which it gives rise are of an acute character, as is often seen in like forms of volvulus where two coils of bowel are involved, one coil being composed of small intestine.

Dr. Rundle describes an autopsy where two

* *Med. Times and Gazette*, vol. ii., 1876, page 33.

adjacent coils of small intestine were found to be adherent, while around them a third segment of the lesser bowel had become twisted. The patient was a man, aged forty, who was seized with sudden and severe abdominal pain associated with vomiting. Collapse soon appeared, and he died in less than twenty-four hours.*

Attention has already been drawn to cases where a volvulus has been formed by an intertwining between a loop of small intestine on the one hand and the sigmoid flexure, or an abnormal cæcum or ascending colon, on the other.

CHAPTER VIII.

INTUSSUSCEPTION: PATHOLOGY.

By the term intussusception is understood the prolapse of one part of the intestine into the lumen of an immediately adjoining part. In cases where the extremity of the ileum is protruded through the ileo-cæcal valve into the colon, the term prolapse is singularly appropriate. In other cases, as, for example, in intussusceptions limited to the small or to the large intestine, the condition may be better expressed by saying that one part of the circumference of the bowel has been turned into the part adjacent to it.

Intussusception is a very common form of intestinal obstruction. Classing all varieties of obstruction together, it forms more than one-third of the whole. Its actual share is probably represented by three-eighths. Among 1,152 † cases of intestinal

* *Méd. Times and Gazette*, vol. i., 1866, page 306.

† From this collection are excluded congenital obstructions, stenoses of the rectum and the various forms of hernia.

obstruction of all kinds collected by Leichtenstern are no less than 442 cases of intussusception. In a special monograph upon the subject this author deals with the substantial total of 593 recorded cases.*

Pathological anatomy.—If an intussusception be viewed in vertical section it will be seen to be composed of six layers of intestine, three on either side of the central canal, all more or less parallel to one another. It will be noticed also that the arrangement of the layers is such that mucous membrane lies in contact with mucous membrane, and peritoneum

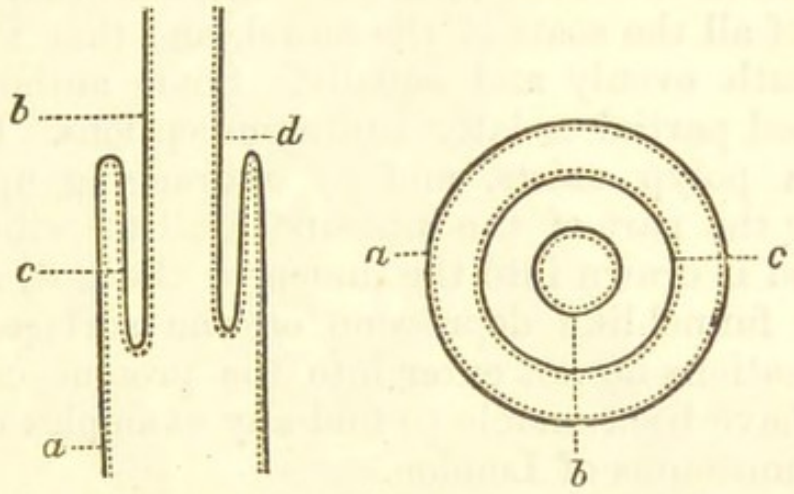


Fig. 30.—Vertical and Transverse Sections of an Intussusception.
a, the sheath or intussuscipiens; *b*, the entering or inner layer; *c*, the returning or middle layer.

with peritoneum. On horizontal section the invaginated mass will show three concentric rings of bowel, with of course the same mutual relations with regard to the mucous and serous surfaces (Fig. 30). All parts of the intussusception are named, and the nomenclature has suffered somewhat from an exuberance of terms. The external of the three layers is known as the intussuscipiens, the sheath, or the receiving layer (*la gaîne* of the French, Fig. 30, *a*). The innermost cylinder is known as the entering layer

* Vierteljahrschrift f. d. prakt. Heilk. Prague, 1873-4.

(Fig. 30, *b*), and the middle one as the returning layer (Fig. 30, *c*). Taken together, these two layers form the intussusceptum (*le boudin* of the French). The "neck" of the intussusception is at its upper part, where the returning layer joins the sheath (Fig. 30, *a*). The ridge formed by the junction of these two layers is known as le bourrelet. The "apex" of the intussusception is at the lower part of the intussusceptum, where the entering and returning layers join. The arrangement of the various parts of an intussusception, are well shown in Fig. 31. All intussusceptions are complete in the sense that the intussusceptum is composed of all the coats of the bowel, and that it enters the sheath evenly and equally. Some authors have described partial or lateral intussusceptions. In these cases a polyp exists, and by a dragging upon the tumour the part of the intestinal wall to which it is attached is drawn into the lumen of the gut, so as to form a funnel-like depression on the surface. Such invaginations do not enter into the present category, and I have been unable to find any examples of them in the museums of London.

Anatomical varieties. — Invaginations may occur at any part of the intestine from the duodenum to the rectum. They may be conveniently divided into the three classes: (1) the enteric; (2) the colic or rectal; and (3) the intussusceptions that involve the ileo-cæcal segment of the bowel.

(1) **Enteric** invaginations may occur in any part of the lesser bowel. In the upper part of the small intestine they are rare, although an isolated case or so has been recorded of intussusception of the duodenum. They are most common in the lower jejunum and then in the ileum.

It would appear that jejunal intussusceptions bear to ileic intussusceptions the proportion of about four to one. Invaginations involving the small intestine

seldom attain great length. They are often very short, and in the majority of cases do not involve

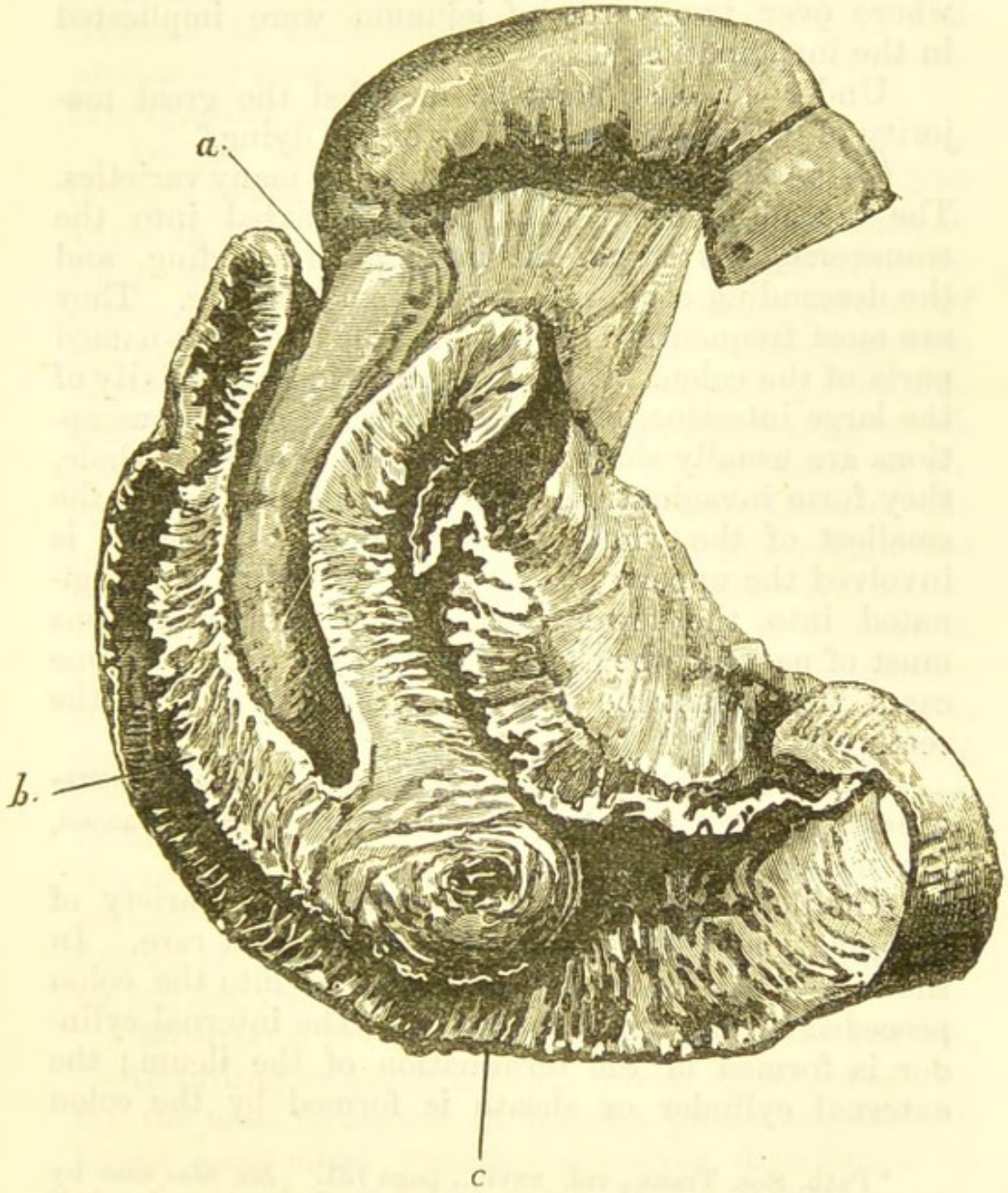


Fig. 31.—Intussusception of Jejunum.
a, internal cylinder; *b*, middle cylinder; *c*, external cylinder.

more than a few inches of the bowel, about three to ten inches, on an average. Some may be, however,

of considerable length, as in a case reported by Mr. Henry Morris, where two feet of the lower ileum were involved;* or another, recorded by M. Bucquoy, where over two yards of jejunum were implicated in the invagination.†

Under this class must be included the great majority of "the intussusceptions of the dying."

(2) **Colic** intussusceptions present many varieties. The ascending colon may be invaginated into the transverse, the transverse into the descending, and the descending colon into the sigmoid flexure. They are most frequently met with in the two last-named parts of the colon. Owing to the comparative fixity of the large intestine, it happens that these intussusceptions are usually short, and, indeed, taken as a whole, they form invaginations that in point of size are the smallest of the whole series. When the rectum is involved the upper segment of this intestine is invaginated into the lower part. Such intussusceptions must of necessity be short, since in the most extreme cases they must be limited by the length of the rectum itself.

(3) The intussusceptions that occur in the **ileo-cæcal region** may be divided into two main classes, the ileo-cæcal and the ileo-colic.

The ileo-cæcal form is the commonest variety of invagination, while the ileo-colic is the most rare. In the former the ileum and cæcum pass into the colon preceded by the ileo-cæcal valve. The internal cylinder is formed of the termination of the ileum; the external cylinder or sheath is formed by the colon

* Path. Soc. Trans., vol. xxviii., page 131. *See also* case by Mr. Eager (*Lancet*, vol. i., 1882, page 604), where one and a half feet of the upper jejunum were involved.

† Recueil des Travaux de la Soc. Méd. d'Observ., tome i., page 192. Paris, 1857. *See also* case by Dr. Johnstone of Baltimore (*Lancet*, vol. i., 1883, page 176), where forty inches of small gut were passed by the anus, with recovery.

alone, while the apex of the intussusception is represented by the ileo-cæcal valve. This form may attain great size, and it is not infrequent for the valve to traverse the whole length of the large intestine and ultimately present itself at the anus or even protrude through that sphincter.

In the ileo-colic variety the termination of the ileum is prolapsed through the ileo-cæcal valve. The valve and the cæcum remain, for a time at least, in their normal situations. The apex of the intussusceptum must always be formed by some portion of the terminal part of the ileum. This intussusception is commonly associated with some secondary invagination of the cæcum and colon itself, concerning which more will be said when speaking of the mode of increase observed in these abnormal conditions of the bowel. A third variety met with in this region has been termed by Leichtenstern the iliaca-ileo-colica. In this form a primary intussusception is formed in the terminal part of the ileum. This invagination, when it reaches the valve, may either pass through it (just as does the uninvaginated gut in the pure ileo-colic form); or it may be arrested at the valve and then be associated with an invagination of the cæcum into the ascending colon. In the former of these two subvarieties the apex of the intussusception will be formed of ileum, in the latter it will be represented by the ileo-cæcal valve.

Relative frequency of the various forms.—According to Leichtenstern, whose statistics are by far the most numerous at present published, the different anatomical varieties are thus distributed in one hundred cases: Ileo-cæcal, 44 per cent.; enteric, 30 per cent.; colic (including rectal), 18 per cent.; and ileo-colic, 8 per cent. With these results the statistics published by Brinton and others very closely agree.

The mode of growth of the intussusception. — In all the forms, with the exception of the ileo-colic, the method of increase is as follows: When an intussusception increases in length after a piece of bowel has been primarily invaginated, the increase is at the expense not of the entering layer, but of the external or receiving layer. For example, let it be supposed that a portion of the termination of the jejunum is invaginated into the ileum. If the mass increases in length it will do so solely at the expense of the ileum. No more of the jejunum will actively enter into the intussusception, so that no matter what segment of gut formed the original apex of the intussusception, that apex will remain the same even if the invagination doubled or trebled its original length. In the ileo-cæcal variety the cæcum is turned into the ascending colon, and the valve forms the apex of the intussusception. As the invagination increases the ascending colon becomes inverted, then the transverse and descending colon, until at length, when the sigmoid flexure is reached, no trace of the ascending, nor probably of the transverse, colon will be left, but the valve will still form the tip of the intussusception. It is obvious that in the growth of this variety much depends upon the mobility of the colon, and since the colon is usually much less fixed in the child than it is in the adult, it follows that extensive invaginations of this species are most commonly met with in the young.

The amount of traction brought to bear upon the parts in growing intussusceptions that involve the colon must often be considerable. This is well illustrated in a specimen in St. Bartholomew's Hospital.* It shows an ileo-cæcal intussusception. The cæcum, the ascending and transverse colon have disappeared from view, the ileum appears to enter directly into

* St. Bart.'s Hosp. Museum, No. 2,188.

the descending colon. The vermiform appendix and the ileo-cæcal valve project beyond the anus. By means of the dragging upon the transverse colon the stomach has been rendered vertical and has been brought into close contact with the intussusception.

In the ileo-colic variety the method whereby the intussusception increases is, in the first instance at least, somewhat different. A portion of the terminal ileum is protruded through the ileo-cæcal valve, and the invagination may increase for some time solely by the prolapse of more and more ileum, the sheath remaining perfectly unchanged. This is exactly the opposite to what happens in other intussusceptions. When once the prolapse has commenced no obstacles are offered to its increase other than those presented by the resistance of the valve and the dragging upon the ileic mesentery. When once the invaginated small intestine is in the spacious colon it meets with practically no resistance. Sooner or later, however, no more ileum can become prolapsed. The part protruded may become fixed by adhesions; or from congestion or distension of the ileum the valve offers a rigid resistance to any further invasion of the colon. In such a case, if the intussusception still continues to increase it must do so by the method observed in other forms of invagination, viz. at the expense of its sheath. No more ileum can enter, but the cæcum can be turned in, and then the ascending colon, and so on until at last the rectum may be reached. A good specimen of ileo-colic intussusception associated with little or no secondary invagination of the cæcum is shown in Fig. 32 from the Museum of the College of Surgeons.*

The **intussusception of the dying.** — All invaginations can be divided into two great forms according to the circumstances of their origin.

* No. 1,368 C.

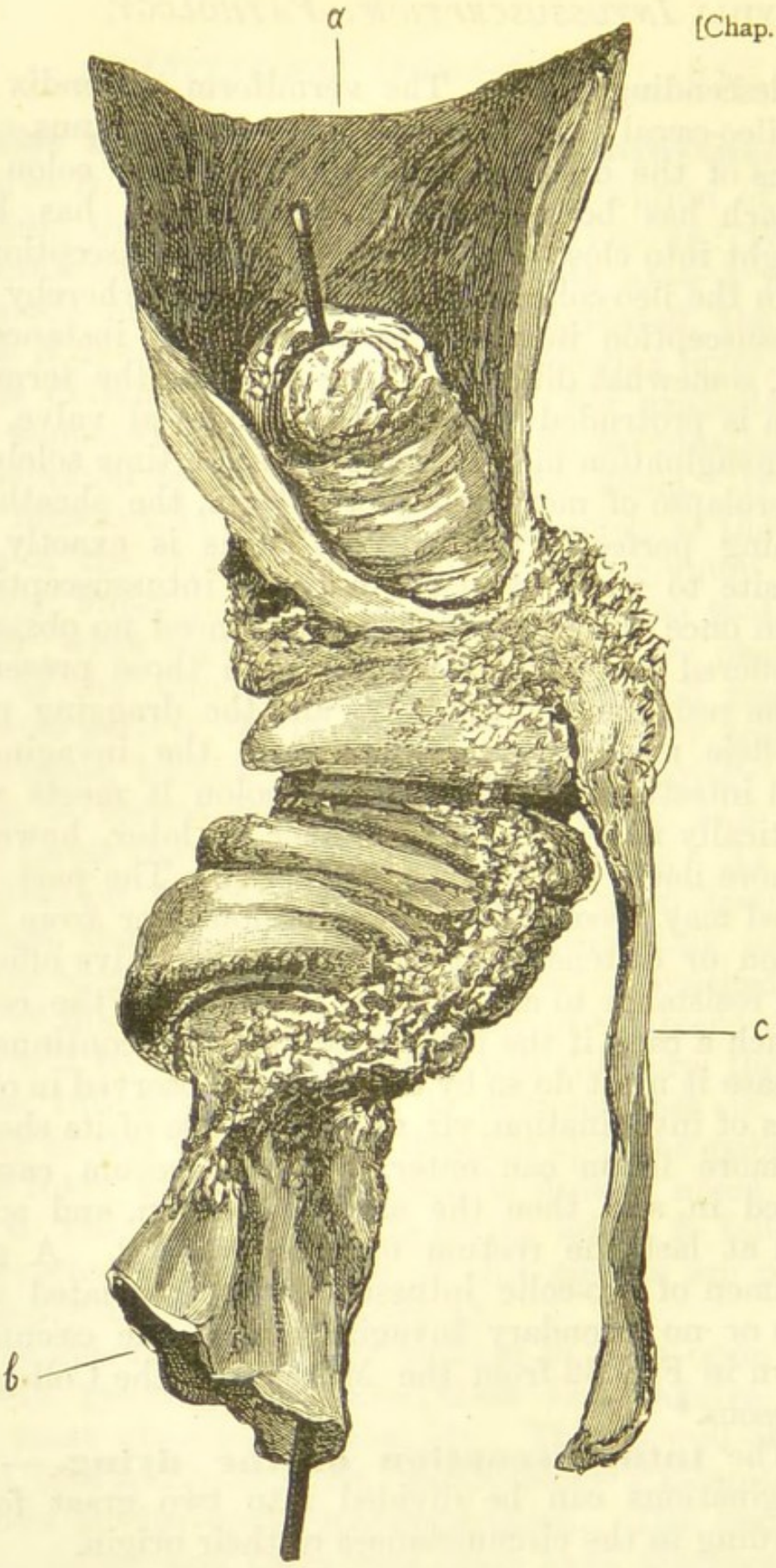


Fig. 32.—Ileo-colic Intussusception.

a, ascending colon ; *b*, ileum ; *c*, vermiform appendix.

(1) The common or obstructive intussusception and (2) the intussusception of the dying. With the former only is surgery concerned. The latter is a form of invagination that occurs probably a little while before death, and depends upon certain irregular peristaltic movements that may be conceived to occur during the act of dying. It is well known that as a patient lies *in articulo mortis* muscular actions become often irregular and disordered before they cease for ever. It is consistent with experience to imagine that a like feebly tumultuous action may pervade the muscle of the intestine during the death struggle, and that it may be such as to produce some invagination of the bowel. Intussusceptions of this kind cause no symptoms during life. They are first discovered at the autopsy. They are always very small, are always free from any trace of congestion or inflammation, and interfere little with the lumen of the bowel. With the most trifling amount of traction they can be reduced. They are most usually met with in children, and especially in such as have died of brain disease. They occur in association with perfectly normal abdominal viscera. They are uncommon in adults.

In two other points may they differ from common intussusceptions, viz. in number and in direction. These points may be considered in more detail. The obstructive invagination is usually single: the intussusceptions of the dying are often multiple. There are a few recorded cases where several intussusceptions have been found which collectively caused obstruction and which were apparently not of the precise nature of those that form just before death. The multiple invaginations are always small and nearly always limited to the small intestine, while at the same time they are associated with but slight changes in the gut. The common obstructive

intussusception that is associated with adhesion of its parts, with gross changes in both its sheath and its intussusceptum, and often with gangrene of the latter is, so far as I can ascertain from the records of cases, invariably single. It is true that such invaginations may be associated with others that are secondary to it and that are clinically of no significance; but I am aware of no instance where two obstructive intussusceptions distinctly independent of one another, and both attended by such morbid changes as are common in such invaginations, have existed at the same time in the same body.

The intussusceptions of the moribund, on the other hand, are more often multiple than single. It

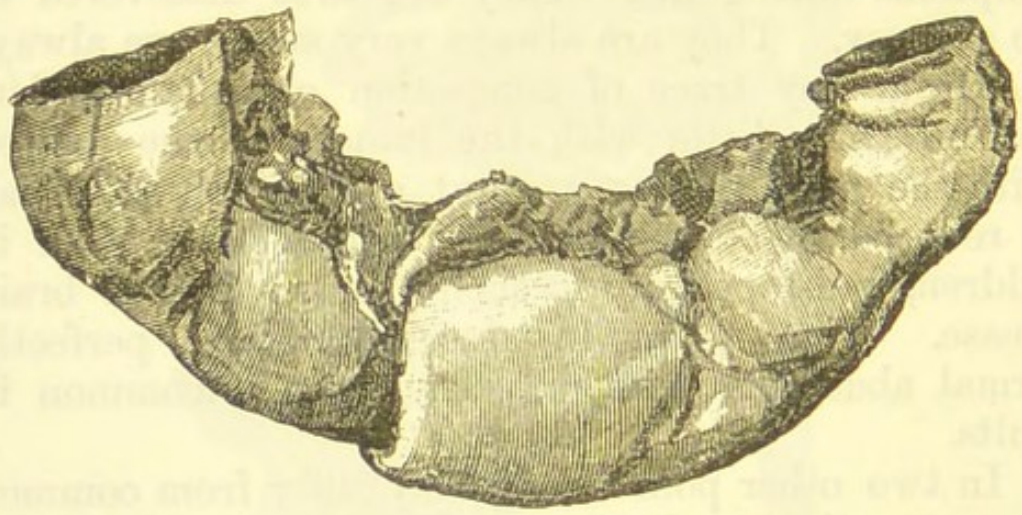


Fig. 33.—Intussusception of the Dying.

is common to find four or five within a little distance of one another, and even as many as ten have been met with in a single case.*

In *direction* the obstructive intussusception is almost invariably descending, *i.e.* the in-turning of the bowel wall is in the direction of the anus. It is true that a primary invagination of this kind may be associated with a secondary ascending intussusception.

* Dr. Gee; *Brit. Med. Journ.*, Nov. 14, 1861. *See also* Mr. Gay's paper on Intussusception. London, 1862.

But such secondary formations are unimportant, have little or no influence upon the primary trouble, and are devoid of any clinical significance. The intussusceptions of the dying are often ascending or retrograde, and the two varieties are not infrequently found to be present in the same body. A specimen of such a case is to be found in Guy's Hospital,* while Fig. 33† shows the common appearance of the invaginations of the moribund.

These non-clinical intussusceptions have formed the bases of many erroneous conclusions and have been accredited with producing an obstruction that may have existed for days and weeks before they themselves had any existence. A case reported by M. Léger‡ may probably be an example of this. A woman of sixty-five died after presenting symptoms of chronic obstruction that had extended over twelve months. She died of inanition. The autopsy revealed an intussusception of the upper part of the jejunum 18 cm. in length. This invagination presented no adhesions, and showed an absence of congestion and indeed of any other morbid changes in its walls. It is extremely improbable that this intussusception could have induced abdominal symptoms for over twelve months, and yet after death be found to be as free from structural changes as a piece of intestine but recently invaginated. The diagnosis of chronic intussusception presupposes that the invagination had existed unreduced for the period covered by the symptoms. Elsewhere in the abdomen were ancient adhesions the products of a past peritonitis. It would probably be more reasonable to assume that the chronic obstruction was due to the adhesions, and that the intussusception was of the character of those that form when the patient lies in articulo mortis.

* No. 1,851 (42). † St. Thomas's Hosp. Museum, No. R 2.
‡ Bull. de la Soc. Anat., 1876, page 719.

Another case of a different nature, reported by M. Le Moyne,* may possibly fall under the present category. The patient, a man aged thirty-five, died with symptoms of subacute obstruction. The autopsy revealed six intussusceptions of the small intestine. They were all small, readily reduced, and free from any structural or vascular changes. The sigmoid flexure was blocked with a mass of fæcal matter and undigested food, which formed so large a collection as to produce a tumour that was *seen* through the parietes several days before death. In this instance I would venture to suggest that the mass in the colon more probably caused the fatal obstruction than did the intussusceptions which all possessed a lumen large enough to admit the point of the little finger.

Retrograde, double, and triple intussusceptions.—These unusual forms may conveniently be considered here. It has been already said that the common or obstructive invagination is almost invariably descending as regards its direction. To this observation there are very few exceptions. Out of a collection of 593 cases Leichtenstern could find only eight examples of a primary ascending or retrograde intussusception of the obstructive (or, as he calls it, of the inflammatory) variety. He considers that these eight instances all depended upon a rare association of anomalous circumstances, and regards them all as allied to the invaginations of the death-struggle, among which retrograde forms are by no means uncommon. A case or two, however, of retrograde intussusception of the obstructive variety may be named that would appear to be of less complicated origin than Leichtenstern is disposed to admit. Such a case is reported by M. Besnier.† It concerns a female,

* Contrib. a l'Étude des Invaginations de l'Intest. grêle. Paris, 1879.

† Thèse de Paris, 1857, page 52

aged 22, who, after presenting symptoms of chronic obstruction, died after nine days of somewhat acute manifestations. The autopsy revealed a small and simple retrograde intussusception of the sigmoid flexure into the descending colon. The invaginated layers were secured in position by solid adhesions, and formed in the lumen of a gut a species of obstructive valve. The bowel above the impediment was ulcerated.

A primary descending intussusception may be associated with a secondary ascending one, the two occupying the same segment of the bowel. In such cases the retrograde invagination is external to the layers that take a descending direction. It is extremely probable that such secondary invaginations depend upon a flaccid and plaited sheath, a fold of which may slip up between itself and the intussusceptum and so produce the appearance described* (Fig. 34). It is significant that these complicated forms are usually met with in the colon. An arrangement of sheath that would favour the complication is shown in Fig. 32. A good example of the cases now under notice is reported in a recent "annotation" in the *Lancet*. The patient was a child, aged six months, who died with symptoms of intussusception occurring after an attack of diarrhœa. There was at the autopsy a double intussusception of the colon. The primary invagination was downwards and was about five inches in length. The layers composing it were adherent and deeply congested. The retrograde intussusception evidently involved the sheath after

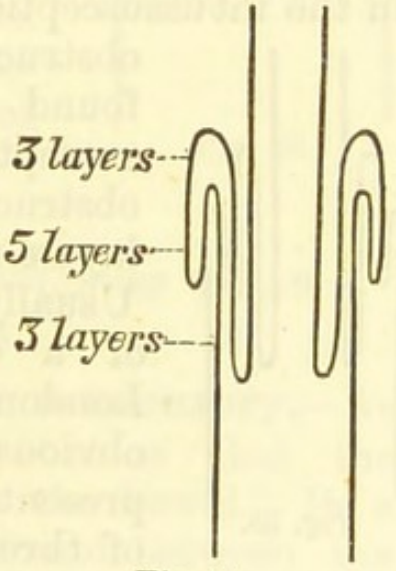


Fig. 34.

* *See* Leichtenstern loc. cit., page 612.

the manner just described. It was about half the length of the original tumour and free from all adhesions. Thus the involved segment showed from above downwards first three layers of bowel, then five layers, and again three layers (Fig. 34). I can find no recorded case that would support the statement of some to the effect that a descending and a retrograde intussusception may start from two points of the intestine, remote from one another, and then by growing ultimately meet and inter-penetrate one another.

Instances of *double* intussusceptions are fairly common. In these cases one invagination is primary the other is secondary. The primary tumour acts as a foreign body in the intestine and leads to fresh infolding of the walls of the bowel. The secondary invagination concerns only the sheath or receiving layer of the primary tumour. This variety is met with both in the colon and in the small intestine, and in the intussusceptions of the dying as well as in the obstructive forms. It is most usually found in the former species of intussusception. When met with in the obstructive invagination the secondary layers may or may not present adhesions. Usually they are free. A good example of a double intussusception is in the London Hospital Museum.* It will be obvious that such invaginations will present five layers of intestine instead of three (Fig. 35).

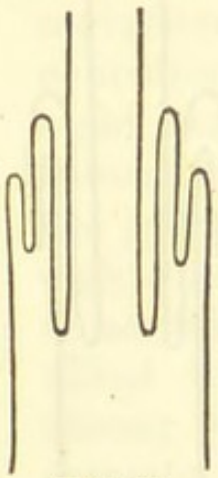


Fig. 35.

Cases of *triple* intussusception are not so common. Here also there is a primary invagination and then two secondary invaginations, the first of which involves the sheath of the primary intussusception. In these cases it will be evident that the tumour will

* Lond. Hosp. Museum, No. 25.

present no less than seven layers of intestine, as can be seen in the annexed diagram (Fig. 36). An excellent example of this variety is described with great clearness by Bucquoy.* It was met with in a male patient, aged twenty-two, who died after having presented the symptoms of chronic intussusception for about six weeks. For many months preceding the onset of the final attack he had had somewhat similar seizures, but of slighter character and of short duration. Both the terminal attack and one of the previous seizures were associated with the appearance of a very distinct abdominal tumour. The post-mortem inspection revealed a triple intussusception that involved nearly the whole of the jejunum. The tumour formed was eleven and a half inches long and six inches in circumference, and presented seven layers of intestine.

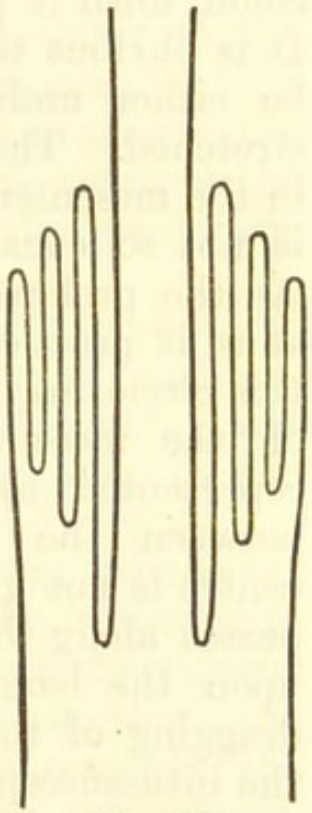


Fig. 36.

THE GENERAL PATHOLOGICAL CHANGES IN AN INTUSSUSCEPTION.

1. **The part played by the mesentery.**—As an invagination increases it is obvious that the mesentery must be drawn in with the bowel. In a tumour of any magnitude it is found between the two layers of the intussusceptum, drawn out into the form of a cone, with its apex at the extremity of the intussusception and its base at the neck. As the invagination increases the traction upon the

* Recueil des Travaux de la Soc. Méd. d'Observ., page 192. Paris, 1857.

mesentery must be great. In cases of extensive intussusception it may be well imagined that that traction is often considerable. For instance, the ileum with its mesentery may be inverted into the cæcum, and may travel along the whole length of the colon, until it presents or even protrudes at the anus. It is obvious that in such cases the mesentery must be either unduly long or must have been greatly stretched. The increased length, however, required in the mesentery to permit its appearance at the anus is not so considerable as may at first sight appear. As the prolapsed gut travels from the cæcum to the anus it practically describes a circle. The centre of this circle may be taken as the vertebral attachment of the mesentery, and the radii of the circle as represented by the mesentery itself. The distance between the involved bowel and the mesenterial centre is not greatly increased as the prolapsed part passes along the colon. Indeed, the greatest demand upon the length of the mesentery is made by the dragging of the membrane into the narrow tube of the intussusception.

The fact that an ileo-cæcal or ileo-colic intussusception may be felt in the rectum within comparatively a short time of its formation will show that the elongation of the mesentery need not be considerable, even if allowance be made for congenital superabundance.

The traction exercised by the mesentery has a considerable effect upon the tumour. It bends the intussusception so that it becomes curved in outline, the concavity of the curve being towards the mesenterial attachment. Sometimes the bending is considerable and almost angular, while a deep transverse fold forms across the concavity of the cylinder of the intussusceptum. This altered outline is communicated in a much diminished form to the

investing layer, and thus the whole tumour has a tendency to assume a curved outline. The concavity of this curve looks towards the root of the mesentery. As another result of the traction, it happens that the axes of the intussusceptum and intussuscipiens do not correspond. The former does not lie in the axis of the latter, but is placed eccentrically nearer to the mesenteric border of the bowel. It follows also that the orifice of the intussusceptum is made to assume the aspect of a slit, and looks not so much towards the lumen of the bowel below as towards the mesenteric side of the receiving layer.

The extent of these changes varies considerably. They may be entirely absent, especially, as Leichtenstern remarks, in intussusceptions of the middle part of the ileum. They are, perhaps, best seen in the invaginations of the ileo-cæcal region.

In the colon the meso-colon may play somewhat the same part as the mesentery. In colic intussusceptions, however, it is very common to find the various layers of the mass parallel to one another, the aperture in the centre and directed towards the central axis of the gut below. On the other hand, several museum specimens show that the intussusceptum may be as curved in a colic invagination as it is in any enteric form of the affection. Such a specimen is shown in Fig. 37,* where the descending colon has become invaginated into the sigmoid flexure. As an example of a straight or non-curved intussusception of the colon, I might cite a specimen in the London Hospital.†

Intussusceptions of the rectum are all more or less free from curving.‡

* St. Thomas's Hosp. Museum, No. R 12

† No. Ae. 47.

‡ As examples *see* Coll. of Surgeons Museum, Nos. 1,380 and 1,380A.

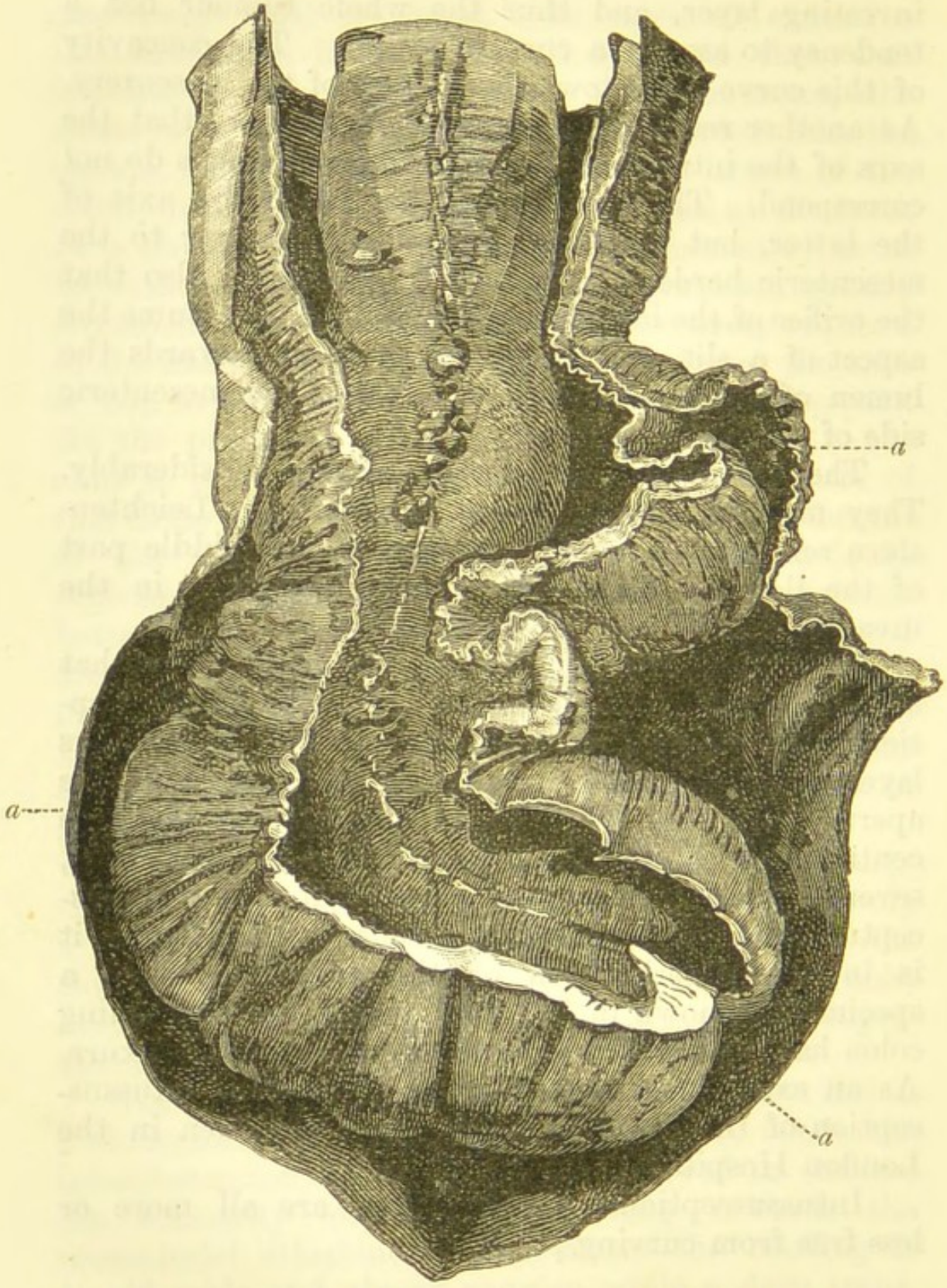


Fig. 37.—Intussusception of descending Colon into Sigmoid Flexure.

a, the sheath.

There is great thickening of the intussusceptum, especially on its convex side.

2. **How obstruction and strangulation are produced.**—Mere invagination of the bowel need not, by any means, lead of necessity either to strangulation of the involved part or to complete or even serious obstruction to the lumen of the intestine.

Many cases are recorded where the patients have lived for months, presenting evidences of the abdominal disturbance, and have died without ever displaying the symptoms of strangulation or acute obstruction of the bowel. At the autopsies made upon such patients, the intussusception that caused death has often been found to show none but the most insignificant structural changes and to be perfectly reducible. As one instance I might quote a case of Dr. Brinton's, the case of a man who died of chronic intussusception lasting over four and a half months. The post-mortem revealed an ileo-cæcal invagination quite free from any gross local changes.* There is also Mr. Hutchinson's oft-quoted case of a child, aged two, who had suffered from chronic intussusception for one month. At the end of that time Mr. Hutchinson opened the abdomen, and readily reduced the invagination he found therein. The patient recovered.† Many other examples could be given. Such cases, however, are exceptional. More usually the compression of the involved mesentery and the manner in which it is dragged upon lead to some obstruction of its vessels. The veins would be more especially involved, the return of blood from the inturned gut would be prevented, and as a result the intussusceptum would become engorged and swollen. It is to be noted that this interference with the circulation is of the very kind that tends to produce irregular movements in the intestine. The part indeed may become strangulated,

* *Lancet*, vol. i., 1863, page 409.
† Med.-Chir. Trans., vol. xxxvii., 1874.

and as a result the whole of the intussusceptum may become gangrenous. The intussusceptum is, in fact, in the position of a strangulated hernia involving a knuckle of bowel.

Speaking generally, therefore, it may be said that patients with intussusception may die of one of two principal causes. They may die of strangulation of the bowel and its results, or they may gradually waste and die, worn out by long-continued pain and sickness and other effects of narrowing of the bowel. Chronic cases very often terminate with acute strangulation.

The actual obstruction to the passage of matters along the intestine may be brought about in many ways.

(1) The orifice of the intussusceptum is rendered slit-like by the dragging of the mesentery, and may be opposed to the wall of the receiving layer.

(2) The intussusceptum may be so bent or curved upon itself as to greatly narrow the lumen of the inner cylinder. This is, to some extent, shown in Fig. 37.

(3) The considerable thickening that the tunics of the involved bowel undergo, as the results of congestion, exudation, and inflammation, tend to greatly narrow the lumen of the passage. So extreme may the narrowing from this cause alone be that it may reduce the calibre of the central canal to that of a No. 10 or No. 12 catheter.

(4) The already narrowed passage may be finally occluded by some accidental circumstance. Thus Mr. Gay mentions a case of ileo-cæcal intussusception where the valve was found to be blocked by some undigested rice.* In other instances the central canal has been plugged by blood clots.† In at least one case

* On Intestinal Obstruction by Invagination. London, 1862.

† *Lancet*, vol. ii., 1846, page 88; and Path. Soc. Trans., vol. xxviii., 1877, page 131.

the polyp that caused the intussusception finally blocked entirely its lower aperture,* and it has been said by Dr. Brinton that an obstruction may be produced by a gangrenous intussusceptum after it has separated.†

3. **How the invagination becomes irreducible.**—This is a matter of extreme importance in the prognosis. If the intussusceptum is irreducible, then cure by spontaneous reduction is impossible, as is also reduction by means of forcible enemata or by laparotomy. On the other hand, if the tunics of the mass be glued together by adhesions about the neck the parts are most favourably placed for spontaneous recovery by elimination of the gangrenous intussusceptum.

The irreducibility very commonly depends upon adhesions. Peritonitis is excited in the invaginated mass, and the serous coats of the inner and middle layer become glued together, while more extensive adhesions involving also the external coat may occur about the neck of the tumour. The situation of the adhesions varies. Sometimes they are limited to the neck of the mass, at other times to its apex, while in a third class of case they involve the whole length of the inner and middle layers. On the whole, the last named are the most common, although adhesions limited to the neck of the intussusception are probably the more usual in acute cases. Adhesions occurring only at the actual apex of the intussusceptum are certainly the least frequently met with.

In any case the false bands may vary from a few insignificant fibres to a dense membrane closely binding together the opposed layers.

In extensive invaginations it is common to find the first few inches of the intussusception fixed by

* M. Fernet; Bull. de la Soc. Anat., 1863, page 296.
† Intestinal Obstruction. London, 1868.

adhesions while the remainder is quite free. In these cases it is probable that the adherent parts represent those first invaginated, no adhesions forming between the layers subsequently prolapsed. Thus it happens that the whole intussusception can be readily reduced, with the exception of the last inch or so.

Of the circumstances that influence the formation of these adhesions little is known. Their appearance is most uncertain. They may be absent in a case that has lasted for months and present in one of but a few days' duration. Putting aside, however, exceptional cases it would appear that the element of time has the most marked effect upon this occurrence. In examples of chronic intussusception adhesions are the rule. They are present in about 80 per cent. of the cases. In acute invaginations adhesions are as often absent as present. Indeed they would appear to be *more* often absent than present, for an examination of nearly sixty recorded instances of the acute form that I have collected myself shows the presence of adhesions in about 45 per cent. only of the cases.* The earliest time for the appearance of definite adhesions is the third day. It is needless to observe that recent adhesions are very soft and yielding, so that in acute examples, although false ligaments may exist, yet they need not, in themselves, offer any serious obstacle to attempts at reduction.

Irreducibility, however, may depend upon other causes than the results of local peritonitis.

(1) The swelling of the intussusceptum may be so excessive as to entirely prevent reduction. Very often the swelling is most marked near the apex, so

* These statistics include cases of recovery without operation where the reduction of the mass was effected by artificial means. The figures are probably fallacious. Cases free from adhesions are obviously the most likely ones to yield to treatment, and thus to be placed on record. An examination of museum specimens places the number of cases where adhesions exist in a higher percentage.

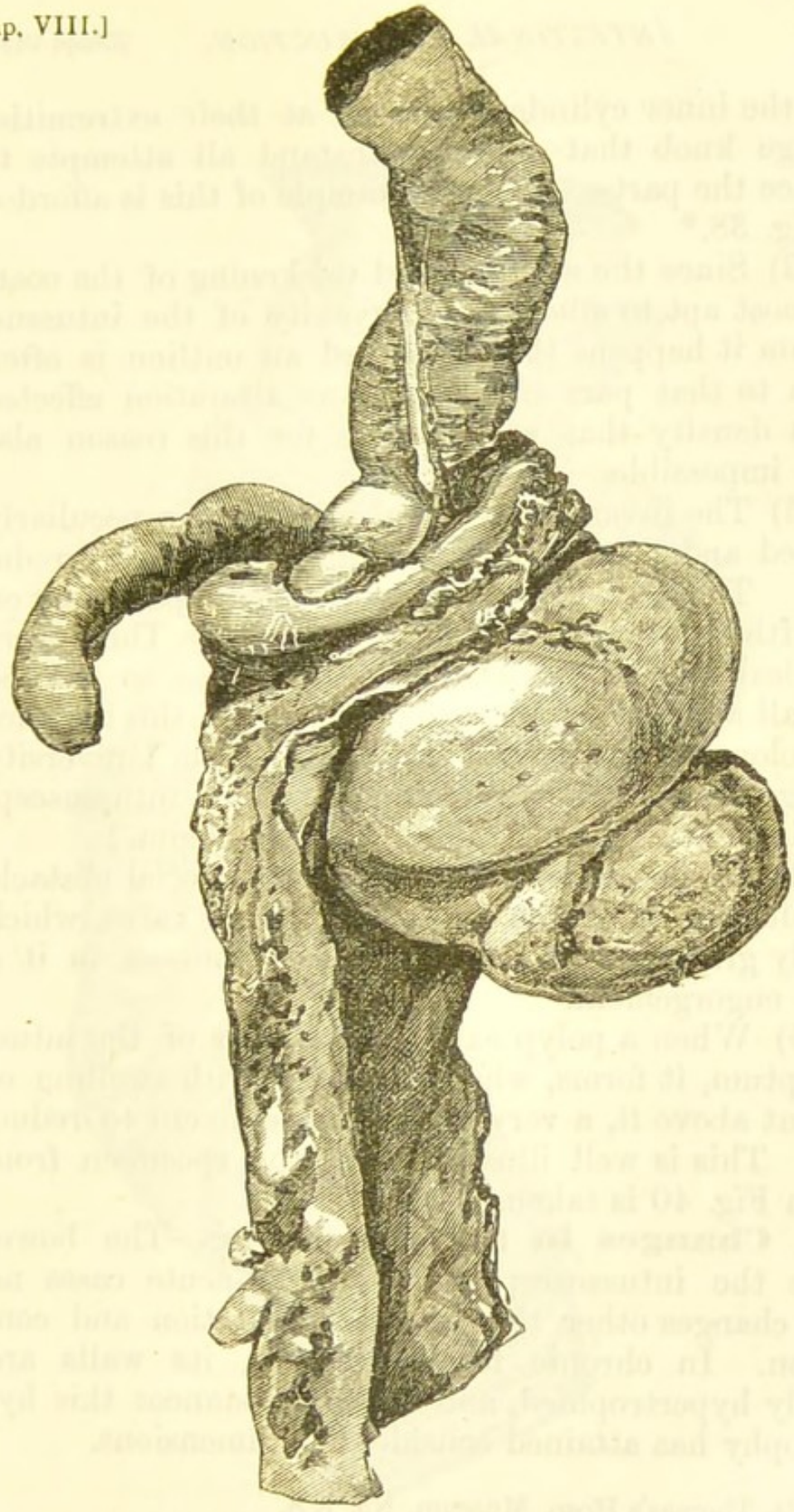


Fig. 38.—Ileo-cæcal Intussusception with great swelling of the Intussusceptum.

that the inner cylinders present at their extremities a huge knob that would withstand all attempts to replace the parts. A good example of this is afforded in Fig. 38.*

(2) Since the swelling and thickening of the coats are most apt to affect the convexity of the intussusceptum it happens that so curved an outline is often given to that part and so great an alteration effected in its density that reduction is for this reason also quite impossible. (*See* Fig. 37.)

(3) The invaginated bowel may become peculiarly twisted and may on this account be rendered irreducible. Thus Mr. Royes Bell performed laparotomy on the fifth day in a case of intussusception. There were practically no adhesions, yet the mass was so twisted that all attempts at reduction failed. In this instance the colon was involved.† In Fig. 39, from University College Museum, a specimen of a twisted intussusception is shown that only implicated the ileum.‡

(4) In ileo-colic invaginations an especial obstacle to reduction is offered by the ileo-cæcal valve, which tightly grips the prolapsed gut and induces in it a rapid engorgement.

(5) When a polyp exists at the apex of the intussusceptum, it forms, when associated with swelling of the gut above it, a very definite impediment to reduction. This is well illustrated in the specimen from which Fig. 40 is taken.§

4. **Changes in the gut above.**—The bowel above the intussusception shows in acute cases no gross changes other than those of dilatation and congestion. In chronic forms, however, its walls are usually hypertrophied, and in some instances this hypertrophy has attained considerable dimensions.

* St. Thomas's Hosp. Museum, No. R 8.
† *Lancet*, vol. i., 1876, page 12. ‡ No. 1,176.
§ Coll. of Surgeons Museum, No. 1,378.

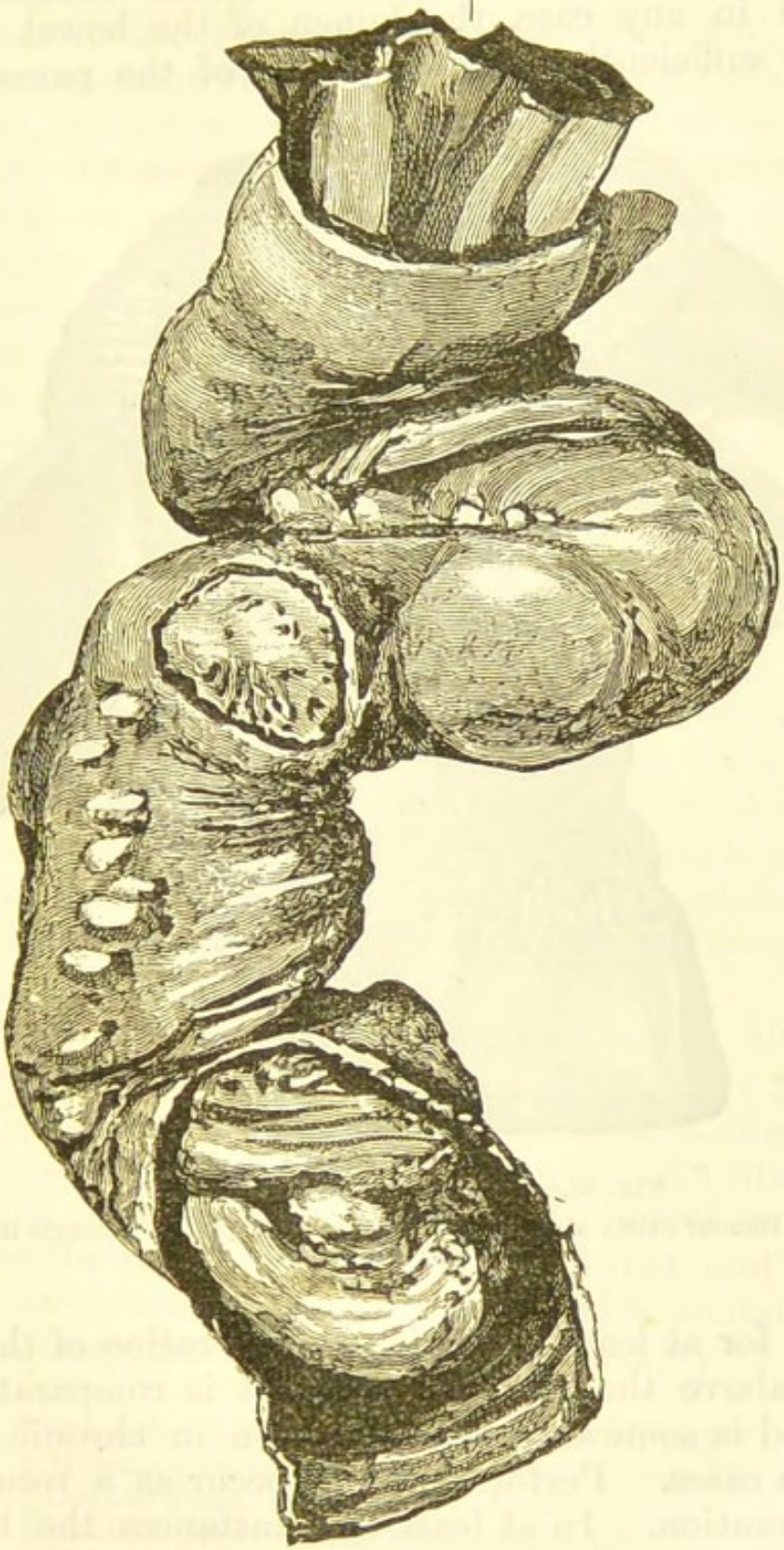


Fig. 39.—Intussusception of Ileum.
a, intussusceptum.

Great fæcal accumulation above the invagination is rare in any case, the lumen of the bowel being usually sufficiently patent to allow of the passage of

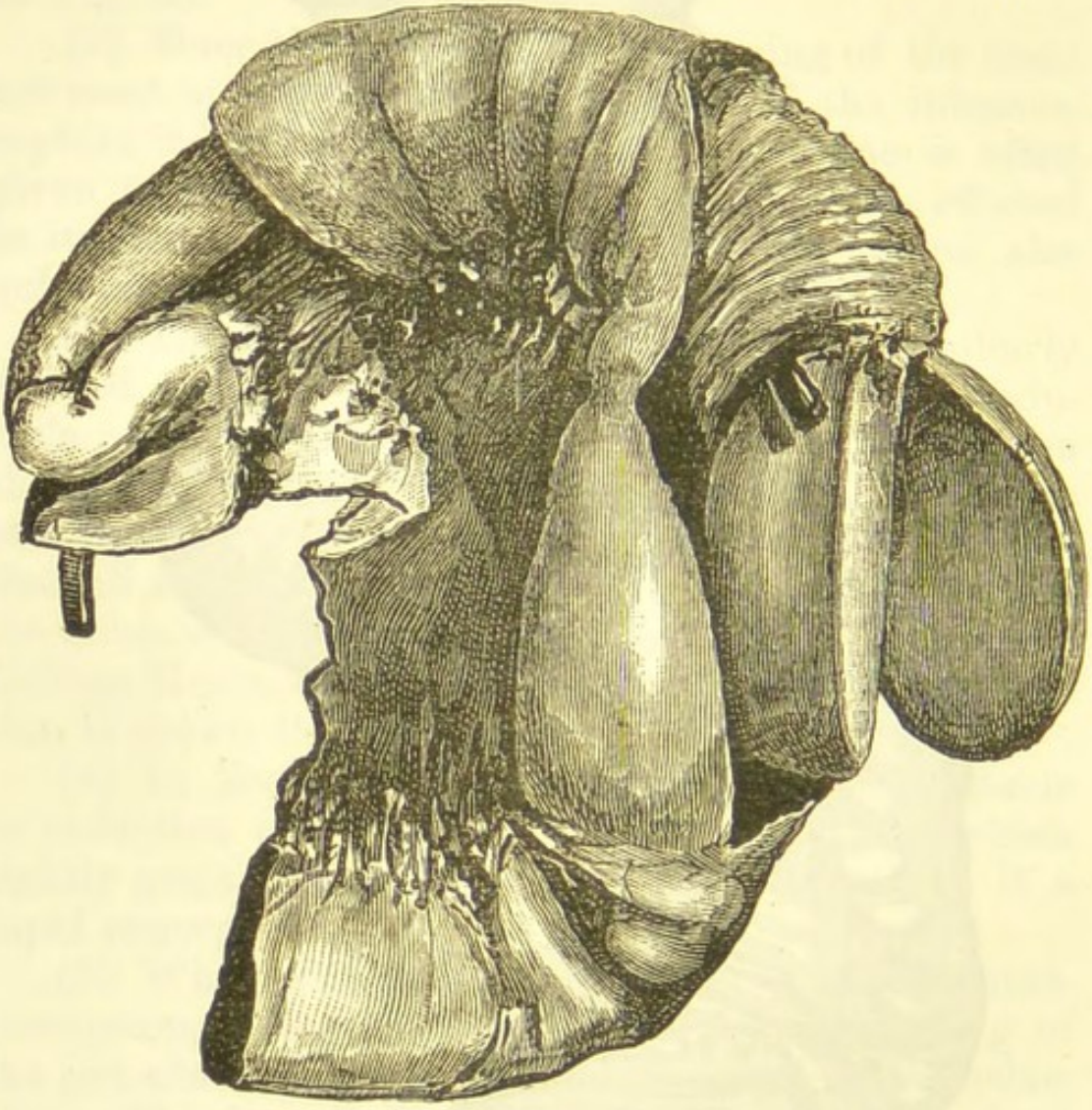


Fig. 40.—Intussusception of Ileum.

A firm oval tumour exists at the end of the intussusception. A bougie indicates the lumen of the gut.

matters for at least some time. Ulceration of the intestine above the involved segment is comparatively rare, and is somewhat more common in chronic than in acute cases. Perforation may occur as a result of this ulceration. In at least two instances the bowel above the invagination underwent spontaneous rupture. Both cases were more or less chronic. were in

males and adults. In one example* the ileum had ruptured above an ileo-cæcal invagination; in the other† the rent was found in the middle of the ascending colon, the intussusception being limited to the rectum.

5. **Changes in the intussuscipiens.**—The sheath or receiving layer seldom shows any gross changes. It may be congested, or a little thickened. It may be much wrinkled and thrown into many folds. It may be the seat of some local peritonitis. Such morbid conditions are common. Among the less frequent changes may be noted the following. The sheath may be greatly thickened.‡ In a case reported by Hauf, the thickness of the three layers of a chronic intussusception amounted to one inch.§ This layer not infrequently presents ulcerations of its mucous membrane, which are often multiple and may lead to perforation, or a part of the wall of the sheath may become gangrenous. This local gangrene is often due to the pressure of a greatly curved intussusceptum, and after it has occurred that part may protrude through the hole formed in the sheath. An excellent example of such protrusion is shown in Fig. 41.‖ (*See also* Fig. 39.)

In a case of acute intussusception of the ileum reported by Mr. Morris, there was extensive gangrene of the sheath on the sixth day with a threatening perforation in three or four places.¶ An instance of chronic intussusception had been placed on record where the sheath was entirely ruptured and divided into two distinct parts, one of which contained the intussusceptum while the other was empty.**

* Grissolle; Bull. de la Soc. Anat., 1835, page 71.
† Holmes; Path. Soc. Trans., vol. viii., page 77.
‡ London Hosp. Museum, No. Ae 45.
§ Heidelb. Med. Annal, 1842, b. 8, s. 428.
‖ Univ. Coll. Museum, No. 1,175.
¶ Path. Soc. Trans., vol. xxviii., page 131.
** *Journ. de Méd. de Sedillot.*, tome 50, 1814, page 446.

Perforations which may occur either in the sheath or in the gut above the intussusception, are a

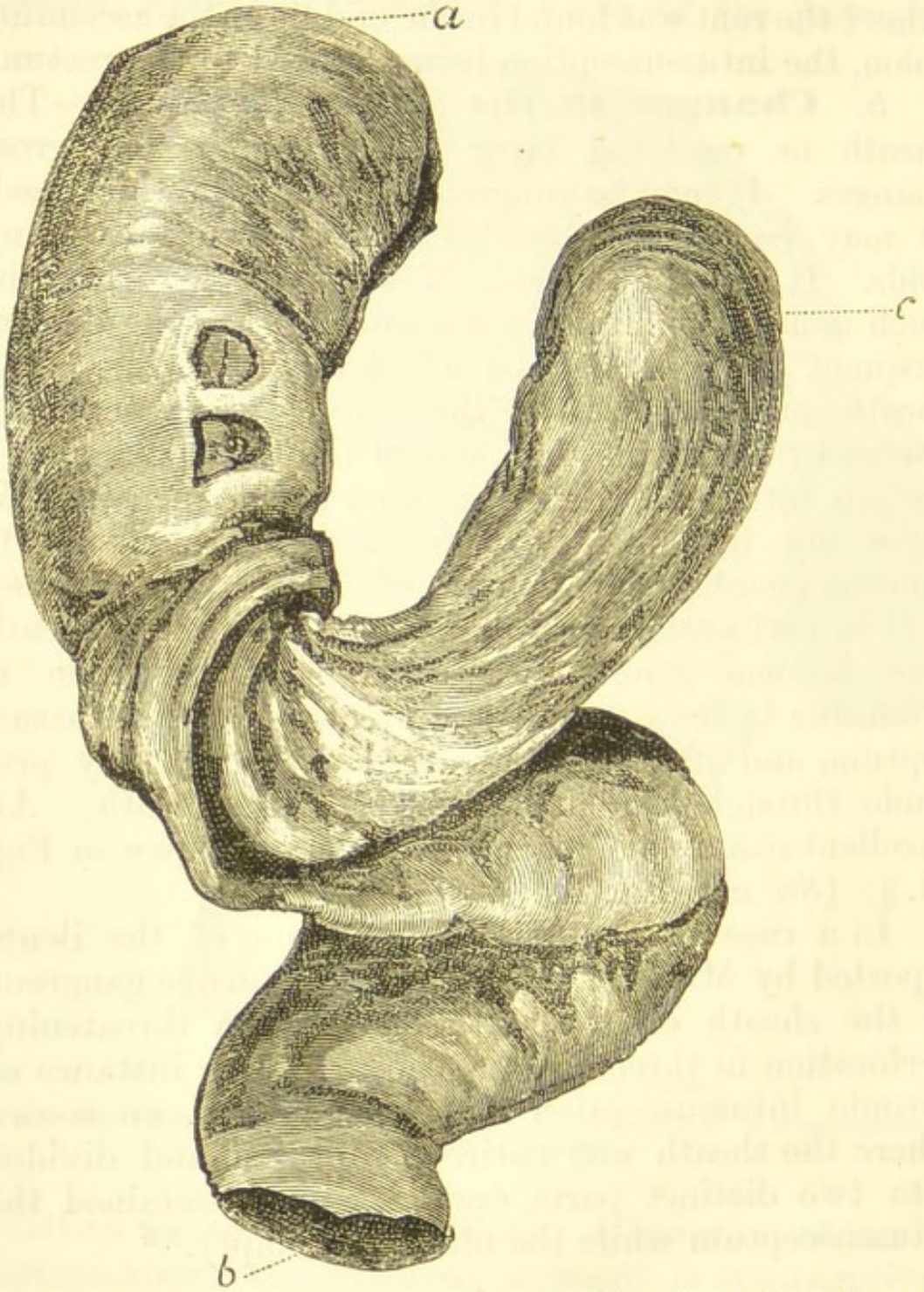


Fig. 41.—Intussusception of the Ileum. Protrusion of the Intussusceptum through an ulcerated Opening in the Sheath.

a, upper end of involved gut; *b*, lower end of involved gut; *c*, the protruding intussusceptum.

little more frequent in chronic than in acute cases. Out of fifty-five examples of chronic intussusception

collected by M. Rafinesque,* there were twelve instances of perforation. Among 175 cases, both acute and chronic, Leichtenstern found twenty-eight examples of perforation. This complication is most common in the ileo-cæcal forms and least common in the ileo-colic.

6. **Changes in the intussusceptum.**—The cylinders involved become engorged with blood, and hæmorrhages may occur in their substance or from their surfaces. It is from the latter source that is derived the bleeding that is so often a conspicuous feature in intussusceptions, especially those of an acute character. The walls may become rapidly œdematous and greatly swollen, and the condition run on readily to gangrene. In more chronic cases great thickening of the layers of the intussusceptum may be met with as a result of long-continued congestion and insidious inflammation of a low type. In both acute and chronic cases the thickening of the layers may be equally distributed throughout the involved cylinders, but far more usually it is most conspicuously marked in two places, viz. at the apex of the intussusceptum (*see* Fig. 38), and along its convexity. (*See* Fig. 37.) Swelling can most conveniently occur in these places, since these parts of the intussusceptum are the most free from pressure. Along the concavity of a much curved tumour much œdema would be impossible, the layers there being thrown into tightly compressed folds and greatly pressed upon. It must also be noted that the convexity of the involved bowel is the part most remote from the entrance of the intestinal vessels, and is thus the more likely to first show evidences of vascular disturbance. For identical reasons, early engorgement may be expected at the apex of the mass when constriction at the neck is prominently marked. The swelling and thickening

* Thèse, Paris, 1878.

about the apex lead to the knob-like tumour that offers so great an obstacle to reduction. It is also the soft swelling at the extreme end of the intussusceptum that gives to that part the appearance and the response to the touch of the os uteri with which it has been so many times compared. In both acute and in chronic cases the middle cylinder suffers more and shows more advanced changes than does the inner cylinder. Thus, when there is much thickening of the intussusceptum, it, as a rule, mostly concerns the middle layer. The thickness of this layer may be considerable. In one case, recorded by Mr. Sidney Jones, the width of the wall of the middle cylinder varied from one-third to one half of an inch.* The intussusceptum had existed for nine weeks. The inner cylinder or entering layer is often greatly contracted, a circumstance that may be met with in both acute and chronic cases. Thus in one acute case this cylinder was found to be no larger than the iliac artery. The invagination involved the ileum and occurred in a patient thirteen years of age.†

One of the most important and most constant changes in the intussusceptum is gangrene. This condition is met with in both acute and chronic cases, although it is always more common, and usually more extensive in the former. It may involve the whole mass of the intussusceptum, which may separate at the neck and be discharged from the bowel. This occurs, as a rule, in acute invaginations, although it is sometimes met with in chronic cases that end acutely. The gangrenous part that is eliminated may vary in length from a few inches to several feet. Cruveilhier has recorded an instance where three metres of bowel were discharged by this process. The gangrene usually appears first and remains most

* Path. Soc. Trans., vol. viii., page 179.
† Ibid., vol. xxviii., page 131.

advanced in the middle layer. Thus it happens that when the separation of the intussusceptum occurs the middle cylinder may be disintegrated and in some parts missing, while the entering layer, although dead, may still be sufficiently well preserved to show the structure of the bowel. Sometimes the anatomical details of the part are singularly well preserved in the separated intestine. An example of this is afforded by a specimen in Guy's Hospital * showing the cæcum and the whole of the ascending colon, which were passed on the eleventh day, the patient recovering. Sometimes, however, the inner cylinder is more extensively involved in the gangrenous process than is the middle layer. This condition is usually met with in ileo-cæcal invaginations, where the part of the intussusceptum formed by the small intestine may perish before that segment formed by the large. The matter of an interval of time between the separation of the inner and middle layers may affect the condition of the gut as it appears when discharged from the anus. This can, however, only concern intussuscepta that are free from adhesions. Suppose that in the invagination (Fig. 42, *a*) separation takes place along the transverse line *b*, and that the two cylinders are adherent, it is obviously a matter of indifference, as regards the appearance of the discharged mass, which layer separates first. The cylinder that first comes away will have to wait, as it were, for its fellow, and they will then be discharged together, retaining the mutual relations that existed between them before gangrene set in. Suppose, however, that no adhesions exist, and that the middle cylinder separates first, as is most usual (Fig. 42, *b*), the separated layer may immediately unfold itself, and when the inner cylinder is set free the dead gut will be discharged as one continuous tube, with its

* No. 1,875.

serous covering external and its lumen lined by mucous membrane.

If, however, the inner layer is set free before its fellow (Fig. 42, *c*), it may become unfolded, and when the separation is complete the gangrenous bowel will be passed as a continuous tube, but with its mucous layer external and with its lumen lined with the serous coat. In such cases (and many examples have been reported) the gut is said to have been passed "turned inside out." Authors who describe these cases are apparently under the impression that the process of "turning inside out" is effected in the dead gut as it passes along the intestine. This, however, is not only difficult to understand, but is supported, so far as I can ascertain, by no evidence of any kind. I have already said that cases marked by more advanced gangrene of the entering layer belong to the ileo-cæcal type of invagination, and it is only among examples of this type that I have been able to find instances of gangrenous intestine passed with its walls turned inside out.*

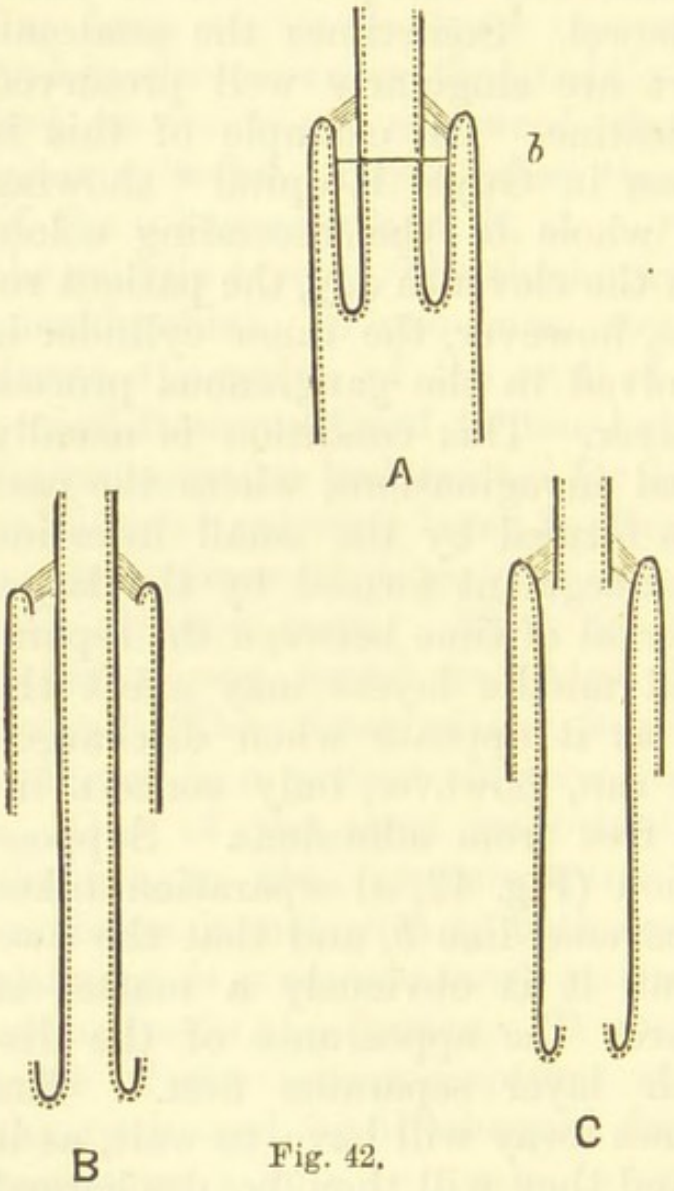


Fig. 42.

* A good example of this apparently inverted bowel is given

In some instances one of the cylinders alone may be separated as a definite tube, the other coming away in the form of gangrenous shreds.

In another set of cases, which as a rule belong to the chronic form of the malady, the gangrene commences at the apex of the intussusceptum. It may remain limited to this part, producing but limited destruction. This is illustrated by a case recorded by Rafinesque where the ileo-cæcal valve that formed the point of the intussusceptum was the only part destroyed. More usually, however, it spreads, and the invaginated mass perishes slowly, and is eliminated in shreds and putrid fragments which may pass unrecognised. In one case of chronic invagination where the parts were becoming gangrenous, the inner and middle layers presented a rent which permitted the intestinal contents to pass between the intussusceptum and the intussuscipiens.*

In the least marked form of the destructive process the mucous membrane is alone involved. This membrane may be gangrenous in part or be ulcerated, the morbid changes in any case being as a rule limited to, or most marked at, the apex. Such mild forms are much more common in chronic than in acute cases.

Speaking generally, then, it may be said that in acute invaginations gangrene is more common and extensive, that it involves principally the neck of the mass, and is associated with an elimination of the cylinders more or less in their entirety. In the chronic forms the gangrene is less rapid, is most marked at the apex, and leads usually to a slowly progressing destruction whereby the intussusceptum is eliminated in fragments.

by Dr. Fagge in his monograph in the Guy's Hospital Reports. Dr. Fagge thinks that the process of "turning inside out" goes on during the expulsion of the gangrenous and inert mass.

* Lhonneur and Vulpian. Bull. de la Soc. Anat., 1855, page 100.

Among less common and less important changes in the intussusceptum the following may be mentioned. The inner and middle layers may alter their mutual positions after the invagination has formed. This, I think, is demonstrated by those cases where a polyp is associated with the intussusception, but where it is found some way up upon the returning layer instead of at the apex of the tumour.

The mucous membrane may be densely pigmented in some chronic cases as a result of long abiding congestion.*

Rafinesque has collected one or two cases of chronic intussusception where soft and scanty adhesions existed between the mucous surfaces of the sheath and of the returning layer.

Lastly may be noticed the remarkable association of *epithelioma* with chronic intussusception. In several recorded cases, and in some museum specimens, I find that an epitheliomatous growth has been found upon the apex of the intussusceptum. Whether this growth preceded or followed the invagination is of little moment. It is very certain, however, that the neoplasm may grow after the intussusception has formed. The remarkable and, I think, unique specimen from which Fig 43 † has been taken shows the internal layer of an ileo-cæcal invagination enormously thickened by a peculiar deposit. This deposit on examination proved to be composed of the tissue of a cylindrical epithelioma. The specimen was obtained from the body of a man, aged 56, who had presented symptoms of chronic intussusception for about twelve months before his death. He was under the care of Mr. Christopher Heath, who relieved the patient for a little while by establishing an artificial anus.‡ The

* As an example, *see Lancet*, vol. v., 1863, page 409.

† University College Museum, No. 5,592.

‡ An account of the case will be found in the Registrar's Reports of University Coll. Hosp. for 1881, page 27, case No. 84.

lumen of invaginated ileum is greatly reduced in size. The neoplasm has invaded mainly the convex surface of the intussusceptum, involving, however, both surfaces at the apex of the protrusion.

The growth along the convexity of the intussusceptum has been evidently influenced by the lesser degree of pressure exercised upon that part of the mass. It is not improbable that in this case the cylindroma commenced at the ileo-cæcal valve, and, acting as a foreign substance, produced the invagination, and then continued to develop in the direction offering the least resistance.



Fig. 43.—Chronic Intussusception with Epithelioma of the middle Layer.

A bougie occupies the lumen of the intestine.

There has recently been added to the Museum of the Royal College of Surgeons a specimen which very closely resembles the one just described.* It shows an intussusception, the middle layer of which has undergone an extreme degree of thickening. This thickening involves the apex of the intussusceptum and, to a much greater extent, the convexity of it. On section the mass has an appearance almost identical with that presented by Mr. Heath's specimen, and indeed the resemblance between these two specimens is singularly striking. Comparing it with Mr. Heath's case one would not have hesitated to declare it also an example of epithelioma, but Dr. Goodhart, by whom the specimen was presented to the College, assures me that a microscopic examination of the thickened gut wall revealed merely the results of chronic inflammation.

Another specimen in the College of Surgeons Museum † shows an epitheliomous growth attacking the apex of an intussusception of the rectum. The patient from whom the specimen was obtained had presented symptoms for nine months.

CHAPTER IX.

THE ETIOLOGY OF INTUSSUSCEPTION.

1. **The immediate cause.**—Many theories have been advanced to explain the invagination of one portion of the intestine into another. Some of these have not withstood the test of time, while others are too vague and too indefinitely expressed to be susceptible of criticism. With such theories

* No. 2,699A. † No. 1,380.

and with the verbose discussions to which they have given rise I propose to have no concern; but will consider merely the one explanation that, I venture to think, has in it the greatest element of truth.

There is practically unanswerable evidence to show that intussusception is brought about by irregular action in the muscular wall of the intestine.

The precise nature of that irregularity may be a matter open to some question. So far as the facts at present at our disposal would show, it would appear that an intussusception occurs either at a point where the gut is the seat of a limited and severe muscular contraction, or at a point where a paralysed segment joins a part still capable of vigorous contraction. Thus had arisen the division of intussusceptions into two forms, the invaginatio spasmodica and the invaginatio paralytica.

The chief data in connection with this subject have been furnished by the elaborate vivisection experiments of Nothnagel,* of which some account may now be given. The intestines of a rabbit having been exposed with suitable precautions, a segment of the bowel is stimulated by means of a faradaic current applied through electrodes placed so close together that a perfectly circumscribed ring-like contraction is produced. On increasing the current a contraction follows which extends for a considerable distance upwards, *i.e.* towards the stomach, but only for a very slight extent downwards. The gut at the point of stimulation is by this time converted into a perfectly pale hard cord from contraction of the circular muscle. Proceeding upwards, the contracted segment is found to pass either gradually into the normal intestine or to end quite abruptly. In the latter instance a minute intussusception forms. The

* Beiträge zur Physiologie and Pathologie des Darmes, page 42. Berlin, 1884.

wide tube of the normal gut above slides a little over the contracted part below. Thus is formed a retrograde intussusception. Such invaginations, however, are always very small, show no tendency to increase and are indeed of only momentary duration. Proceeding downwards from the point of stimulation a very different condition is met with. A proper descending invagination is found to be forming. On closely examining its mode of development, these points are to be noticed. The spot at which the electrodes are applied forms practically a fixed point. The normal gut immediately below the contracted part turns itself upwards to a slight extent over this strongly contracted and greatly narrowed portion. A minute invagination is thus produced, which increases solely at the expense of the intussuscipiens. This mode of development is clearly demonstrated by the following experiment. In Fig. 44 the condition of the gut at the time of the experiment is shown. *c* is the upper end (*i.e.* towards the stomach), *d* is the lower end, and *e* is the contracted segment. At one spot *a* on the bowel a fine blue thread was drawn through the serous coat and then cut short. At another point *b* lower down a red thread was in like manner introduced. The electrodes were applied at the point *a*, represented by the blue thread. An ascending contraction *e* of the bowel followed, while below the point of stimulation an invagination formed. During the development of this intussusception the electrodes remained unmoved at *a*, and the blue thread kept always at the

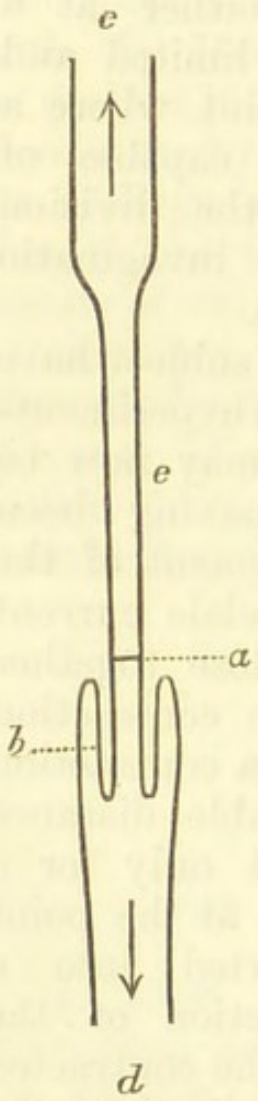


Fig. 44.

upper retiring angle or neck of the invagination. The red thread, however, moved gradually upwards until it reached the upper retiring angle, when it disappeared. After a while, when the intussusception was cut open, the red thread was found about the middle of the middle layer.

The invaginations so produced existed for a certain length of time, and then disappeared as the gut became restored to its normal condition.

Nothnagel found that stimulation of the bowel above the intussusception had no effect in promoting its unfolding, while stimulation of the intussuscipiens merely caused the invagination to become all the more rigid. Stimulation, however, of the gut below the involution caused an ascending contraction, by means of which the intussusception was at once relieved.

Thus, in one case where an invagination of the colon had been artificially produced, it was made to disappear by an antiperistalsis induced by an enema of a solution of common salt.

The experiments described so far refer to invaginatio spasmodica. Nothnagel's investigation of the invaginatio paralytica give the following results.

A segment of bowel from three to six inches in length was entirely paralysed by crushing. When stimulation was applied above the paralysed part nothing followed save the usual ascending contraction. When, however, the electrodes were applied to the gut immediately below the inert segment a typical descending intussusception developed. This invagination grew solely at the expense of the normal bowel. The paralysed part was not concerned in it, the electrodes remaining quite unmoved at the original place of application, just as occurred in the previous experiment at the mark of the blue thread.

These researches serve to demonstrate, so far as

they go, the existence of both a spasmodic and a paralytic form of intussusception. Nothnagel considers that the former variety is infinitely more common than the latter, and the evidence afforded by clinical observation would support his opinion.

The distinction between these two forms is not of material importance. The simple fact remains that intussusception depends upon irregular action in the muscular wall of the intestine.

The experiments detailed should serve to correct the common impressions that exist as to the production of invagination, and that are expounded in the chief text-books. There is no driving of a contracted segment of gut into the non-contracted part below by the "propulsive action of the intestine." Peristalsis in the bowel above the contracted portion appears to have no influence in the formation of the intussusception; and it is a question rather of one piece of gut being *drawn over* another than of one part being thrust into the subjacent segment. It is important also to note that the whole length of the contracted segment is not used in the invagination as is, I believe, very usually supposed.

I do not think that sufficient importance has been attached to the action of the longitudinal layer of muscle in producing intussusception, although Nothnagel makes some mention of the probable part it plays.

If the arrangement of parts be considered in that area of the bowel where a vigorously contracted segment joins a non-contracted portion, the condition of the muscle of the intestine will be as follows: The action of the circular layer must cease abruptly at the line where the contracted and non-contracted parts meet, since the fibres of this layer are placed at right angles to the long axis of the gut. The action of the longitudinal fibres must extend, however, beyond the

line of meeting. If they be considered to act from the contracted segment as from a fixed point, it is evident that they will tend to draw the wide non-contracted segment over the narrow and contracted piece. In this way, by the drawing of one part of the intestinal tube over another part, the intussusception is formed, and this mode of formation applies as well to the retrograde as to the descending invaginations.

When once the invagination has taken place it is probable that the intussusceptum acts the part of a foreign body in the intestine, stimulates the intussuscipiens to contract and so force along the inturned cylinder.

Many clinical facts support the association of intussusception with disordered intestinal movements. Conspicuous are the attacks of colic, which are so early and so marked a sign of the condition; the frequent association of the intussusception with states attended, or apt to be attended, by disturbed peristaltic movements, such as diarrhœa, intestinal polypi, the presence of masses of undigested food in the bowel, and the like.*

Intussusceptions have been met with in cases where a cause of grave intestinal disturbance already existed. Thus Mr. Joseph Bell reports a case of strangulation by band, for the relief of which he performed laparotomy. On opening the abdomen he discovered an invagination of the bowel, four inches in length, which was readily reduced.† The occurrence of intussusception after injury to the abdomen may depend upon some local disturbance in the activity of the intestine resulting from the lesion. In some few instances intussusceptions have occurred

* Griesenger has shown that in dysentery a paralysis of a section of the intestine is not uncommon.

† *Edinb. Med. Journ.*, 1882, page 53.

after typhoid fever, after cholera, after severe muco-enteritis, and after the reduction of strangulated hernia, all being conditions under which disordered intestinal action may be expected.

It may be noted also that invaginations are most common in the young, in whom nerve processes are active, and in whom the tissues are susceptible of ready change and capable of being readily disturbed.

The "invaginations of the dying," moreover, are most apt to occur in those who have died of some grave nerve lesion, such as meningitis, and in whom it may not be unreasonable to expect a disturbance of so important a part of the nervous system as that supplying the intestines.

And here, by-the-by, I might venture to suggest that slight invaginations having a more or less momentary existence are probably much more common in the human subject than is supposed. It seems to me that there is good reason for believing that some attacks of colic, especially such as follow upon the ingestion of unassimilable food, may have for their anatomical basis a series of temporary invaginations of the bowel.

The resemblance between these colicky attacks and an attack of intussusception appears to be often peculiarly complete, and the divergence between the two sets of cases to depend simply upon the element of duration or persistence. In both there is the same kind of pain, the same disposition to vomit, the same form of constitutional depression, and often the common symptom of marked tenesmus. When the invagination becomes strangulated the resemblance of course ceases. It is difficult to avoid the belief that many, perhaps most, of the cases of protracted "spasms" met with in delicate women, and in persons liable to digestive disturbances, are due to definite intussusceptions, which in time reduce themselves instead of

passing on to strangulation. The sudden onset of these attacks, their equally sudden cessation, and the manner in which they yield to opiates, appear to strongly support this belief.

The peculiarly frequent occurrence of invaginations in the ileo-cæcal region requires some slight explanation. This frequency may depend to some extent upon the difference in size between the ileum and the colon, and the ease with which the former could be prolapsed into the capacious cæcum. Facilities for invagination, moreover, are offered by the fixed position of the cæcum as compared with the mobility of the lower ileum, and by the circumstance that at the valve of Bauhin an active segment of the bowel meets a comparatively inert portion.

Leichtenstern and others, however, have pointed out the great influence that the sphincter-like valve may have in producing invaginations when their formation is associated with tenesmus. They have compared the ileo-cæcal orifice to the anus, and the intussusceptions of this region to prolapse of the rectum. The matter cannot be better expressed than in Leichtenstern's own words. "If we consider that the ileo-cæcal opening is distinguished by a sphincter, the contraction of which can increase to powerful tenesmus, we recognise that there is a complete analogy between the conditions of invagination in the region of the cæcum and the different kinds of prolapse of the rectum, which, like ileo-cæcal invaginations, is found most frequently in early childhood. Just as anal tenesmus, excited by any cause whatever (rectal blennorrhœa, profuse diarrhœa), usually excites and accompanies prolapse of the rectum, so is ileo-cæcal tenesmus, excited by catarrh or abnormal irritability of the terminal portion of the ileum, of great importance in the production of many ileo-cæcal and ileo-colic invaginations. In many cases in which we

see invaginations in the region of the cæcum follow prolonged diarrhœa or colic, the taking of unsuitable food, or, especially in early infancy, the withdrawal of the mother's milk and the substitution of improper food, cæcal tenesmus plays an important part. If the cæcum and the colon are rendered easily movable by their mesentery, as is regularly the case during early life, the repeated and more forcible peristaltic pressure towards the persistently contracted ileo-cæcal sphincter causes ileo-cæcal invagination. If the cæcum be firmly fastened down, so that it cannot be turned in and invaginated into the colon, prolapse of the ileum into the colon takes place, with formation of an ileo-colic invagination, just as prolapse of the rectum may follow violent anal tenesmus. If neither of these happens, invagination of the lowest part of the ileum may occur, as is the case also in the rectum when it becomes invaginated in itself above an obstinately contracted (tenesmus) sphincter, and is finally prolapsed. If ileo-cæcal invaginations are very common in children, and ileum invaginations, on the contrary, very rare, the reason lies in the greater mobility of the cæcum and ascending colon allowed by their mesentery, and the consequent removal of an obstacle to invagination. In adults this element is not removed, and we find ileum invaginations as frequent as ileo-cæcal." *

2. **The remote or exciting cause.**—A great deal has been written upon the question of the exciting causes of intussusception, and stress laid upon the circumstance that with a more perfect knowledge of these causes a more definite form of prophylactic treatment may be attempted. Precise knowledge upon this point is still, however, wanting. From an examination of a number of reported cases, and from certain statistics bearing upon the matter of etiology, it

* Loc. cit . Ziemssen's Cyclopædia, vol. vii., page 617.

is probable that in 100 examples of intussusception the exciting causes would be distributed as follows :

1. No evident exciting cause	62 per cent.
2. Diarrhœa, dysentery, enteritis, marked irregularity of the bowels . .	8 ,,
3. Polypi	5 ,,
4. Ingesta	5 ,,
5. Injuries and exposure to cold . . .	5 ,,
6. Certain acute and chronic ailments which may or may not have had a concern in the etiology, such as typhoid fever, whooping cough, measles, scarlet fever, small-pox, cholera, and hernia; with these may be included pregnancy and labour	15 ,,
Total	100

Some more detailed notice may be taken of the circumstances to be considered under these six headings.

1. It would appear that in more than half of the cases that have been recorded no cause could be found for the invagination. It is probable that this percentage is too high, since in many of the cases coming under this heading the evidence is negative, the patient's previous condition not having been detailed. Leichtenstern, however, out of a total of 593 cases found no less than 111 in which it was distinctly stated that the trouble appeared abruptly in patients enjoying at the time perfect health.

In reading through a collection of well recorded cases one cannot but be struck with the great frequency with which invaginations have appeared in persons of delicate health. Many are simply described as delicate, others as wasted, several have been anæmic, and not a few have been the subject of heart disease or of chronic pulmonary mischief.*

* For marked examples *see* Path. Soc. Trans., vol. xxiv., page 108 (anæmia). Ibid., vol. xxxii., page 82 (heart disease), and Bull. de la Soc. Anat., 1867, page 136 (chronic phthisis).

Although the matter cannot be expressed numerically, it would certainly appear that intussusception is more common in the delicate than in those possessing vigorous health.

2. Probably the cases coming under this heading are represented, on the other hand, by too low a figure. The association of intussusception with diarrhœa is marked, although in some instances I think the purging has been rather a symptom of the disease than a cause of it. Possibly in many cases of chronic diarrhœa in children, where the purging suddenly ceases some little while before death, and where the mothers are apt to say that "the child was purged until there was nothing more to pass," there may be an intussusception present to account for the altered circumstances of the case.

Intussusceptions presumably due to diarrhœa are most commonly met with in children, and are most often of the colic or ileo-cæcal varieties.* In one or two cases an intussusception has appeared after the administration of powerful aperients.

3. An example of the association of an intussusception with polyp is shown in Fig. 40.† The polyp is usually found attached to the apex of the intussusceptum, although in rare cases it may be found about its middle, owing probably to a shifting of the entering and returning layers. In some examples the association is no doubt accidental, as was probably the case in a specimen described by Sir Prescott Hewett, where a pedunculated polyp, the size of a pear, was attached to the intussuscipiens just below the invagination.‡ The polypi in these cases

* For marked examples, *see Lancet*, vol. i., 1876, page 12. Path. Soc. Trans., vol. viii., page 177. St. Bart.'s Hosp. Reports, 1876, page 95.

† *See also* specimens in Lond. Hosp. Museum, No. Ae 45, and Coll. of Surgeons Museum, No. 1,380 a.

‡ Path. Soc. Trans., vol. i., page 95.

vary in size from a hazel nut to an egg or a pear. As a rule, however, they are quite small. They are oval, usually pedunculated and nearly always attached to the convex wall of the intestine. In two-thirds of the cases they are found attached to the lower ileum, and thus they most frequently lead to enteric, or to ileo-cæcal, or ileo-colic invaginations. They have produced intussusceptions in the jejunum, the duodenum,* the colon and the rectum. They more usually produce acute than chronic forms of the malady. As a rule, only one polyp is found associated with the invagination. Dr. Fuller, however, records, a case where thirty of such tumours were found, with the largest of which an intussusception was involved.† In one remarkable instance three polypi at some distance apart caused three separate intussusceptions in the same patient. The three tumours formed were visible during life.‡

4. The severe colic often produced during the passage of undigested food through the intestine would suggest that masses of such matters may not infrequently cause invagination. A good example of this association is shown in a specimen in University College Museum.§ The specimen is from the small intestine of an animal, and it will be seen that the invagination has formed itself about a large piece of undigested tendon. In a case recorded by M. Le Moyne, it is supposed that a mass of partly digested beans found at the autopsy in the sigmoid flexure had, during its passage through the intestine, produced no less than six invaginations, which were found after death.‖ In a patient of M. Dubois',¶ the symptoms appeared soon

* Bull. de la Soc. Anat., 1864, page 37.
† Path. Soc. Trans., vol. xxi., page 188.
‡ Bull. de la Soc. Anat., 1870, page 260.
§ No. 1,170.
‖ Contrib. a l'Étude des Invaginations. Paris, 1879. Thèse.
¶ *Gaz. des Hôp.*, 1863, page 298.

after swallowing a number of cherry stones. In a case by Mr. Gay,* a mass of rice was found in the intussusceptum, and other instances of this association of undigested food masses with invagination have been given with equal clearness.

5. The relation between injuries and invaginations is, it must be confessed, not very clear. The intestinal trouble has appeared after blows upon the abdomen, after a patient has been ridden over, and after severe compression of the belly. Three or four examples have been given where the symptoms of invagination developed suddenly while the child was being "jumped" in some one's arms.† Leichtenstern has collected six cases where the symptoms appeared after exposure to cold. In a solitary instance the evidences of invagination came on shortly after drinking much cold water while sweating. In the *Lancet* for 1867 is recorded the case of a child, aged five, who died in four days from the effects of a burn. For the last forty-eight hours of its life there had been feculent vomiting. The autopsy revealed three invaginations; two were recent, but the third had evidently existed for some little time.‡

6. Under this heading it is impossible to assign any definite position in the etiology of intussusception to the various maladies that are mentioned. Not infrequently the association has probably been purely casual.

In other instances the debility produced by the previous ailment has probably been an influential factor in the causation of the disorder in the bowels. In those examples, however, where invaginations have followed upon cholera and hernia, it may be allowed

* Monograph, loc. cit.

† Rilliet et Barthez; Traité clinique et prat. des Mal. des Enfants, 1861, tome i., page 806 (two cases). *Lancet*, vol. i., 1877, page 273.

‡ Dr. Heckford; *Lancet*, vol. i., 1867, page 362.

that a morbid state of the bowel has been induced that could readily lead to intussusception.

Among the rarer causes, real or apparent, of invaginations, may be mentioned stricture of the ileo-cæcal valve, growths or vegetations attached to the valve,* and cancerous affections of the intestine.† One of the most remarkable cases of invagination is illustrated by a specimen in Guy's Hospital Museum that is probably unique. It shows a small and short Meckel's diverticulum springing from the lower ileum. This diverticle had become inverted so as to project into the lumen of the intestine, and when in that position had led to the formation of an intussusception.‡

CHAPTER X.

THE SYMPTOMS OF INTUSSUSCEPTION.

FOLLOWING the excellent classification of Rafinesque, intussusception, when regarded from a clinical standpoint, may be divided into four forms. 1. The ultra-acute, when the patient dies within the first twenty-four hours. 2. The acute, when the duration of the disease extends between two to seven days. 3. The subacute, when it extends between seven and thirty days. 4. The chronic, when the malady lasts beyond the period of one month. No definite line, of course, can be drawn to separate these various forms from one another. The division is arbitrary, but from a purely clinical point of view the arrangement is convenient.

* Dance; Arch. Gén. de Méd., 1832, xxviii., page 177.

† *See* specimen No. 1,380 in Coll. of Surgeons Museum, showing an invagination of the rectum depending upon an epithelioma.

‡ Guy's Hosp. Museum, No. 1,819[5].

It will be well to consider in the first place some circumstances, such as those of sex, age, etc., that are *common* to all forms of invagination; and then to review the symptoms as they concern, first acute and subacute cases, and secondly as they concern the chronic forms.

The chief clinical features of intussusception will be considered when dealing with cases belonging to the former category.

Frequency.—In his statistics of 1,152 cases of intestinal obstruction of all kinds (excluding herniæ and affections of the rectum), Leichtenstern places 442 cases of intussusception. Thus invaginations form about 30 per cent. or a little less than one-third of all species of obstruction of the bowels.

From an examination of sundry tables of mortality, and from my own collection of recorded cases, I think that among 100 examples of intussusception the chief clinical varieties may be divided as follows: acute, 50 per cent., subacute 32 per cent., and chronic 18 per cent.

Sex.—Intussusception is more common in males than in females. Of Leichtenstern's 442 cases, 285 occurred in males and 157 in females. Mr. Gay, however, dealing with 1,289 cases obtained from the Registrar General's Reports for five years, finds the proportion to be 678 males to 611 females, or about 1·11 to 1. The age of the patient, however, has certainly a conspicuous influence upon this proportion. The younger the individual the more marked is the preponderance of the male sex. Thus, in twenty-five cases in children, collected by Rilliet, twenty-two were in male subjects and three only in females. Mr. Gay's statistics, however, are probably more reliable. He shows that in children under one year old the proportion of males to females is as 163 to 93. As age advances the disproportion becomes gradually less

marked, until between the ages of twenty-five and thirty-five the number of cases met with in the two sexes is about equal. After thirty-five there appears to be a preponderance on the side of the females, the proportion between the ages of thirty-five and forty-five being, according to Mr. Gay, as 74 females to 55 males.

This matter appears to be somewhat influenced also by the chronicity of the case. Thus, out of fifty-one cases of chronic invagination collected by Rafinesque, thirty-eight were males and thirteen females.

Age.—Intussusception occurs so frequently in children that it forms the most common variety of obstruction to which they are liable. More than 50 per cent. of the cases are met with during the first ten years of life, and about 25 per cent. during the first year of existence. Taking the mean of the somewhat voluminous tables that have been published upon this subject, I think that the following percentage will fairly represent the frequency of the disease during the various decades of life :

Before the age of 11 years	53 per cent.	
Between 11 and 20 years	12	,,
,, 21 and 40 years	20	,,
,, 41 and 60 years	11	,,
Beyond 60 years	4	,, or probably less.*

Taking the percentages of a large number of chronic cases only the following results are obtained :

Before the age of 11 years	25 per cent.
Between 11 and 20 years	10 ,,
,, 21 and 40 years	50 ,,
,, 41 and 60 years	11 ,,
Beyond 60 years	4 ,,

* Mr. Gay's tables show a much larger percentage of cases in patients over sixty years of age, but his results differ so widely from those published by others that I fancy some error must have crept in.

A comparison made between these two tables shows in a striking manner the influence of age upon the chronicity of the case. It seems to show the great frequency of the acuter forms during the first ten years of life, and of the chronic forms during the period of active adult age.

Previous history.—In the previous history of cases of intussusception there is little to note that is of clinical or diagnostic interest. Indeed, the only circumstances to be considered in such a history are those that have been already described as concerned in the etiology of the disease. Several cases have been reported in which there is little doubt but that the patients had had previous attacks of intussusception from which they recovered more or less readily, Such a case was that of a child, aged fifteen months. who was suffering from an intussusception that protruded at the anus. Since its birth the child had been liable to attacks of "colic," during which a mass would appear in the epigastric region and subside as the pain passed off.* In a very similar case, in the person of a girl aged nineteen, who died of acute intussusception, there was a history of attacks of colicky pain which probably depended upon invaginations that after a while reduced themselves.

The mode of onset is usually sudden. In acute and subacute cases a sudden mode of onset is to be noticed in about 75 per cent. of the examples.

In chronic cases the sudden appearance of symptoms is noted in about 30 to 40 per cent. of the recorded instances. The mode of onset is somewhat influenced by the nature of the invagination. In ileo-colic intussusceptions the commencement is nearly always sudden, while in the colic and rectal varieties it is more frequently gradual. The symptoms may appear (as already noted when

* *New York Med. Journ.*, July, 1877.

speaking of the etiology of the disease) during perfect health. They may come on abruptly during exercise or while at rest, and even during sleep.* Several cases in infants displayed their first evidences while the child was being suckled. As a rule, in both the acute and the chronic cases, the first symptom is pain, a symptom the characters of which are described below. Vomiting is not usually among the initial symptoms.

Among the rarer commencing symptoms the following may be noted. The first evidence of the invagination may be simply tenesmus without abdominal pain ;† or tenesmus with much straining at stool. In one case of gradual origin the malady was ushered in with slight colicky pains, with much tenesmus and with dysuria.‡ In at least one instance the first definite signs of intussusception were afforded by an escape of blood from the anus, and shortly after by the projection of the invaginated gut through the sphincter. §

It by no means follows that cases marked by violent and abrupt symptoms at the commencement necessarily take an acute course. They frequently do ; although, on the other hand, many chronic cases have begun with very urgent manifestations. As one instance of the latter association I might quote a case by Hauf || where the first symptoms were those of pain so violent as to cause the patient to roll upon the ground. The subsequent course, however, of the disease was lingering.

Before commencing a notice of the separate symptoms a superficial comparison may be made

* Path. Soc. Trans., vol. xi., page 109 ; Mr. Nunneley.

† Mr. Pitts ; St. Thomas's Hosp. Reports, 1882, page 75.

‡ Ohle. Mag. für die gesam. Heilk. Rust., 1817, bd. ii., s. 253.

§ Mr. H. Marsh ; St. Bart.'s Hosp. Reports, 1876, page 95.

|| Heidelb. Med. Anal., 1842, bd. 8, s. 428.

between the acute and the chronic cases. In the acute form of the disease, the symptoms depend mainly upon strangulation of the invaginated bowel and actual obstruction of its lumen. They are marked by paroxysmal pain, by tenesmus, by the passage of bloody mucus, if not by diarrhœa, and by the presence of a tumour. In chronic intussusception a patient may die from one of two conditions. He may succumb, emaciated and worn out by the frequent pain or vomiting and the gross interference with the functions of the intestine; or after exhibiting for some time the evidences of chronic invagination, he may die of an acute attack supervening upon the chronic. In the lingering form the symptoms are usually very ambiguous, and an aspect may be assumed by the case that may be lacking in all the most distinctive signs of invagination.

THE ACUTE AND SUBACUTE FORMS.

Pain.—Pain, as already stated, is usually the first symptom of intussusception. It is also one of the most constant and conspicuous. Sometimes the initial attack of pain reaches at once the maximum of that felt, and after its subsidence the suffering becomes moderate. Usually, however, the pain inincreases gradually in severity up to a certain point, and then begins to subside. During the time that the invagination is increasing and while the process of strangulation is active the pain may be acute, but when the parts have become well fixed by adhesions, or more especially when gangrene has set in, it commonly becomes greatly modified in its character. This tendency of the pain to become less at a certain stage in the case is a conspicuous feature in intussusception. The pain in any given case may commence gradually in the form of trifling attacks of colic appearing at long intervals or coming on only

after defæcation, or a violent initial attack may be preceded for a while by a definite but trifling sense of discomfort in the abdomen. The form of invagination that is most usually associated with intense pain at the onset is the ileo-colic.

The pain is colicky, and its great feature is its occurrence in paroxysms. Intermittent pain, as has been already stated, nearly always indicates an incomplete obstruction in the intestine and in intussusception, therefore, it may be expected to be well marked. The pain may at first occur at long intervals, during which the patient is free from suffering. As the case advances the intervals become shorter and shorter. In the acuter forms the intervals are not marked. The patient very often is never free from pain; but here, although the pain is continuous, it is broken in upon by definite exacerbations. The intervals between the attacks are sometimes very precise, the paroxysms appearing every twenty or thirty minutes, and having a more or less exact duration. In any case, as the intussusceptum becomes congested, its neck more and more strangulated, and its lumen narrowed, the pain becomes more continuous although it is still associated with exacerbations. When the paroxysms are marked they usually appear suddenly and subside suddenly, although to this circumstance there are many exceptions.

The pain in intussusception depends upon violent and irregular peristaltic movement. It is more severe, as a rule, in cases involving the small than in those involving the large intestine. Some of the most severe instances of pain have been in the ileo-colic varieties and in invaginations high up in the small intestine where the muscular coat is well developed. It has been said that the intervals between the paroxysms are shorter when the small gut is involved, as compared with the colon. This is

often true, but the fact depends rather upon the greater degree of occlusion met with in the lesser bowel than upon the anatomical position of the lesion. Everything depends upon the state of the intussusception itself. A small invagination in the colon may cause early and intense pain, while on the other hand an ileo-cæcal invagination may actually project at the anus before much pain has been produced.

I cannot endorse the statement that the more empty the bowel the less the pain. Were this the fact the least painful cases would be those that have followed upon diarrhœa. The reverse, rather, is what is usually met with. It is well known that when a patient has a sore throat it is more painful to swallow a teaspoonful of water than a large bolus of soft food like arrowroot. The large mass demands but little contraction of the fauces to pass it along. In one well-marked case of invagination the symptoms came on after diarrhœa. The gut in this instance may be considered to have been empty ; a purge was given and pain of the severest character followed.

In a few cases the pain has been described as agonising, but as a rule it is much less severe than in other forms of acute intestinal obstruction. In position it is at first very ill defined, but as the invagination advances, and especially as a definite tumour develops, the pain becomes more or less distinctly localised about the seat of the lesion. At first the abdominal parietes are not tender on pressure, and are flaccid, or, at least, not in a state of tension. It often happens, indeed, that pressure over the more painful part relieves the patient's suffering, just as cramp in other parts, such as in the calf, may often be relieved by pressure. Muscles, however, that have been long in a state of cramp become tender, and so in intussusception the abdomen in time usually becomes somewhat tender on pressure, especially about

the site of the invagination. This is partly the result of continued irregular muscular action, but is perhaps in a greater extent due to the engorgement of the invaginated parts and the development of some local peritonitis. A well localised tenderness is, in the absence of a definite tumour, a valuable guide to the position of an intussusception. Sometimes the pain has been relieved when the patient has assumed a peculiar posture. The longer the case lasts the greater is the tendency for both the pain and the tenderness to become diffused, presuming that they have been previously more localised.

Vomiting is, in intussusception, by no means so conspicuous a symptom as it is in other forms of acute intestinal obstruction, such as in strangulation by bands. It does not appear so early; it seldom becomes excessive or very distressing; it is less often stercoraceous, and is apt to fluctuate considerably.

Vomiting is more constant and severe in acute cases than it is in chronic. In about three-fourths of the acuter cases it appears with the earliest symptoms, coming on either with the pain or a little while after it. In the remaining cases it appears later, and on an average about the third day. Its onset may be much delayed, as in a case where laparotomy was performed on the eighteenth day, and where vomiting did not appear until the fifteenth day. In chronic forms the delay may be still greater, and vomiting may not set in until a few days or hours before death. In about 8 per cent. of the acute and subacute cases vomiting does not appear to have occurred at all during the course of the malady.

There is often great irregularity in the appearance and character of the sickness. Indeed, as a rule in intussusception this symptom is marked by considerable fluctuations. I might take the following as a fairly marked instance: In a case of ileo-colic

invagination, fatal on the fourteenth day, vomiting appeared early with the initial pain. It persisted for five days. During the sixth day the patient did not vomit at all; on the seventh day the sickness returned in a more severe form than ever. On the eighth it was again much better; while on the ninth it became feculent.* In many cases the vomiting, after having been severe, has been absent for several days together. In several examples of the acute form of the malady that I have collected the patient was only sick once, while in other instances the vomiting appeared at long and irregular intervals. The attacks of vomiting often coincide with attacks of pain. In one case of acute invagination where the sickness had ceased, the symptom was caused to reappear by introducing the finger into the rectum.†

The examination of a number of recorded cases shows that the vomiting is least severe and least constant in those cases that are associated throughout with diarrhœa. It is also very often slight in degree in those instances of the malady that are attended by distinctly paroxysmal pain. In other words, the sickness is least troublesome when the lumen of the bowel is still patent. Most of the worst instances have been in cases marked by early and persistent constipation, excluding from that term the passage of blood and mucus unmixed with fæces. In any case the sudden cessation of diarrhœa is usually attended by an increase in the vomiting.

In many instances the vomiting gives much temporary relief. This is especially the case when it appears at long intervals. This feature is more marked in the vomiting of intussusception than in any other form of obstruction.

The vomited matter is usually alimentary or

* Bull. de la Soc. Anat., 1867, page 136; M. Naudier.
† *Lancet*, vol. i., 1877, page 273; Mr. Ransford.

bilious. Feculent vomiting is not met with in more than 25 per cent. of all cases of acute or subacute intussusception. In chronic cases it occurs only in about 7 per cent. In the acuter cases stercoraceous vomiting is in nearly every instance associated with constipation, or at least with the passage of no fæcal matter in the discharge from the anus. It is met with most frequently in invaginations about the ileo-cæcal region, and then in those involving the lower extremity of the small intestine. It appears, on an average, on the fourth or fifth day. It often, however, does not appear for a week or a fortnight, or not until near the termination of the case, when the progress of the malady is distinctly subacute. In two or three instances blood has appeared in the vomited matter. This symptom is usually met with in children and in enteric intussusceptions.

On the whole, it may be said that vomiting is most marked in the enteric and ileo-colic invaginations, less marked in the ileo-cæcal forms, and least conspicuous in the colic and rectal varieties.

The state of the bowels in intussusception presents some very distinct characters. As a result of the violent peristaltic action excited by the invagination, diarrhœa is a very common condition; and as a consequence of the great engorgement of the intussusceptum it happens that the motions passed are usually stained with blood. When the lumen of the bowel becomes so occluded that no more fæcal matter passes, the evacuations may consist simply of bloody mucus.

Constipation, as indicated by the passage of *no* fæcal matter, is not common in intussusception. In the majority of the acute and subacute cases there is some diarrhœa at first and then absolute constipation towards the termination of the case. The occurrence of more or less constipation as a marked feature during the *progress* of the malady does not pertain to

more than 30 per cent. of the cases. Sometimes diarrhœa continues throughout the whole course of the case, being, as a rule, more marked at the commencement than the end. At the same time it may be noticed that a severer diarrhœa, or a diarrhœa after constipation, may precede, attend, or follow the elimination of a gangrenous intussusceptum. Sometimes a loose state of the bowels alternates with some constipation, but this condition is more usual in the chronic forms of the malady. The diarrhœa may be severe; and from ten to twenty evacuations may pass in the twenty-four hours.

The occurrence of blood in the stools is a striking feature. As a rule, the more acute the case and the more violent the strangulation, the more conspicuous is the hæmorrhage. In acute cases this symptom is present in about 80 per cent. of the examples. It is met with less frequently in those following a subacute course, and is found in no more than 50 per cent. of the chronic cases. It is perhaps more marked in children than in adults. It is most constant in the ileo-colic varieties, then in the ileo-cæcal, next in the colic, and is probably least constant in enteric invaginations. The amount of blood is usually not excessive. The hæmorrhage may, however, be so profuse as to be the principal cause of death.* As already observed, the clots of blood may block up the lumen of the intussusceptum and may even plug the bowel below the seat of the invagination. In any case the symptom is usually more marked at the commencement of the attack than during its later progress. Bleeding may, however, attend the evacuation of the intussusceptum.

Tenesmus is a striking symptom. It is more commonly met with in acute and subacute than in

* Le Moyne, loc. cit., page 23. *Med. Times and Gazette*, vol. ii., 1865, page 195. *Amer. Journ. Med. Sciences*, vol. xii., page 372.

chronic cases. Indeed, other things being equal, the more chronic the case the less frequent is the appearance of the symptom. I find that in acute and sub acute forms tenesmus occurs in about 55 per cent. of the examples. Rafinesque finds an account of the occurrence of this symptom in only 13 per cent. of distinctly chronic cases. The mean, therefore, for all forms of invagination would be about 24 per cent. Leichtenstern in his able monograph gives this mean as 17·6 per cent., but I cannot help thinking that this percentage is much too low. It must be remembered that in many accounts of invagination reported from a pathological point of view the symptoms are often imperfectly given; and many of such cases can hardly but be included among Leichtenstern's statistics. The frequency and severity of the tenesmus depend mainly upon the nearness of the intussusception to the anus. The symptom therefore is very usual in rectal and colic invaginations, is common in the more extensive ileo-cæcal varieties, and is least often met with in the pure enteric forms. Leichtenstern finds 94 cases marked by tenesmus to be thus divided: enteric form 4, ileo-cæcal forms 75, colic forms 15. The proper value of these figures can be appreciated by reference to the table showing the *relative* frequency of the various varieties (page 171).

Tenesmus is usually an early symptom of intussusception, and is indeed often among its first manifestations. It may be so constant and so severe as to cause intense distress, as in a case reported by Dr. Ballard.* When the invagination occupies the rectum or sigmoid flexure the tenesmus may be followed by paralysis of the sphincter ani whereby a patulous condition of the anus is produced. A good example of this complication has been placed upon

* Path. Soc. Trans., vol. xviii., 1867, page 92.

record by Mr. Holmes. It occurred in a man aged forty, who had a rectal invagination. The sphincter became so relaxed that several fingers could be introduced into the anus.*

General symptoms.—Of the general constitutional condition of the patients suffering from acute and subacute intussusception little need be said. The condition is nearly the same, although differing a little in degree, as that met with and described in connection with strangulation by bands.

Collapse is usually much less marked, because on the whole the progress of the case is less acute and the pain less severe than in obstruction by bands. In some ultra-acute cases collapse may appear early and lead on to death. This is especially the case with acute invaginations in young infants. Leichtenstern has only been able to collect five instances of death during the first twenty-four hours, and of these cases no less than four were in infants not over one year old.

As regards the temperature it will be below normal in cases associated with shock. In the majority of the cases, and especially in such as are subacute, it is normal or a little above normal. It is important to recognise the fact that there may be a rise of temperature in intussusception apart from any evidences of local peritonitis. As a good illustration of this may be cited a case recorded by Dr. Eastes. It concerned a little girl aged eleven. On the seventh and eighth day of the symptoms the temperature reached 101·3. On the evening of the eighth day the invagination was reduced by means of forced enemata. On the ninth day the temperature was 97·6. The child made a good recovery.

Thirst is by no means so frequently complained of in invagination cases as it is in examples of

* Path. Soc. Trans., vol. viii., page 177.

strangulation by bands. This circumstance depends mainly upon the less copious character of the vomiting. When the vomiting is very profuse in intussusception much thirst may be complained of. The symptom, however, in a marked form is quite rare.

The quantity of urine passed may be diminished, for the same reasons that obtain in other forms of acute obstruction of the bowels. The symptom is rarely present, and is seldom, if ever, so marked as in examples of strangulation by band. It is limited to the more distinctly acute instances of the malady when it does occur.

I can only find two instances of intussusception where stranguary was complained of, and no case associated with the appearance of cramps in the limbs.

In the subacute cases the patients become thin and anæmic and often much wasted. A condition readily induced by the continued digestive disturbance, the frequent attacks of vomiting and pain, the loss of appetite, and the broken rest.

THE STATE OF THE ABDOMEN.

Tension of the abdominal walls is not met with in intussusception, or at least not in the earlier stages. It appears when local or general peritonitis develops, and may be present during the attacks of pain, especially when they have existed for some time and are attended by tenderness on pressure.

Meteorism is also rare in these cases. In a marked form it is seldom, if ever, met with. It depends undoubtedly upon the condition of the bowels. It is found in instances where constipation exists and where the lumen of the intestine is practically occluded. It is thus most commonly met with towards the end of the attack. When diarrhœa exists, not only is no meteorism present, but the abdomen is often, on the contrary, distinctly sunken in. On the

cessation of the diarrhœa, the symptom may develop. It is usually quite moderate in degree. It is needless to say that it appears to a greater or less extent wher peritonitis sets in.

The "**signe de Dance**" is of little or no value. It is said to be met with in cases where the cæcum has become invaginated, as in the ileo-cæcal forms of the disease, and consists in a depression about the right flank or right iliac fossa. It is supposed to indicate the displacement of the caput coli. One would expect this symptom to be more marked in chronic cases, yet out of fifty-three examples of this form collected by Rafinesque the "signe de Dance" was only noted in two instances.

A tumour.—The presence of a tumour formed by the invaginated mass, and to be felt either through the abdominal parietes or rectum is of great diagnostic value in cases of intussusception. It is to be discovered in a little less than 50 per cent. of all cases, and would appear to be not more frequently felt in the chronic than in acute forms. Thus Leichtenstern, taking all varieties of intussusception, found that it was met with 222 times in a total of 433 cases. Rafinesque, dealing only with chronic cases, found 24 examples of the occurrence of a tumour in 53 recorded instances.

The tumour is more commonly met with in some anatomical forms of invagination than in others. It is most frequently associated with the ileo-cæcal and colic varieties, least frequently with the enteric and ileo-colic. The relative frequency in the different varieties may be expressed as follows: In the ileo-cæcal form it occurs in 61 per cent. of the cases; in the colic in 52 per cent.; in the enteric in 24 per cent., and in the ileo-colic in 23 per cent.

It is usually more distinct in children than in adults. The tumour varies in size. It may be as

small as a hen's egg, or it may attain the thickness of the adult fore-arm. It is cylindrical, and is very commonly described as sausage-shaped. It often shows the distinct curve of the intussusception. As regards length, it is usually short and very rarely exceeds six inches. This limitation in length does not necessarily correspond to the length of the invagination mass. It depends rather upon its position. The tumour is not evident when it occupies the hepatic or splenic flexures of the colon, and thus the portion that can be detected cannot well exceed the length of the transverse or descending colon, or of part of the right limb of the large bowel.

It has assumed the appearance of a double tumour, one part having been felt in the transverse and the other in the descending colon, the intermediate portion in the splenic flexure not being evident. In the ileo-cæcal variety the tumour will be more distinct the nearer the mass is to the rectum. While in the cæcum and lower ascending colon the tumour must necessarily be small. The rarity of a tumour in the ileo-colic variety is explained by the small size of those invaginations when simple, and by the fact that the intussusceptum is composed of small intestine enclosed in large.

It thus happens that the tumour is most often met with over the descending colon, and next in frequency over the transverse colon. Enteric invaginations usually form a tumour in the cæcal region, the lower ileum being the part most often involved.

The tumour varies in distinctness, and it is seldom that all parts of it can be equally made out. It usually appears fixed. It may often, however, especially in chronic cases, be observed to change its position, to now advance along the colon in the direction of the anus, and now to return by the inverse direction. It can often be made to move

under the use of enemata, the mass being forced back towards the cæcum. This can only occur in invaginations that involve the colon. The progress of the invagination from the cæcum to the rectum can often be distinctly watched. A tumour that remains long stationary in the cæcal region probably depends upon an ileo-colic invagination.

In consistence it feels hard and resisting. Its density may vary greatly. During attacks of pain it may be large, prominent, and hard. During the intervals it often becomes less distinct and softer. When first noticed it frequently happens that it is only present while painful peristaltic movements are going on, being quite absent when the patient is free from pain. When it has existed for some time it is generally tender; but in earlier periods any pain that may be felt in it is often relieved by pressure. In any doubtful case an examination of the abdomen should be made under chloroform.

M. Homolle reports a case where three invaginations existed in the small intestine, which gave rise to three separate tumours.*

The importance of the abdominal tumour in the diagnosis of the affection, and in attempts to estimate the condition of the involved segment, is considerable.

In no case should a tumour be pronounced as absent until the abdomen has been examined during a paroxysm of pain. When present, the exact site of the swelling should be noted, its size, its outline, and its mobility.

It is especially to be observed whether the mass increases in size during attacks of pain, whether it changes its position during attacks of pain, and whether it is tender on pressure.

The following table from Leichtenstern's monograph will show the relation between the tumour and

* Bull. de la Soc. Anat., 1870, page 260.

the different forms of intussusception, together with the comparative frequency of the mass in different situations.

Seat of Tumour.	Seat of Intussusception.					
	Ileo-cæcal.	Colic.	Enteric.	Ileo-colic.	Unknown.	Total.
Cæcal region	9	0	9	4	5	27
Region of ascending colon	1	2	1	0	3	7
Transverse colon	12	2	4	0	1	19
Region of descending colon	12	4	2	1	1	20
Region of sigmoid flexure	25	10	3	2	12	52
Tumour in the rectum	10	10	0	1	10	31
Tumour projecting from anus	20	12	0	1	8	41
Tumour in hypogastrium	0	0	3	0	0	3
Moving of tumour from ascending to transverse colon	1	0	0	0	0	1
Moving of tumour from transverse colon to sigmoid flexure	8	0	0	0	0	8
Moving of tumour from cæcum to sigmoid flexure	2	0	0	0	0	2
Site of tumour unknown	0	1	4	0	4	9
Total	100	41	26	9	44	220

Tumour in the rectum.—It will be seen from the above table that in thirty-one instances the tumour was felt in the rectum, while in forty-one it projected from the anus. This condition is, as may be surmised, almost limited to the colic and ileo-cæcal invaginations. It appears much more frequently in children than in adults. In children, moreover, the tumour reaches the rectum much more quickly, owing to the greater mobility of a child's colon. In such patients it has reached the rectal region by the second day of the attack, and may be, as already stated, one of the early evidences of the invagination. As a rule,

the tumour appears much later, on an average (in acute and subacute cases) on the seventh day. In chronic forms the average date for the appearance of the mass in the rectum is the fifteenth day. It has, however, appeared as late as the third and fourth months, and in one case as late as the seventh month of the duration of the symptoms. The protrusion is usually small (being about three inches in length), and conical in shape. It may attain greater length (I have seen one eight inches long), and cases are reported where ten and twelve inches of bowel have projected from the anus. The protruding mass is usually deeply congested and much altered in structure. It may be gangrenous. The intussusception has, however, been successfully reduced by enemata, insufflation, or laparotomy, even when it has protruded for some time at the anus.* The projecting tumour may present at its apex the ileo-cæcal valve, and near its extremity the orifice of the appendix. When examined by the finger introduced into the rectum, the tumour, before it has prolapsed, presents tolerably characteristic features to the touch. Its swollen extremity with its narrowed lumen has been many times compared to the os uteri, and the comparison is a very suitable one.

The tumour when in the rectum, or when protruding beyond it, has been on several occasions the cause of an error in diagnosis. It has been mistaken for prolapse, for rectal polyp, and for piles. Unfortunately the error has extended from the diagnosis to the treatment, and the mass has been incised or cauterised and even cut off. There are some remarkable cases of recovery after these operations.

* The best case is the well known one of Mr. Hutchinson's. Here the symptoms had lasted one month and the prolapse had existed for fifteen days. The bowel was reduced after laparotomy, and the child recovered. Med.-Chir. Trans., vol. lvii., page 31.

In one the patient was a man aged sixty, and the tumour, prolapsed beyond the sphincter, was taken for a polyp or a cancerous growth. It was removed en masse by the galvanic wire and found to be a piece of greatly hypertrophied ileum with the ileo-cæcal valve. The patient recovered, and was relieved of a constipation from which he had long suffered.* In another case, in the person of a child aged fifteen months, four inches of intussuscepted bowel were cut away at the anus without any evil following.† In a third instance the tumour was considered to be "hæmorrhoidal," and was incised to the extent of one inch, laparotomy was then performed, the intussusception reduced, and the wound in the colon stitched up. The patient died.‡

On the other hand, in cases of intestinal obstruction tumours have been found in the rectum that have been mistaken for invaginated masses. Thus, in a case reported by Dr. Platt, a child aged nine had symptoms of obstruction associated with some of the signs of intussusception. High up in the rectum a defined soft and elastic swelling could be felt which had an orifice like the os uteri. In a few days it was found to be a little lower down. The child died. The autopsy revealed a stricture of the small intestine but no invagination. The tumour was a remarkable false diverticulum in the rectal wall, into the orifice of which the finger had been passed.§ In another case, in a boy aged thirteen, there was an intussusception of the ileum. Laparotomy was performed with a fatal result. During life there was felt in the rectum "a soft velvety but resisting body with a small central depression, suggestive of the os uteri. Around this, and

* *Boston Med. Journ.*, July 6, 1876.
† *New York Med. Journ.*, July, 1877.
‡ Mag. für gesam. Heilk. Rust., s. 253. Berlin, 1817.
§ *Lancet*, vol. i., 1873, page 42.

between it and the rectum wall, the finger could be swept freely, and the injection tube, when guided by the finger, could be passed upwards for a few inches." The autopsy revealed an invagination in the ileum nine inches from the cæcum, while the rectal tumour was simply a mass of firm blood-clot.*

I can only find two cases among the acute or subacute forms of intussusception where coils of intestine were visible through the abdominal parietes. One instance occurred in Mr. Morris' patient, to whose case allusion has just been made. The feature was noticed on the sixth day of the attack, the patient dying on the eighth. The other instance concerned a case of ileo-colic invagination in a girl aged seventeen.† The symptom appears to have been first noticed on the eleventh day, death taking place on the fourteenth. It is worthy of note that this patient was emaciated by chronic phthisis at the time of the attack.

THE CHRONIC FORMS

By an arbitrary division those cases of intussusception are considered to be chronic that have lasted for more than one month.

Details as to frequency of occurrence, sex, age, and mode of onset have already been given; and in the account of the acute forms a general notice has been taken of the symptoms of invagination.

It remains only now to enter into certain special points.

The anatomical form of intussusception that is most often met with in chronic cases is the ileo-cæcal. It forms more than one-half of all the examples. The enteric form is the variety that is the least often chronic. The relative proportion is thus given by

* Path. Soc. Trans., vol. xxviii., page 131; Mr. Henry Morris.
† Bull. de la Soc. Anat., 1867, page 136.

Rafinesque; his conclusions being based upon a collection of fifty-five distinctly chronic cases.*

Ileo-cæcal	60 per cent.
Colic	15 „
Enteric	15 „
Ileo-colic	10 „
	100

To appreciate the full value of this table it should be compared with that on page 171, which deals with intussusceptions of all kinds both acute and chronic.

The **clinical features** of chronic intussusception are often, and indeed usually, very ambiguous. No form of intestinal obstruction presents so many confusing elements in the diagnosis; no form has led to more conspicuous errors in the right appreciation of the nature of the malady.

Out of the fifty-five cases collected by Rafinesque many were never suspected to be examples of intussusception, and no less than twenty-seven were the subjects of an absolutely incorrect diagnosis. Chronic intussusception has been mistaken for fæcal accumulation, for rectal polyp, for cancer of the bowel, for ulcer of the stomach, for dyspepsia, for chronic dysentery, for gastro-enteritis, for chronic peritonitis, and for other ailments equally remote from the nature of the actual disease.

The **course** of the malady may extend over many months, and may be protracted even for a year. In one instance there are good reasons for believing that the intussusception had existed for more than a year. Pohl has recently reported a case of intussusception in

*In the following account of chronic invagination in its clinical aspect I have made free use of the remarkable monograph of Rafinesque, a monograph so elaborate and exhaustive that it leaves little ground untouched and available for subsequent writers.

a young man, which he affirms had existed for no less a time than *eleven years*. The invagination involved 24 cm. of the lower ileum, and the lumen of the gut was almost obliterated. The patient, who had presented intestinal symptoms during the eleven years, died of an acute attack, which ended on the fifth day in perforation. *

During its progress the malady usually follows a most irregular course. The bowels may be at one time constipated, and at another in a state of diarrhœa. There may be violent pain one day and none the next. Some patients are troubled by severe vomiting, while others are never sick. In some cases there are long intervals of freedom from sickness, while in others there are no such breaks. There is no method in the irregularity and but few common features that underlie all the cases and that may serve as certain signs.

The **onset** of the malady is usually a little indefinite, and the earliest symptoms are often ascribed to indigestion, to mild colic, or to simple irregularities in the bowels. In about 30 per cent. the commencement has been abrupt, the case subsequently assuming a chronic aspect. In any case pain is usually the first symptom. The ileo-colic form of chronic invagination usually begins suddenly.

The **pain** that occurs during the progress of the disease is paroxysmal. Attacks of pain may appear several times a day or only once in the twenty-four hours. Sometimes days and even weeks have elapsed between the paroxysms. The intervals between the attacks are seldom regular, and when the pain does appear at stated times the occurrence is probably due each time to a repetition of the same cause; as, for example, when the paroxysm has usually appeared at night after a late supper.

As the malady advances the intervals between the

* Prager Med. Wochenschr., No. 21, 1883.

attacks of pain become shorter and the pain itself more diffused. In the less protracted cases there may be almost continuous suffering, marked, however, by exacerbations.

The pain, when present, has the general character described when dealing with the acute form of the disease.

Vomiting is not a very conspicuous symptom. In forty of Rafinesque's cases where this symptom is mentioned it occurred more or less frequently in twenty-four instances. In four instances the patient was sick at rare intervals, in seven vomiting did not appear until within a few days or hours of death, and in three cases there was an entire absence of vomiting throughout the progress of the malady. In any case the attacks of sickness were very rarely continuous. Usually they appeared at irregular intervals coinciding with the attacks of pain or depending upon some alimentary excess.

The duration of the affection appears to have little effect upon this symptom. Age has some influence, since nearly all the cases where the vomiting was insignificant or absent occurred in adults. Vomiting is most constant in the ileo-colic and enteric forms, and usually appears earlier in those varieties of the disease than it does in the other forms. Feculent vomiting is met with in less than 7 per cent. of the cases. It depends rather upon the degree of obstruction in the intestine than upon the seat or duration of the intestinal lesion.

The **appetite** usually becomes much impaired, and the symptoms are often aggravated by food. In a large number of instances it showed considerable fluctuations, and in at least one case it was voracious.*

The **state of the bowels** is most variable. Natural and regular stools may be passed during the

* Path. Soc. Trans., vol. x., page 160; Dr. Quain.

greater part of the disease, or there may be long-continued diarrhœa, or marked constipation, or alternations between the two last named conditions. Indeed, the only certain feature in the state of the bowels in chronic invagination is the feature of uncertainty. On the whole, a tendency to diarrhœa is the most common condition, and a normal state of the bowels the most rare. From an examination of forty-six cases Rafinesque obtained the following results: Motions normal or nearly so, seven cases; alternations of constipation with diarrhœa, eleven cases; predominance of constipation, twelve cases; and predominance of diarrhœa, sixteen cases. Constipation is most marked in the enteric forms, diarrhœa in the ileo-cæcal, and alternations between these two conditions in the colic and rectal varieties.

Blood is passed with the stools in about 50 per cent. of the cases, while tenesmus is present in 13 per cent.

In chronic invagination the bowels usually respond to the action of aperients. These drugs sometimes give much relief, but more often provoke at least a temporary aggravation of the symptoms.

In any case of long-standing intussusception a certain degree of persisting obstruction must exist in the intestine. As a result of this, the bowel above the invagination becomes hypertrophied by excessive development of its muscular wall. The patients, on the other hand, usually emaciate, and the anterior abdominal parietes of course share in the general wasting. Thus it happens that *coils of intestine* are very often *to be seen* in movement beneath the belly wall, a circumstance that will be most distinct when vigorous and irregular peristaltic waves are passing along the disordered intestine. There are few forms of chronic obstruction where this feature is more marked than it is in the present class of cases, and it serves as a valuable factor in the diagnosis.

The **general condition** of the patients in chronic invagination shows, as may be imagined, considerable variation. In the early periods of the disease, and in the intervals between attacks of pain, they may appear to be in fair health. In time, however, they usually become anæmic and emaciated. They are worn out by the frequent pain, and exhausted by the vomiting and diarrhœa. Some die of an acute attack that suddenly appears and puts an end to the case. Others die simply of exhaustion and marasmus. A few succumb to perforative peritonitis, and a small number to effects depending upon the spontaneous elimination of the intussusceptum.

With regard to the **state of the abdomen,** little can be added to what has been said when speaking of the acute form of the malady. As a rule the abdominal walls remain flaccid and present no abnormal feature. When a long continued diarrhœa exists with emaciation they may be retracted. When marked constipation exists there may be some meteorism, which will, however, always be moderate. Tenderness on pressure is very seldom to be noticed except in cases that are associated with peritonitis.

As already stated, a *tumour* is to be found in about one-half of the cases. Its characters have been fully described above.

Among the fifty-five cases collected by Rafinesque, the tumour was felt in the rectum in seven instances, and had protruded beyond the sphincter in nine. Thus it will be seen that in chronic cases the invaginated mass reaches the rectum in about 32 per cent. of the cases.

In Rafinesque's series the mass was discovered in the rectum on about the fifteenth day in three instances, and at the third, fourth, fifth, and seventh month respectively in the remaining four examples.

CHAPTER XI.

THE COURSE AND PROGNOSIS OF INTUSSUSCEPTION.

As has been already remarked, the course of an intussusception may be either ultra-acute, acute, subacute, or chronic (page 215).

The relative frequency of these different forms, as ascertained from an examination of the fatal cases, may be expressed as follows :

Acute	48	per cent.
Subacute	34	,,
Chronic	18	,,
	100	

The ultra-acute form is extremely rare. Leichtenstern met with only five examples of it among nearly 270 fatal cases.

The site of the invagination greatly influences its course. Thus the enteric and ileo-colic forms are usually acute or subacute, the great majority of the examples of both these varieties terminating within the first fourteen days of the attack. Colic and rectal invaginations are more often chronic or subacute than acute.

Ileo-cæcal intussusceptions, being the most common form of the malady, are met with in all the grades of the affection. Three-fourths, however, of the cases are either subacute or chronic. Attention has already been drawn to the fact that 60 per cent. of the examples of chronic invagination belong to the ileo-cæcal variety.

The age of the patient also greatly influences the progress of the affection. This is well demonstrated

in the subjoined analysis of 269 fatal cases collected by Leichtenstern. It shows that invagination in the very young has a great disposition to run an acute course. Four out of five ultra-acute cases occurred in children not over a year old; and no less than 79 out of 129 acute cases occurred also in patients who were not more than twelve months of age.

The general mortality of intussusception is about 70 per cent. Leichtenstern has pointed out that the malady is somewhat more fatal in females than in males, and gives the following as the results obtained from his statistics: Males, mortality 68 per cent.; females, 70 per cent.

The ultra-acute cases are all fatal, the patients dying of shock within a comparatively short time from the commencement of the attack.* A very high mortality runs through the acute cases, especially through such as occur in young children. Most of the cases of recovery are met with in the subacute variety of the malady. The mortality among distinctly chronic cases is again high. Out of fifty-nine chronic cases collected by Rafinesque there were no less than fifty-one that terminated fatally.

The extremely fatal character assumed by intussusception in infants under one year old is well illustrated in the subjoined table. In over 80 per cent. of the fatal cases death occurred before the seventh day.

In children that are a little older the fatal termination usually takes place towards the end of the first week, or the commencement of the second. In adults death usually takes place during the course of the second and third weeks; many, however, dying after the malady has become chronic.

According to Leichtenstern, the deaths between the

* As a good example, *see Lancet*, vol. i., 1882, page 604. Child lived thirteen hours.

ages of eleven and sixty years are met with in the different anatomical varieties in the following proportions: The ileo-cæcal forms, 71 per cent.; enteric, 57·8 per cent.; colic, 70·9 per cent.

Time of Death.	Ages of Patients.								
	1 year.	2 to 5 yrs.	6 to 10 yrs.	11 to 20 yrs.	21 to 40 yrs.	41 to 60 yrs.	Above 60 yrs.	Unknown.	Total.
The 1st day	4	0	0	0	1	0	0	0	5
The 2nd day	18	4	2	1	1	0	0	0	26
The 3rd day	26	2	1	2	0	1	0	3	35
The 4th to the 7th day	35	10	7	4	3	4	1	4	68
In the 2nd week	10	6	4	10	13	5	1	2	51
In the 3rd week	2	2	1	3	8	0	0	2	18
In the 4th week	2	1	1	0	5	4	1	1	15
In the 2nd and 3rd months	2	1	2	5	8	5	0	4	27
In the 4th and 5th months	1	2	0	0	7	1	0	0	11
In the 6th and 7th months	0	0	0	0	1	0	0	2	3
In the 8th month	0	1	1	0	1	0	0	0	3
In the 9th month	0	0	0	0	1	0	0	0	1
In the 10th or 11th month	0	0	0	0	2	0	0	1	3
After 1 year	0	0	0	0	0	0	1	1	2
After 2 years	0	0	0	0	0	1	0	0	1
Total	100	29	19	25	51	21	4	20	269

Methods of spontaneous cure.—In a great many instances intussusceptions have been cured by treatment, some have been successfully reduced after laparotomy had been performed, others have been unfolded by means of enemata and insufflation of air.

With these cases, however, we have at present no concern, and have to deal only with instances where the invagination has cured itself.

Cases of spontaneous cure may be divided into two distinct categories: 1. Those that occur in

invaginations that are still reducible. 2. Those that occur in invaginations that are quite irreducible.

To the **first** category belong instances of spontaneous reduction. Of the existence of this mode of cure there can be little doubt, although its occurrence must be a matter of extreme rarity. There are several instances reported of fatal intussusception in which the patient had had one or more previous attacks which in all points, save in duration, resembled the earlier stages of the fatal attack. There is every reason to suppose that such previous attacks were due to the formation of intussusceptions that underwent spontaneous reduction.

I think, moreover, that some of the cases of supposed cure of invagination by large doses of opium, administered promptly, may have been instances of spontaneous reduction; the curative movement being rendered more easy by the state of nerve repose induced by the sedative.

There are one or two cases where patients have died after having presented many of the symptoms of invagination, and where after death nothing was found save a piece of small intestine shrunken and congested. Such cases might well have been instances of the spontaneous reduction of an enteric invagination, although they are described as examples of death from "spasm," or from paralysis of a portion of the bowel.* A case reported by Mr. Gay affords probably a little more direct evidence concerning this matter. The patient was a woman, aged thirty-eight, who was admitted into hospital with symptoms of obstruction. The symptoms had appeared suddenly; there was fixed and localised pain, a hard tumour to the left of the umbilicus, constipation and vomiting.

* *See* case recorded by Henrot; Des Pseudo-étranglements, page 53. Paris, 1865. Also case by Travers; Inquiry into the Process of Nature in repairing Injuries of the Intestines, page 211, London, 1812.

The symptoms in a short while passed off suddenly. The patient was phthisical, and died in two days of pulmonary hæmorrhage. The autopsy revealed a contraction of a limited portion of the ileum, and the gut presented distinct evidences of recent constriction.

It may be surmised that spontaneous reduction can only occur in quite recent cases, and probably only in the enteric form of invagination. A remarkable case recorded by Rilliet would appear to point to the possibility of spontaneous reduction in cases of some standing. Rilliet's patient was a boy, aged ten, who was taken on July 1st with abdominal pains. On August 4th he vomited; August 5th and 6th were marked by the appearance of severe intermittent attacks of colic, and evidences of a painful tumour in the right flank. Black fetid stools were passed. The attacks of pain were followed by intervals of complete ease. By the 9th the tumour had become softer and less defined. Diarrhœa set in on the 10th, the stools containing a little blood. The tumour gradually diminished and disappeared and the child got well.* Rafinesque reports in his monograph a somewhat similar case. In both these cases it would have to be shown that the obstruction was not due to the impaction of fæces or undigested food before they could be accepted as intussusceptions.

To the **second** category belong two kinds of case. In one a fæcal fistula is formed in the bowel above the intussusception. In the other, spontaneous cure is brought about by elimination of the invaginated bowel.

The formation of a fæcal fistula must be extremely rare. I have only been able to find one example of such a mode of relief. The case is reported by Bruchet, and concerns a man of sixty-seven, who for three or four months before his death passed fæcal matter with his urine. The autopsy showed a

* *Gazette des Hôpitaux*, 1852.

short intussusception of the colon into the sigmoid flexure with above it a fistulous opening into the bladder.* It will be understood that should a fæcal fistula (due to ulceration above the obstruction) form and make its outer orifice in the integuments, an artificial anus may be produced that could give permanent relief.

Elimination of the invaginated bowel by gangrene is the only common form of spontaneous cure. The account of the pathology of the process has already been given (page 196). For statistics on the matter we have again to turn to Leichtenstern, whose collection of cases is greatly in excess of that made by any other author.

Spontaneous elimination occurs in about 42 per cent. of all cases. It is a little influenced apparently by sex, occurring in 54 per cent. of the female cases and in 31 per cent. of the cases in males.

It is greatly influenced by the position of the intussusception.

Thus, in the ileo-cæcal invaginations it occurred in	20	per cent. of the cases.
In colic	28	,, ,,
In enteric	61	,, ,,

Still more conspicuously is spontaneous elimination influenced by age, being extremely rare in children under two years of age.

Leichtenstern's statistics upon this point yield the following results :

In the first year of age spontaneous elimination occurred in . .	2	per cent. of the cases.
Between the 2nd and 5th year .	6	,,
,, 6th ,, 10th ,, .	38	,,
,, 11th ,, 40th ,, .	40	,,
,, 41st ,, 60th ,, .	44	,,
Above the age of 60 years . .	46	,,

* Revue Mensuelle de Méd. et de Chir., 1878, tome ii., page 255.

The period of time in the course of the malady at which elimination occurs is fully shown in the following table also from the same monograph.

Spontaneous elimination occurred :

At the end of 3 days in	1 case
„ 4 „	2 „
„ 5 to 7 days in	8 „
„ 8 to 10 „	14 „
„ 11 to 14 „	35 „
After the 3rd week, in	34 „
„ 4th „	12 „
„ 2nd month, in	9 „
„ 4th „	3 „
„ 6th „	3 „
After about one year, in	3 (?)

It must not be supposed, however, that when spontaneous elimination has occurred cure and recovery must necessarily follow.

Over 40 per cent. of the patients who have been the subjects of elimination of the bowel die from effects directly connected with the intestinal lesion or with the elimination process itself. The mortality after separation is a little lower in colic invaginations than it is in the remaining forms, and is conspicuously affected by the age of the patient. If one excepts the very young, it may be said that the older the patient the greater becomes the probability that elimination of the bowel will be followed by death. In patients between eleven and twenty years of age the deaths after spontaneous separation are only 28 per cent. ; in those between twenty-one and forty years 32 per cent., between forty-one and fifty the percentage of deaths rises to 36, and in patients between fifty-one and sixty years of age to 50 per cent. In patients above sixty years of age the mortality is as high as 85 per cent.

It only remains now to consider what are the

modes of death after spontaneous elimination of the gangrenous intestine.

In the first place it often happens that the separation is in a sense premature and occurs before the parts about the neck of the mass have become securely fused together. After the intussusceptum has been removed a perforation or rupture occurs, through which fæcal matter escapes into the peritoneum, leading to a fatal peritonitis.

Or the fusion of the parts about the neck may be perfect but slight. The gangrenous segment in its passage along the intestine blocks the canal: some obstruction occurs: the gut above the obstructed point becomes distended, and a rupture occurs along the line of separation of the gangrenous intestine.

In another set of cases persistent ulceration remains about the elimination line. This may lead to chronic diarrhœa, which may in time prove fatal, or may cause death much more readily by producing a perforation. This and like perforations may either open upon the peritoneal surface or into the subperitoneal tissue. In the latter instance a large fæcal abscess is produced and the fatal issue more or less delayed.

A part of the intussusceptum may remain and may lead to a new invagination, which in its turn may prove fatal.

Some patients die of hæmorrhage incident to the separation of the gangrenous gut.* Others perish from pyæmia, and of this form of death Mr. Holmes has recorded an excellent example.†

Rafinesque has discovered two recorded cases of gangrene of one of the lower limbs following upon elimination of invaginated bowel. In both these instances it is probable that the result was brought about by thrombosis of the iliac veins.

* *Amer. Journ. Med. Sciences*, vol. xii., page 372.
† Path. Soc. Trans., vol. xix., page 207.

It is said that stricture of the intestine may follow from cicatrisation at the line of elimination, and that the stricture so produced may cause in its turn fatal obstruction. Such an occurrence must be very rare. It is true that some narrowing of the

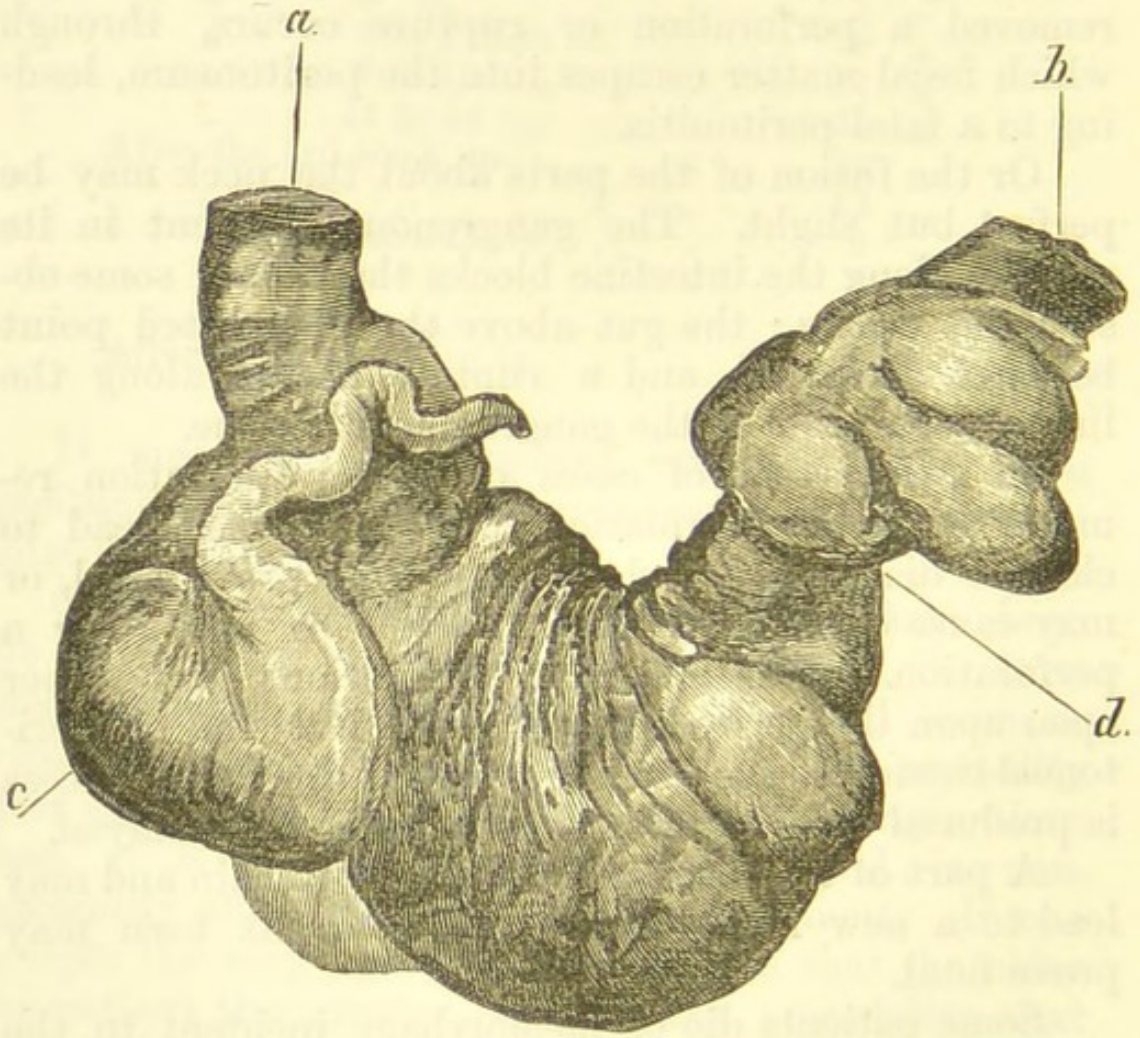


Fig. 45.—Contraction of Colon after the separation of an Intussusception.
a, ileum ; *b*, colon ; *c*, cæcum ; *d*, seat of contraction.

parts may occur after the separation, as is well shown in Fig. 45.* Recovery following upon elimination is comparatively common, yet I cannot find in any of the museums in London a straightforward case of stricture of a marked kind following upon intussusception, nor have I discovered any recorded cases (save, perhaps,

* College of Surgeons Museum, No. 1,377. For another example, *see* Dr. Hare's case ; Path. Soc. Trans., vol. xiii., page 86.

one mentioned below) where such a circumstance has without doubt occurred. It would appear, then, that stricture of the intestine of a grade sufficient to cause fatal obstruction must be excessively rare as a result of the elimination of the gut in invagination.

In one case of stricture of the lesser bowel that is supposed to have followed invagination, there is no history of a piece of gut having been passed, nor indeed any evidence that the patient, a woman of thirty-eight, had ever had intussusception. This patient, moreover, had a cicatricial stricture in her gullet, and a cicatrix in her stomach that had greatly deformed that viscus. In the absence of some complete evidence it may be suggested that the cicatrix in the jejunum was due to the same cause that produced the two other cicatrices.* The solitary case alluded to above is placed on record by Dr. Fuller. It concerns a patient, aged twenty-one, who died of subacute intussusception of the ileum. When twelve years old she had had a severe attack of colic attended by vomiting and much pain in the iliac region. The symptoms subsided in seven days. She had since then been much troubled with constipation. The autopsy revealed no less than thirty polypoid growths in the lesser bowel. Four and a half feet above the cæcum the ileum presented a cicatricial stricture, as if from an ulcer, the bowel here resembling the ileo-cæcal valve. It may in this case be surmised that the attack at the age of twelve was due to an intussusception, brought about perhaps by a polyp, and that the cicatrix had resulted from the separation of the involved part.

This conclusion, however, can be nothing more than a surmise.

Among the signs that mark the separation of gangrenous bowel are the following: The evacuations commonly become exceedingly foul, blood often

* Dr. Bristowe; Path. Soc. Trans., vol. xx., page 180.

appears in the stools, together with small shreds of matter that on examination prove to be gangrenous fragments of intestine. The elimination may be preceded by absolute constipation and by severe symptoms of obstruction. Or it may be preceded by a profuse and sudden diarrhœa. After the separation is complete there is usually a cessation of symptoms, with the exception of some diarrhœa, which may persist for a while.

Finally it must be remembered that in many patients the elimination occurs too late to save life and the sufferer dies of the effects of the intussusception rather than from any evils incident to its separation.

One point remains. On page 199 a case has been alluded to where, as a result of limited gangrene, a rent formed in the inner and middle layers of an invagination tumour whereby the intestinal contents were able to pass between the intussusceptum and the intussuscipiens. This is the only example I can find of what may possibly prove to be one other mode of spontaneous cure.

CHAPTER XII.

STRICTURE OF THE INTESTINE: PATHOLOGY.

Under the general term "stricture of the intestine" should be included all those morbid conditions of the bowel that have led to a definite narrowing of its lumen. This should, perhaps, more particularly hold good in any account of intestinal obstructions wherein the subject was approached from a clinical rather than from a pathological standpoint.

For purposes of convenience, however, and to avoid bringing together under one heading many perfectly distinct pathological processes, the term "stricture" is here limited to a narrowing of the lumen brought about by changes in the coats of the bowel itself. These changes, it should be further observed, take origin, in probably every instance, in the mucous and submucous layers of the gut, for they depend upon only two conditions, upon cicatrisation after loss of substance and upon carcinomatous deposits. Thus from the present category are excluded those cases of stenosis of the bowel due to the contraction of inflammatory products in its serous coat, and also those instances of narrowing of the lumen of the bowel from kinking, from the rigid bending effected by adhesions, from the matting together of sundry coils, and from the shrinking of the mesentery.

Two forms, however, of genuine stricture of the intestine, as expressed by the above definition, have been already considered. One concerns the changes that may be induced in the walls of the bowel as the result of long-continued traction, as from a diverticulum; the other concerns the constriction that may follow after the separation of an intussusception.

All strictures of the intestine, as limited by the definition already given, may be divided into two great classes, the cicatricial and the cancerous.

1. THE CICATRICIAL STRICTURE.

This depends upon the contracting of a cicatrix consequent upon loss of substance by ulceration or limited gangrene of the inner coats. The aspect and degree of the stricture will obviously depend upon the situation and extent of the original loss of substance. A limited patch of ulceration placed in the long axis of the bowel may lead to very insignificant narrowing of its lumen, while an ulcer no more extensive but

disposed transversely around the gut may produce an annular constriction that may almost close the tube. Some contracting cicatrices may merely alter the course or direction of the bowel, others that are not annular may pucker up a portion of the intestinal wall and produce great distortion of the tube, but without much narrowing of it. An evenly distributed scar may produce a regular narrowing of the bowel, while an unequally contracting cicatrix may produce obstruction as well by actually diminishing the size of the canal as by distorting the intestinal walls.

It will be readily understood that the cicatrix that produces the greatest amount of harm with the least amount of contraction is that that assumes an annular form; while the least harmful cicatrix is the one that is longitudinal in direction and that involves only a part of the circumference of the bowel.

It is convenient to divide the cicatricial strictures into three classes. 1. Those depending upon primary ulceration. 2. Those that are subsequent to lesions following strangulated hernia. 3. Those that may follow injury. The first class concerns both the large and small intestine. The others, so far as the cases I have collected serve to show, concern only the lesser bowel.

1. **Stricture after ulceration.**—It must be confessed that our knowledge of ulcerative processes in the intestine is still very incomplete, not only in their pathology but also in their clinical bearings. Following the arrangement of Leube,* intestinal ulcers may be divided into six classes. 1, typhoid; 2, dysenteric; 3, catarrhal; 4, peptic; 5, syphilitic; and 6, tubercular.

*Ziemssen's Cyclopædia of Medicine, vol. vii., page 399. *See also* Die Symptom. der Darmgeschwüre, by Nothnagel in Volkmann's Sammlung, No. 200, 1881.

1. **Typhoid.**—The characters of these ulcers are well known. They lead to distinct and recognisable scars, but it is only in extremely rare cases that they produce any stenosis of the intestine. This is not always easy to understand. It is true that the primary typhoid ulcer is often of no great extent, is arranged parallel to the long axis of the bowel, and involves but a portion of its circumference; but the serpiginous ulcers that may follow upon the primary lesion are often very extensive, involving large tracts of the intestine, and extending so deeply as to produce, in a few instances, perforation. In criticising a case of reputed stricture after typhoid it is well to remember that the morbid process is usually limited to the ileum. It extends to the colon in about 50 per cent. of the cases, but even then very rarely indeed does it go beyond the cæcum or ascending colon. In the other direction also it is extremely unusual for the disease to extend higher than three metres from the ileo-cæcal valve.* Klob gives a case of stenosis after extensive typhoid ulcers. I have not been able to find any recorded instance, except this, that appears to be an undoubted example of stricture after enteric fever. Many of the reputed cases do not bear examination, and the association of a previous typhoid with these examples is probably accidental.†

2. **Dysenteric.**—The ulcers left by dysentery are frequent causes of stricture. These ulcers may be met with in the rectum alone or in the sigmoid flexure or in the cæcum alone. In general terms it may be said that they become less common as one passes up the colon from the rectum. In some instances the whole of the large intestine has been

* *See* Hoffmann's Statistics; Untersuch. über die path-anat. Veränd. der Organe beim Abdominal Typhus. Leipzig, 1869.

† *See* for examples case by Dr. Bristowe; Path. Soc. Trans., vol. iv., page 152. Case by Dr. Larguier des Bancels; Thèse de Paris, No. 142, 1870, page 86.

involved. The ulcers in this malady are often very destructive. They have a tendency, as they spread and fuse, to isolate little patches of mucous membrane, which remain undestroyed and stand out like islands among the ulcerated districts. As the scar contracts these islands are often rendered very prominent, and project from the surface as hard warty-looking excrescences. The cicatrix is often extensive, rigid, and dense. The contraction may be very irregular. The gut may be much puckered, or thrown into irregular folds or in other ways distorted. The mucous membrane often becomes undermined during the ulcerative process, and the bands of membrane thus isolated commonly remain as rigid bars and cords that contribute one more element to the irregular aspect of the cicatrix. Unilateral scars may produce a bending of the gut or may cause sickle-like folds of the intestinal wall to project into the lumen of the tube. Such folds may act the part of valves and increase the obstruction, and the same may sometimes be said of the elevations and excrescences that so often mark the dysenteric cicatrix. An example of stenosis after dysentery is shown in Fig. 46.* I think that the nature of the more exuberant of the cicatrices has sometimes been unrecognised. I believe that not a few instances of so-called "scirrhus" of the colon are examples really of dense, hard, dysenteric scars, associated with much contraction and with firm warty excrescences. It is not improbable that one of the specimens of "scirrhus" shown in the St. Thomas's Hospital collection † is really an example of extensive contraction after dysentery, and I have found several museum specimens that are, I think, susceptible of the same interpretation. Dysenteric strictures are most often met with in the rectum, sigmoid flexure,

* St. Bart.'s Hosp. Museum, No. 1,987. *See also* No. 1,986.
† St. Thomas's Hosp. Museum, No. Q 141.

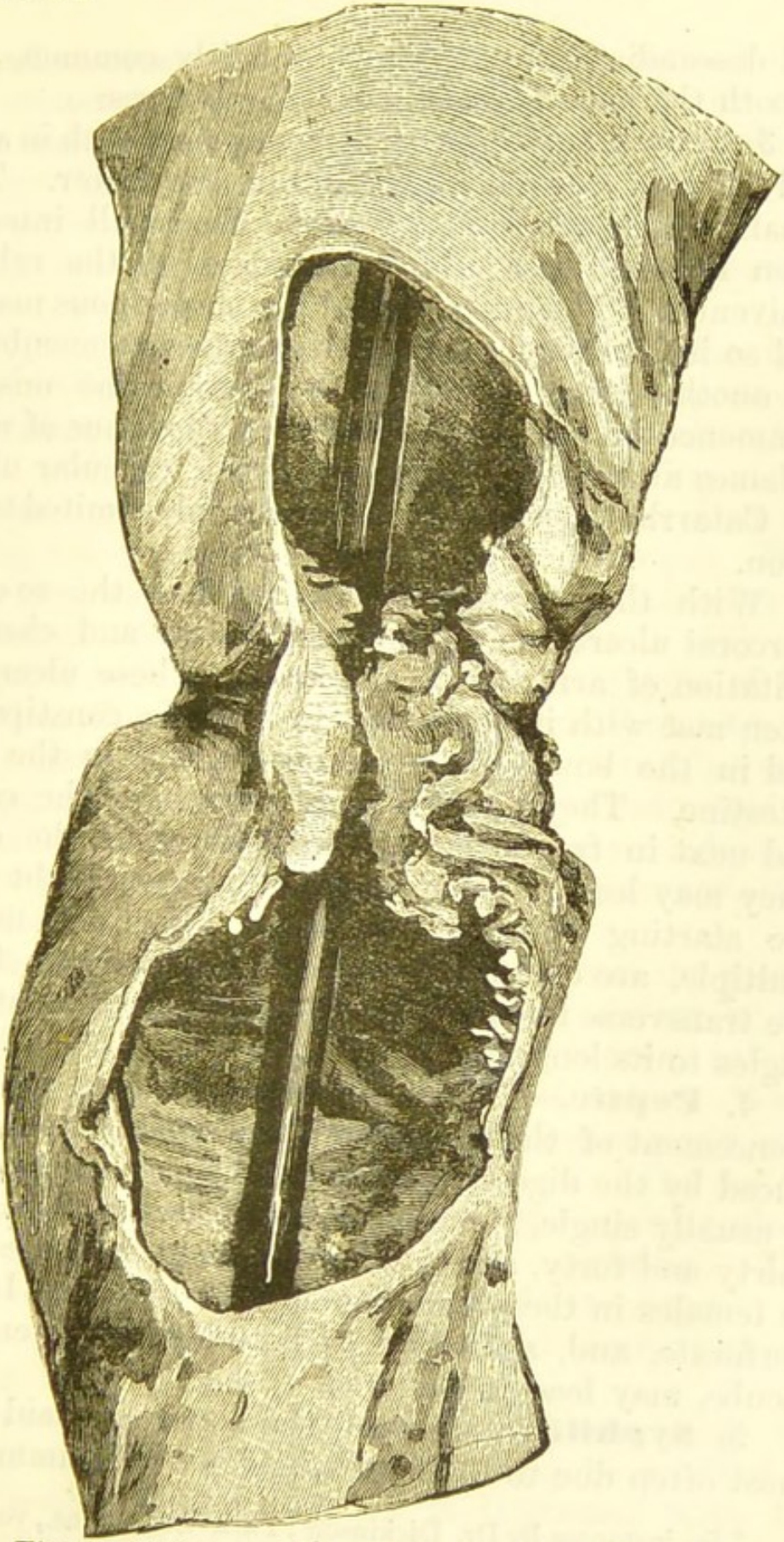


Fig. 46.—Stricture of Colon after dysenteric Ulceration.

and descending colon. They are fairly common, also, at both the hepatic and the splenic flexures.

3. **Catarrhal.**—These ulcers are met with in acute and chronic catarrh, especially in the latter. They usually begin as erosions, and in the small intestine often follow for a while the edges of the valvulæ conniventes. They may spread in a serpiginous manner and so isolate patches of healthy mucous membrane. In another form described by Leube the mischief commences in the lymphoid follicles, the tissue of which inflames and, breaking down, forms a follicular ulcer.

Catarrhal ulcers are most commonly limited to the colon.

With them must also be included the so-called stercoral ulcers due to the mechanical and chemical irritation of arrested fæcal masses. These ulcers are often met with in the colon in chronic constipation, and in the bowel above an obstruction in the large intestine. They most frequently occur in the cæcum and next in frequency at the flexures of the colon. They may lead to perforation and are no doubt often the starting point of stenosis. They are usually multiple, are oval and parallel to one another, follow the transverse folds of the bowel, and are thus at right angles to its long axis.*

4. **Peptic.**—This ulcer is met with at the commencement of the duodenum, and is said to be produced by the digestive action of the gastric juice. It is usually single, is most common between the ages of thirty and forty, and is more frequent in males than in females in the proportion of ten to one. It may perforate, and, according to both Leichtenstern and Leube, may lead to stenosis.

5. **Syphilitic** ulcers of the bowel are said to be most often due to the breaking down of gummata in

* *See* instances by Dr. Dickinson ; Path Soc. Trans., vol. xviii., page 101.

the submucous tissue. The ulcers thus formed may run round the gut in an annular manner, or may form isolated ulcers with a rounded or serpiginous outline having a remarkably uneven surface and well cut and slightly undermined edges.

Excluding the rectum, this form of ulcer is said to be most common in the lower ileum.

6. **Tubercular.**—These ulcers begin in the lymphoid follicles and assume a course and appearance very much like that observed in scrofulous ulceration of the pharynx. They increase by spreading at the edge and generally adopt a transverse direction following the course of the vessels around the gut. They often thus extend around the whole circumference of the bowel. In other instances the ulcer is oval and elongated with its long axis in the long axis of the intestine. Some, again, are rounded and others sinuous. The edges of the sore may be thin, irregular, and undermined, as if the mucous membrane had rotted off in patches. In other and probably more advanced cases the margin becomes defined, thickened, and rounded.

These ulcers may be met with in almost any part of the intestine, and often involve a great extent of the bowel. They are most common, however, in the lower ileum and about the ileo-cæcal valve. When associated with marked tuberculous deposits and with tuberculosis elsewhere they seldom heal. The milder cases, however, cicatrise, and then the annular ulcers may produce some stenosis of the intestine. This stenosis is, I think, usually of a moderate degree. A specimen of stricture from tubercular ulcer is shown in Fig. 47.

Returning to the intestine and examining the simple strictures of that tube that may be ascribed to cicatrisation after ulcer, one is impressed with the comparative valuelessness of the classification of ulcers



just given. In some instances there is no doubt that the stricture has followed a dysenteric or a tubercular ulcer, or there are good reasons for supposing that it has been due to a catarrhal ulcer, but certainly in the majority of the cases the conclusion as to the origin of the stricture is purely negative. It may be evident that it is *not* due to typhoid or to dysentery, or to tuberculosis, but beyond that the diagnosis, in a vast number of cases, does not and cannot go.

Regarding these strictures collectively it may be said that they are usually definite and well limited. As viewed from the peritoneal surface they may appear merely as a well-marked constriction of

Fig. 47.—Portion of Jejunum showing two Strictures, the result of tubercular Ulceration.

The gut has been turned inside out so as to show the mucous surface.

the gut, as if a cord or tape had been tied about it, or may have induced more distortion of the bowel. The former condition is perhaps more often met with in the large intestine and the latter in the small. In the lesser bowel the strictured part is usually free and exempt from adhesions to adjacent surfaces. In the colon, however, the stenosed segment is often bound down, especially when the part involved is one or other of the flexures. The lumen of the narrowed tube may be regular in outline or much distorted.

It may at the time of its causing death admit the forefinger, or be, on the other hand, so small as to hardly permit the introduction of a probe.

As regards locality, strictures of the lesser bowel are usually situated in the ileum and preferably in the middle or lower parts of the ileum. In the colon about 50 per cent. of these cicatricial strictures are in the sigmoid flexure. Next in frequency come the descending colon and splenic flexure, and beyond those parts the stenoses become rarer and rarer as the cæcum is approached.

In comparing the large intestine with the small, one is struck with the fact that the simple stricture of the colon is nearly always single. Indeed, out of thirteen recorded cases that I have collected there is only one example of multiple simple stricture of the large intestine. In this instance the patient, a woman aged twenty-nine, had, in addition to a stricture of the rectum, a stricture at the hepatic and at the splenic flexures.* On the other hand, out of ten recorded cases of cicatricial stricture of the lesser bowel there were six instances of single stricture and four of multiple. In one of the six cases there were cicatrices in the gullet and stomach in addition to that producing stenosis of the intestine.† The four cases

* M. Marignac ; Bull. de la Soc. Anat., 1877, page 519.

† Dr. Bristowe ; Path. Soc. Trans., vol. xx., page 180. The nature of the cicatrices was unknown.

of multiple stricture present certain very striking characters that are common to the series. The patients were all women except one. They were all young adults, their ages ranging from twenty-two to thirty-three. There were three or four definite strictures in each case, which were placed at varying distances apart. The ileum was involved in each instance. In none of the cases was the nature of the ulceration upon which the cicatrisation depended diagnosed.*

There is no doubt but that the present variety of cicatricial stricture is very much more common in the large than in the small intestine. The statistics, however, at present available are not sufficiently extensive to form the basis for a correct estimation of the comparative frequency.

My own statistics are, I am aware, misleading, and if one could judge roughly from a general examination of museum specimens, it may be said that the proportion in which the large and small gut is involved is about as six to one.

I have met with five recorded instances of stenosis of the ileo-cæcal valve subsequent to the cicatrisation of ulcers. In one of the cases the ulcers appeared to have spread from the ileum, and in another example from the colon. In the remaining instances the stenosis had probably followed a typhlitis brought about by the impaction of fæces or masses of undigested

* As a good example of the series, *see* Kœberle's famous case, in which he resected with success two mètres of ileum; Bull. et Mém. de la Soc. de Chir. de Paris, 1881, page 99. (*See also* St. Thomas's Hosp. Museum, No. Q 127 and No. Q 129.) Since the above was written a fifth case has been added to this series in the form of a very interesting specimen exhibited by Dr. Sharkey before the Pathological Society (*Lancet*, May 24, 1884). Here there were multiple strictures, due obviously to the cicatrisation of ulcers. The patient was a woman, aged twenty-three. The part of gut involved was the ileum, and the nature of the ulceration was not established, although the specimen had been the subject of most careful examination.

food in the cæcum. In two of the cases the valve just admitted the point of the finger, in another it would only give passage to a No. 9 catheter,* and in a fourth case it was almost entirely obliterated.† In this last instance the ileum and cæcum communicated by means of a fistulous opening, and the closure of the valve proved a matter of comparatively little importance.

An excellent example of stricture of the ileo-cæcal valve is shown in Fig 48. In this case the stenosis was due to cicatrisation after ulcer.‡

2. **Stricture after strangulated hernia.**—The stricture that may form in a piece of the intestine that has been involved in a strangulated hernia is due to cicatrisation and follows upon ulceration or limited gangrene of the involved bowel. I have found four recorded examples of this stricture, in addition to several specimens to be seen in some of the London museums. It has followed upon both inguinal and femoral rupture, and has produced symptoms of obstruction at a period, after the relief of the hernia by operation, varying from one month to "some years." In three cases the ileum was involved; in one the jejunum. In one instance one and a half inches of the bowel were found contracted and thickened.§ In other examples the stricture was of very limited extent and annular as if a narrow tape had encircled the bowel. In one example the stenosed part would only admit a goose-quill,‖ and in another water would only pass through it in drops.¶ In one specimen** a large

* Path. Soc. Trans., vol. xxi., page 171.

† Berlin. klin. Wochens, No. 26, page 393, June, 1879.

‡ For examples *see* Coll. of Surgeons Museum, Nos. 1,247 and 1,248.

§ *Med. Times and Gazette*, vol. i., 1872, page 363.

‖ Bull. et Mém. de la Soc. de Chir. de Paris, 1880, page 706.

¶ Path. Soc. Trans., vol. iii., page 95.

** Middlesex Hosp. Museum, No. 114, viii.; *see also* Guy's Hospital Museum, No. 2,507 (36).

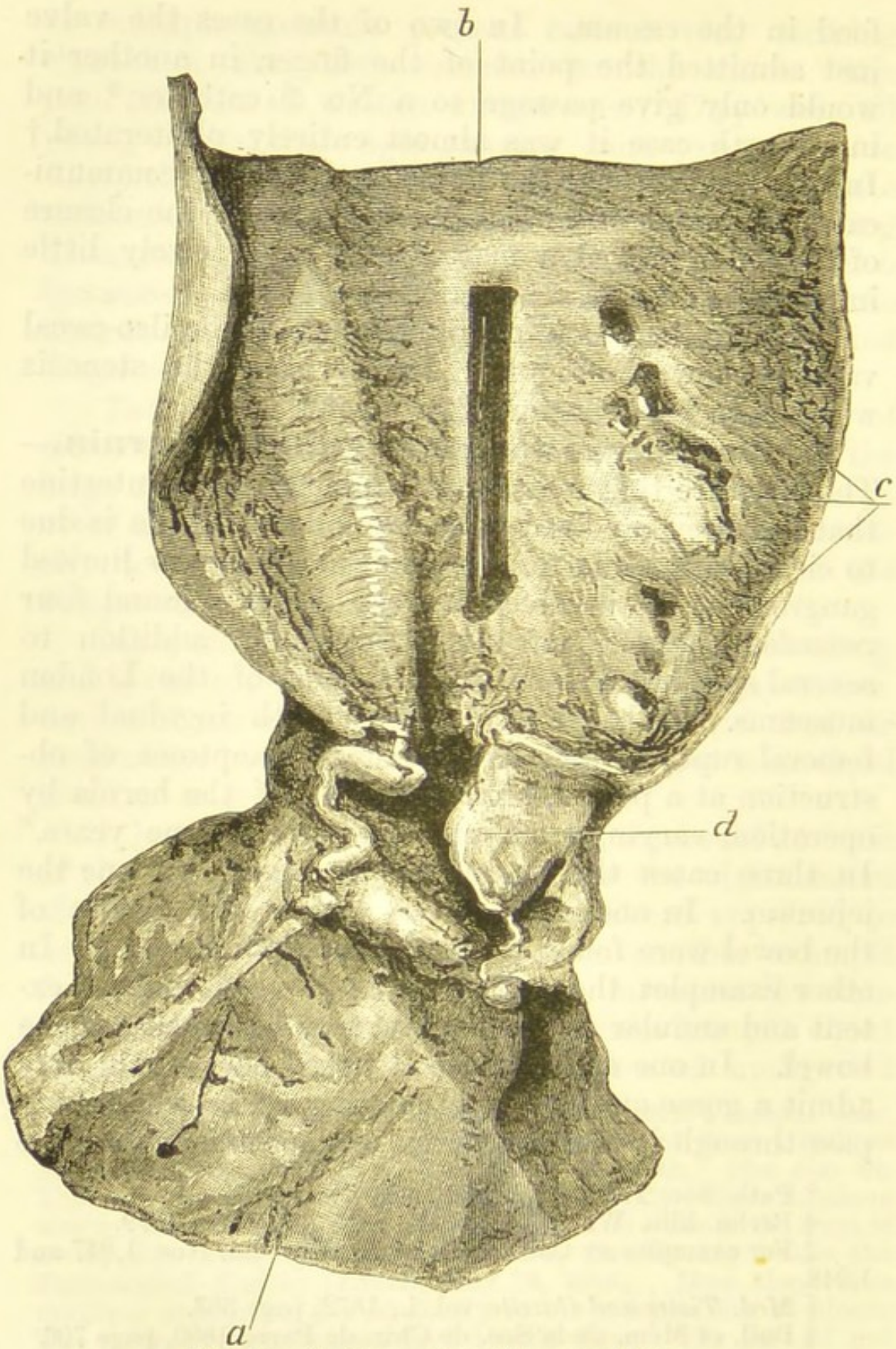


Fig. 48.—Stricture of the Ileo-cæcal Valve.

a, cæcum not laid open; *b*, ileum laid open; *c*, cicatrices of ulcers; *d*, puckered mucous membrane. The valve, which was reduced to the size of a No. 12 catheter, is occupied by a piece of whalebone.

valvular fold of mucous membrane passed across the lumen of the gut at the strictured part.

3. **Stricture after injury.**—I find records of two cases of stricture that were evidently due to cicatrisation following injury to the bowel. Both patients were males aged about forty-five. In one case symptoms of obstruction came on three months after the patient had been ridden over,* in the other case four months after a blow upon the abdomen.† In the former the ileum was involved, in the latter the upper jejunum. Both strictures were very narrow, and adhesions existed in the vicinity of the stenosed segments.

In the Pathological Society's Transactions ‡ Mr. Ward details a case where the lower three inches of the ileum were found much contracted and thickened, the ileo-cæcal valve "a mere ridge," and the cæcum somewhat narrowed. Some large gall-stones, much worn, were found in the cæcum, and it may be that the trouble in the ileum was induced by their temporary impaction there.

I have not entered into the subject of congenital strictures of the intestine.

It may here be convenient to draw attention to a specimen in the Museum of University College Hospital, which is, so far as I can ascertain, quite unique.

A drawing of the specimen is shown in Fig. 49.

It shows a portion of the small intestine, the lumen of which has been at one point remarkably narrowed. The narrowing is due to an even folding-in of all the coats of the bowel towards the lumen of the tube.

This infolding involves only a portion of the circumference of the intestine. The infolded parts appear quite normal on section, save for a little

* Path. Soc. Trans., vol. iv., page 156.
† Bull. de la Soc. Anat., 1877, page 86.
‡ Vol. for 1858, page 365.

thickening of the mucous membrane. The fold is rendered permanent by adhesions between the two opposed serous surfaces. The infolding is towards the mesenteric attachment of the bowel. In the mesentery are certain enlarged and inflamed glands in close contact with the gut. The specimen was obtained from the body of a man who died of intestinal obstruction.

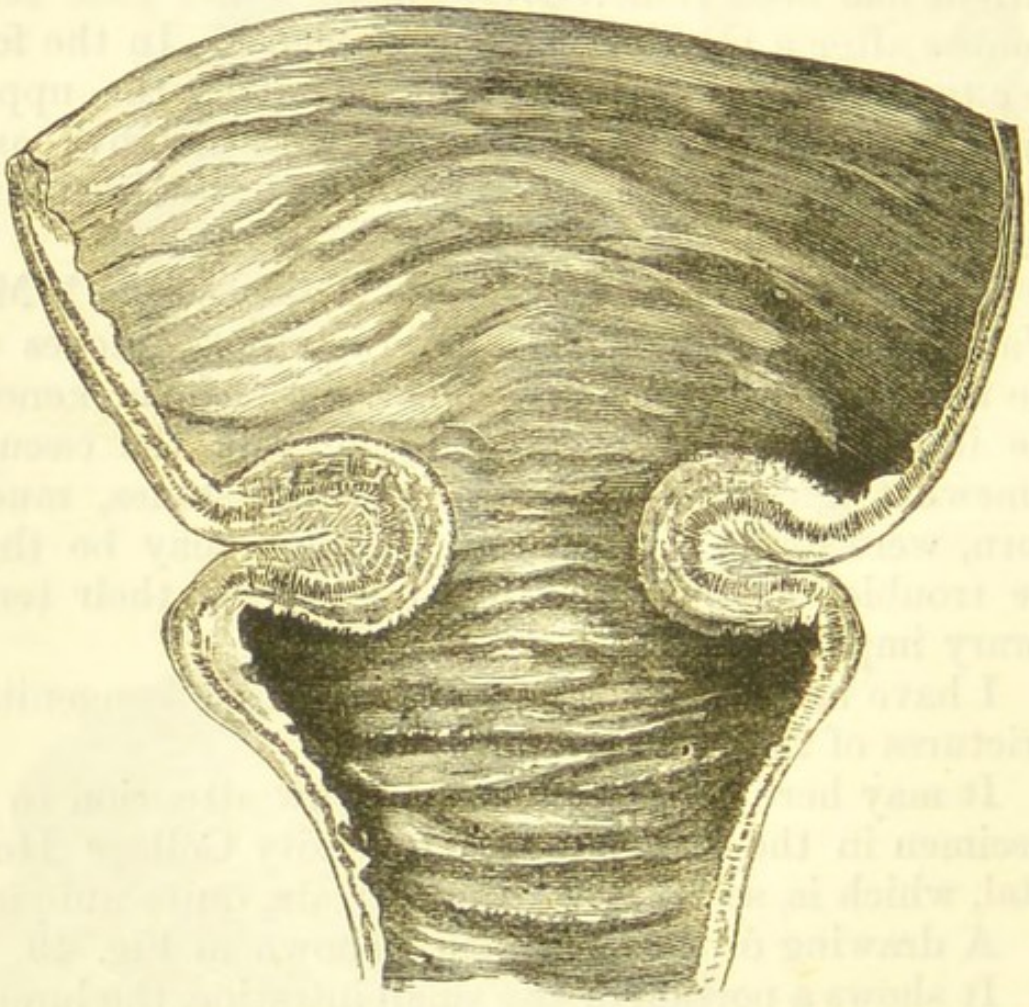


Fig. 49.—Stenosis due to in-turning of the Intestinal Wall, the result of Mesenteric Gland Disease.

Of the nature of the obstruction in this case it is difficult to speak. It is certainly not a stricture in the proper sense. It may be a case of abrupt bending of the intestine with fusion of the opposed surfaces at the angle of the bend. Cases of this character have been already dealt with, but they do not present the peculiarities afforded by the present specimen. The

gut, moreover, if viewed laterally does not present evidences of acute bending. It can only be surmised that the condition is associated with the mesenteric gland disease, and that the little local peritonitis excited had spread from the disordered lymph glands. Above the stenosed part is a considerable pouch.

2. THE CANCEROUS STRICTURE.

Carcinoma of the intestine may be either primary or secondary. As a secondary growth it may appear either by metastasis or by extension from neighbouring parts. So far as surgical practice is concerned, the growth causing obstruction or definite intestinal symptoms is usually primary; and the metastatic form need not be considered here.*

It must be confessed that the pathology of cancer of the intestine is by no means in a satisfactory condition, and there is a great lack among available records of full and detailed accounts of the microscopical structure of these growths. According to most authors, primary carcinoma of the bowel includes the following varieties, viz. scirrhus, medullary, colloid, and epithelial. With regard to scirrhus, I have not been able to find any clear description of an undoubted primary scirrhus growth in the intestine, nor have I been able to find in the various museums any specimens of this condition that are beyond question. I am much disposed to doubt its existence. Mr. Harrison Cripps, as the result of his extensive investigations into new growths of the rectum, doubts the existence of scirrhus or medullary cancer in that part, and has been unable to find any examples of such growths in that segment of the bowel.

* Mr. R. Williams, in a statistical paper dealing with 5,556 cases of carcinoma of all parts, has collected forty-nine instances of cancer of the intestine, twenty-three being in male, and twenty-six in female subjects (*Lancet*, May, 24, 1884).

The same remark that applies to scirrhus applies also to medullary carcinoma. I can find no record of any case of primary cancer of the bowel that upon microscopical examination was proved to have been without doubt an encephaloid growth.

Putting aside for a moment the subject of colloid cancer, one is now driven to the conclusion that the most usual form of carcinoma of the intestine is cylindrical epithelioma. Mr. Harrison Cripps has very clearly shown that the usual "malignant disease" of the rectum is of this character, and the rectum is not so entirely unlike the rest of the intestinal tube as to lead us to anticipate that it possesses a peculiar monopoly in its morbid growths. In an admirable monograph upon cancer of the intestine recently published by M. Haussmann, the conclusion above expressed receives very substantial confirmation.* M. Haussmann has collected no less than 268 recorded cases of so-called cancer of the intestine.

In seventy-three of these cases a microscopical examination of the growth is given, with the result that in forty-three instances the neoplasm proved to be a cylindrical epithelioma. In four of the remaining thirty cases the mass is described as colloid and might have been an epithelioma that had undergone the colloid change. With regard to the rest of the cases, it is significant that they mainly belong to the older descriptions and to a period antecedent to the time of an elaborate pathological histology. M. Haussmann's observations upon these statistics, and his general conclusion upon the whole subject, are expressed in the following words: "Examinons en effet les dates de nos observations et nous pourrons facilement nous

* Cancer de l'Intestin. Thèse de Paris, 1882, No. 228. I might be allowed to say that I had formed the conclusion above named many months before I had read M. Haussmann's monograph.

convaincre de l'existence d'un fait important : le carcinôme intestinal devient de plus en plus rare à mesure que l'on s'approche davantage de l'époque actuelle. Si nous ne tenons compte de chaque côté que des faits observés depuis 1875, nous voyons le nombre des carcinômes descendre à 8, tandis que celui des épithéliomes se maintient à 26. Si nous rapprochons encore notre point de départ et si de 1875 nous le reportons à 1879, c'est 3 carcinômes seulement que nous voyons rester debout en face de 24 épithéliomas cylindriques. Il nous semble que cette marche si rapidement décroissante du carcinôme démontre suffisamment sans même que l'on entre dans l'examen des faits, que le carcinôme de l'intestine est destiné à disparaître. Nous croyons donc pouvoir légitimement conclure de cette discussion que tous les variétés de cancer de l'intestin admises jusqu' à présent doivent être ramenées à une seule : l'épithélioma cylindrique. Nous donnerons donc du cancer de l'intestin la définition suivante : le cancer de l'intestin est l'épithélioma cylindrique de cet organe."

With regard to colloid cancer one cannot but be struck with the fact that this form of carcinoma is not so commonly met with as it was. An examination of the "Transactions of the Pathological Society" from their first volume to the present time would induce the belief that this form of neoplasm is becoming extinct. In other words, a more precise and advanced pathology would appear to be rapidly narrowing the extensive ground it once covered. Colloid carcinoma is usually defined as a schirrus, medullary, or epithelial cancer, the cells of which have undergone colloid degeneration. Some of the reported cases of colloid cancer may have been incorrectly associated with that name, others might have been examples of the colloid degeneration of secondary growths, while not a few were probably instances of colloid change in a primary epitheliomatous growth.

An examination of all the so-called specimens of "intestinal cancer" to be found in museums, etc., will show that they can be readily divided into two great classes; into examples of cylindrical epithelioma and into instances of neoplasms that do not belong to the epitheliomata. One class is positive, the other, so far as pathological knowledge at present extends, is negative.

We may consider first the growths alluded to as forming the second class in this division, a division that simply has for its object the separation of the well-defined epitheliomata from the other and somewhat ambiguous growths that are classed together as "cancers" of the intestine. There is no reason for supposing that these neoplasms are all of the same character, although when viewed collectively they present certain general features which may be expressed in the following description. They appear first as rounded nodules under the mucous membrane and are covered by a healthy layer of that tunic. These nodules may be single, but they are nearly always multiple. They may be met with here and there at many different points in the intestine more or less remote from one another, or many may be found clustered together in a comparatively small segment of the bowel. (*See* Fig. 50.*) They usually form very distinct and prominent projections, varying in size from a pea to a large marble.

These isolated new growths, which are at first separated and surrounded by healthy mucous membrane, increase in size, and it is possible that those that are in near relation to one another may coalesce. By one means or by another the morbid growth forms a mass of some magnitude, then the mucous membrane that covers it breaks down and the surface of

* St. Bart.'s Hosp. Museum, No. 2,026. *See also* Coll. of Surgeons Museum, No. 1,220.

the tumour becomes excavated by an ulcerative process. It would appear that the neoplasm may disintegrate almost as rapidly as it grows, and so indefinitely postpone the serious narrowing of the lumen of the bowel that appears always imminent. The new growth spreads in depth as well as superficially. It would seem to take its origin from the submucous



Fig. 50.—Cancer of Jejunum.

tissue, but soon invades all the coats of the intestine. It commonly assumes an annular form, and, following the direction of the blood-vessels, is soon found to have encircled the intestine. In other instances it remains as a large flattened tumour, that has apparently spread equally in all directions, that may extend around three-fourths of the lumen of the intestine, and that will present an ulcerated and broken-down

surface.* New growths such as these are variously described as "cancer," "colloid cancer," "villous cancer," and "medullary cancer." They are commonly attended by like enlargements in the mesenteric glands, and in advanced cases by miliary nodules in the serous membrane. As regards the nature of these growths I am inclined to think that the great majority of them are examples of secondary deposits, although they may not be so described in museum catalogues. They precisely resemble, both in appearance and in general arrangement, new growths in the intestine that are avowedly secondary to tumours elsewhere. The multiplicity of the deposits, and the frequent extensive implication of the serous membrane, are features that would suggest secondary rather than primary growths.

It is, moreover, to be noted that this is not the form of carcinoma usually met with in surgical practice, not the form that is apt to assume a somewhat lingering course and to produce a certain and progressive narrowing of the intestine, and not the form that is usually met with in the clinical records of those who have died with distinct symptoms of stricture of the bowel. Some present all the aspects displayed by specimens of lympho-sarcoma of the bowel, the nature of which has been placed beyond doubt.

From this somewhat vague and probably heterogeneous collection of new growths we might turn to the well-defined examples of carcinoma that form the first of the two classes above alluded to, the cylindrical epitheliomata.

Cylindromata may be met with in the bowel under three different aspects: (1) As small nodules; (2) as flattened plaques involving only a portion of the

*For specimens *see* Middlesex Hosp. Museum, No. viii. 113A; Coll. of Surgeons Museum, No. 1,221; Guy's Hosp. Museum, No 1,881 (97); and Lond. Hosp. Museum, No. Af. 28.

circumference of the gut; and (3) as annular deposits which surround the bowel like a ring. Into the microscopic characters of this form of epithelioma it is not necessary to enter. The morbid changes commence in the epithelium of Lieberkühn's glands, and produce at first a great thickening of the glandular layer of the mucous membrane for some distance, or the neoplastic action may be more limited to one spot and a projecting nodule be produced. Some of these nodules form conspicuous tumours which are very apt to assume a polypoid outline. In other instances the growth spreads laterally rather than towards the lumen of the bowel, and an epitheliomatous plaque is produced. In this form a raised flattened mass of neoplastic structure is formed upon one part of the intestinal wall. Its edges are well defined and often abruptly raised, its centre is uneven and often ulcerated. An example of the nodular or polypoid form is afforded by Fig. 51.*

The commonest form, however, under which epithelioma of the intestine presents itself is that of an annular band around the intestine. Compared with this aspect of the growth the nodules and plaques may be said to be comparatively rare. The ring-like formation affords an example of the neoplasm directed in its course by the blood-vessels of the part, which here follow a course transversely to the long axis of the bowel. It is this form of epithelioma that usually is met with under the title of malignant stricture of the intestine, and it probably represents the only true cancerous stricture of this part. The appearance of these strictures is very typical. The gut at the stenosed part appears to be very suddenly constricted, as if a piece of cord had been drawn tightly about it. The stricture is usually quite annular but insignificant in width,

* Coll. of Surgeons Museum, No. 1,222. *See also* Path. Soc. Trans., vol. iv., page 154; and St. Bart.'s Hosp. Museum, No. 2,023.

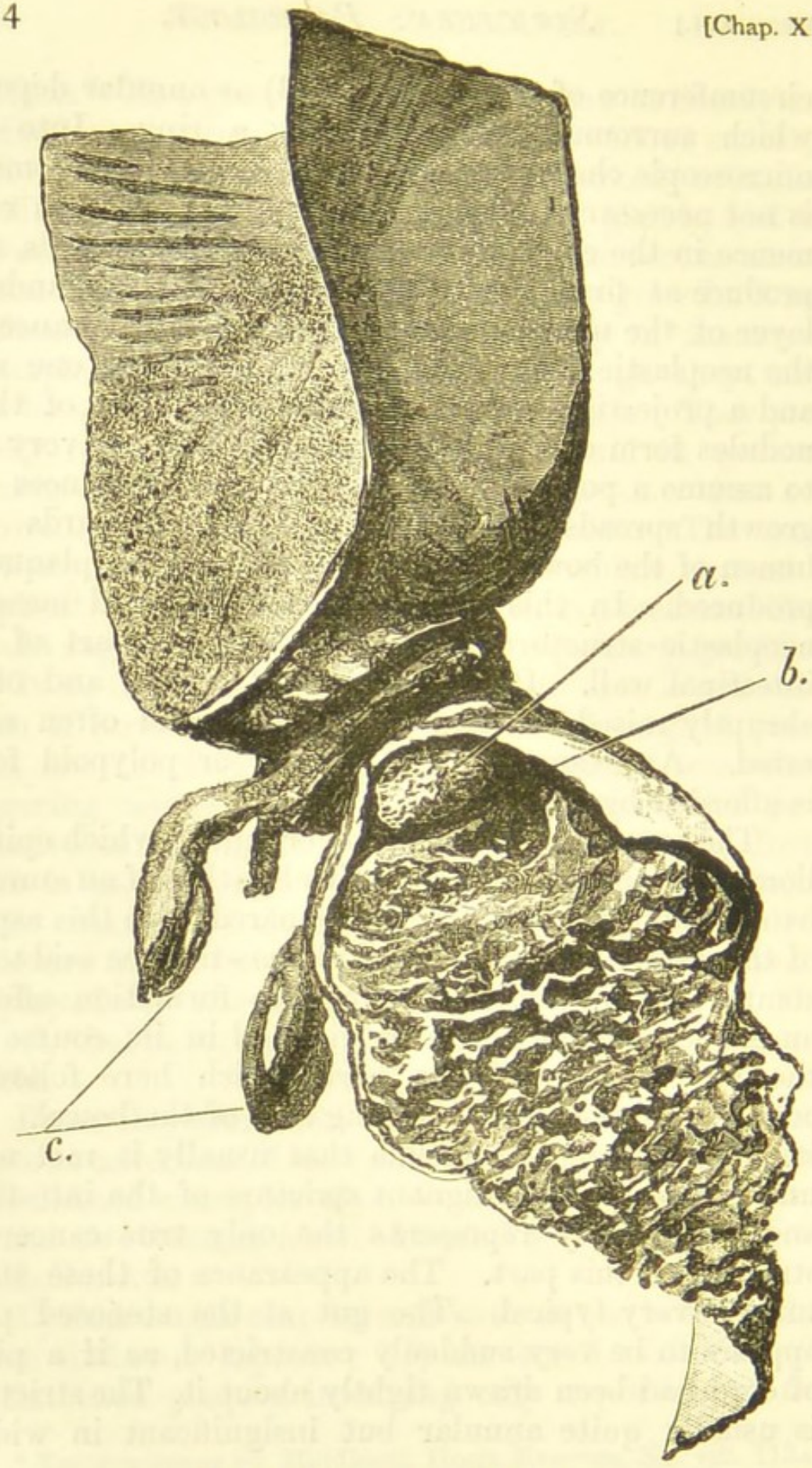


Fig. 51.—Epithelioma of Colon.
a, tumour; *b*, site of lumen of bowel; *c*, appendices epiploicæ.

comparatively little of the gut, as measured along its long axis, being involved. The peritoneum about the stenosed part is often thickened and the bowel itself is not infrequently adherent. On examining the gut from the inside the stricture may appear as an annular and contracted deposit, the surface of which is irregularly ulcerated. Sometimes the stricture appears as if contracted about one of the nodular growths already described. In other instances the neoplasm has extended laterally more after the manner of a plaque, and the edge of the new growth, or rather of the ulcerated surface that it has left, shows a distinct rounded, raised, and everted border which is very typical and very pronounced. This is well shown in the specimen from which Fig. 52* has been taken. Strictures of this character are often very narrow. Some, for example, in the colon have been decided as "almost closed," or as allowing only a probe to pass, or as having a diameter no greater than that of a goose-quill. They are much more common in the large than in the small intestine, and I have met with several specimens where the margins of the ileo-cæcal valve were the seat of an epitheliomatous growth.

It is important to recognise the fact that epitheliomata of the intestine appear as single growths. I have not been able to find any undoubted example of multiple primary epithelioma. In this respect, therefore, it differs markedly from the other forms of so-called cancer. The mesenteric glands were found involved in about 50 per cent. of the recorded cases, but this complication is, without doubt, late to appear.

Of the causes that produce these growths nothing is known. In one interesting case mentioned by M. Isenard a well-marked cylindrical epithelioma appears to have developed upon the scar left by a dysenteric

* St. Bart.'s Hosp. Museum, No. 2,020. *See also* Coll. of Surgeons Museum, No. 1,223.

ulcer. The patient had had dysentery two years previously, and in the vicinity of the carcinoma were many dysenteric cicatrices.*

In addition to the forms of carcinoma here dealt with it is necessary to bear in mind that besides the primary and the metastatic varieties of cancer of the bowel there are cases in which a cancerous growth has

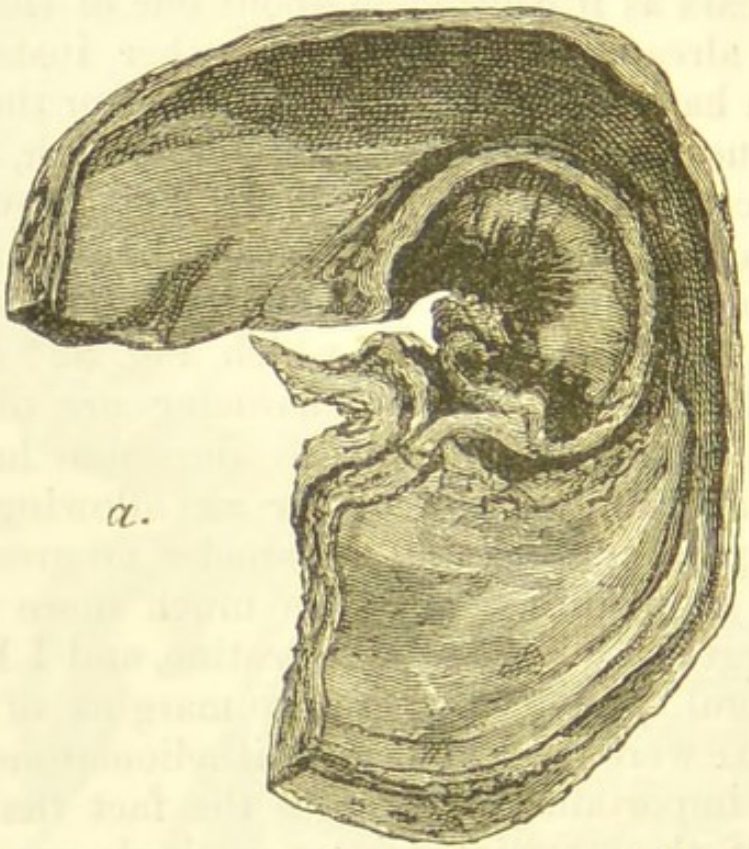


Fig. 52.—Epithelioma of Colon. Bird's-eye view of the Interior of the Bowel.
At *a*, a triangular piece of the intestine has been cut away.

spread to the intestine from an adjacent part and has produced obstruction of the lumen of the tube so involved. Thus Mr. McCarthy has recorded a case of intestinal obstruction that was relieved by enterotomy. The patient lived forty-eight days after the operation. The autopsy revealed a cancer of the splenic flexure that had spread to the bowel from a primary growth in the stomach.†

* Bull. de la Soc. Anat., 1873, page 613.
† Med.-Chir. Trans., 1872.

A similar spreading has been noticed in connection with malignant disease of the uterus.

The general pathological changes consequent upon stricture.—The gut above the stenosis becomes dilated and its walls hypertrophied. In long standing cases this hypertrophy may be considerable and far spread. Thus in cases of stricture of the sigmoid flexure not only has the colon been found dilated and hypertrophied, but also the terminal portion of the ileum. Often above the stricture is a distinct pouch due to distension acting probably upon walls already diseased. The walls of the pouch are thin, the mucous lining is frequently ulcerated, and that ulceration often leads to fatal perforation. These pouches are more commonly met with in connection with simple than with malignant strictures, and are much more common in the small than in the large intestine. (*See* Fig. 53.)

It is remarkable in how many cases cherry and plum stones have been found in these pouches or in the distended intestine above a simple stricture. The most curious case of this kind is reported by Dr. Wickham Legge. The patient, a female aged twenty-six, for several years before her death evacuated, on various occasions, cherry stones with her stools. She also vomited a few. During life a mass of cherry stones could be felt through the parietes giving to the hand a peculiar sensation as they were rubbed together. At the autopsy a stricture of the ileo-cæcal valve was found, and above it in the small intestine, an imperial pint of fruit stones.* In another case of stricture of the ileo-cæcal valve nearly a litre of cherry stones was found above the obstruction.† In a case reported by Dr. Peacock there were found in a pouch above a stricture of the small intestine thirty-three plum

* Path. Soc. Trans., vol. xxi., page 171.
† L'Union Méd., 1856, No. 57.

stones, sixteen cherry stones, and six orange pips.* In another very similar instance there were only three plum stones in the pouch.† Lastly, Dr. Moore has recorded a case of accumulation of a large number of cherry stones above a simple stricture of the descending colon.‡ In most of the instances these foreign bodies had led to perforation of the bowel. It is not improbable that the habit of swallowing fruit stones had, in the present instances, induced the simple stricture that was found in each case. Or it may be that the stricture had an independent origin and then induced the morbid appetite. A third alternative is the assumption that the habit of swallowing fruit stones is very widespread.

In one curious case of stricture of the lesser bowel a conical pouch or funnel was found to hang down into the lower part of the intestine. It had an aperture at its apex and through it all the fæces had passed. The funnel-like process was large and conspicuous and is well depicted in Fig. 53.§ It was probably produced by the excessive enlargement of a simple pouch formed above the stricture. The fundus of the pouch would be pressed against the wall of the gut below the stricture, until at last perforation into that part of the intestine would occur and the formation of the funnel-like process would be complete. It may be noted that in the specimen the mucous lining of the process can be seen to be continuous with that of the intestine above.

It is common to find about simple strictures of the lesser bowel certain frænа and bars of cicatricial tissue which are apparently the products of an irregular ulceration, and possibly of the adhesions of adjacent inflamed surfaces.

* Path. Soc. Trans., vol. x., page 154.
† Ibid., vol. iv., page 152. ‡ *Lancet*, vol. ii., 1876, page 505.
§ St. Thomas's Hosp. Museum, No. Q 129.

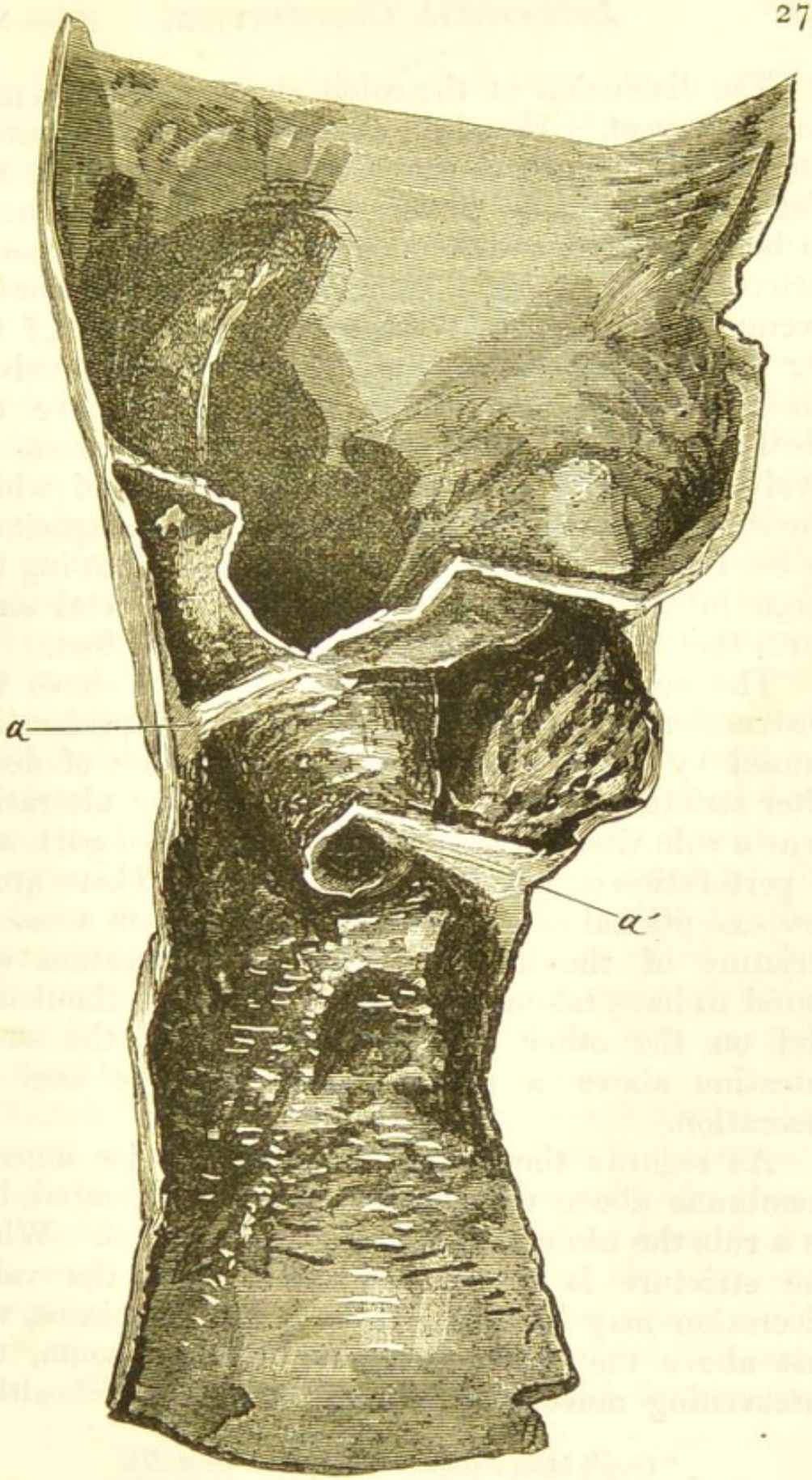


Fig. 53.—Stricture of the small Intestine.

a and *a'* point to frœna holding in position a remarkable pouch of mucous membrane.

The distension of the colon above a stricture may be very great. Thus in a case of epithelial cancer of the sigmoid flexure causing stricture, reported by Dr. Fagge,* the splenic flexure of the colon was found to be as large as a distended stomach. In a case of stricture of the splenic flexure by the same author the cæcum was found to be as large as the calf of the leg. In another instance where the stenosis involved the descending colon, the large intestine above the obstruction had a diameter of from eleven to twelve inches.† The enormous distension of which the colon is capable is well illustrated by a specimen in St. Bartholomew's Hospital Museum,‡ showing the large intestine of a child (who died of rectal stricture) that has a diameter of more than one foot.

The mucous membrane of the bowel above the obstruction is very usually ulcerated, and perforation caused by these ulcers is a common cause of death after stricture. In the small intestine the ulceration is as a rule situated just above the stenosed part, and if perforation occurs it will occur here. There are a few exceptional cases. Thus, for example, in a case of stricture of the ileo-cæcal valve a perforation was found to have taken place in the middle of the ileum, and on the other hand several feet of the small intestine above a stricture may be the seat of ulceration.

As regards the colon, the whole of its mucous membrane above the stricture may be ulcerated, but as a rule the ulceration is much more limited. When the stricture is at some distance from the valve ulceration may be noted in two distinct places, viz. just above the obstruction and in the cæcum, the intervening mucous membrane being quite healthy.

* Guy's Hosp. Reports, vol. xiv., page 272.
† *Lancet*, vol. ii., 1876, page 505.
‡ No. 1,952.

This has been met with several times in stricture of the sigmoid flexure. When perforation occurs in colic strictures the abnormal aperture may be either just above the stricture or in the cæcum. The relative proportion of perforation in these two places is as seven to four.

In several cases where ulcers have been found in the cæcum similar lesions have been at the same time met with in the ileum. In one instance of simple stricture of the splenic flexure there was an annular ulcer in the colon just above the obstruction and six large ulcers in the lower end of the ileum. No other part of the bowel, not even the cæcum, was involved. A fatal perforation had occurred in the lower ileum.*

The perforating ulcer above the stricture need not open into the peritoneal cavity. In a few rare cases where adhesions have formed the perforation has been so placed as to give temporary relief at least to the obstruction. Thus in one case of stricture of the valve, the ileum opened into the commencement of the colon, forming a fistula bimucosa through which the fæces could pass.† Other cases of relief by the formation of such a fistula have been reported; also an instance where the colon above a stricture in a distorted sigmoid flexure was found to have opened into the bladder and rectum.‡

Sometimes the changes in the bowel above the obstruction pass the limits of ulceration and the part becomes gangrenous. Gangrene developed under these circumstances is usually found in obstructions of the colon only, and it is only in this part of the intestine that gangrene of an extensive character is met with. Dr. Moxon has recorded a good example of this condition. The stricture was in the sigmoid flexure, the

* Bull. de la Soc. Anat., 1870, page 27.
† Path. Soc. Trans., vol. xxi., page 171.
‡ Ibid., vol. i., page 264.

patient an adult. The anterior wall of the ascending colon was wanting (having sloughed) over an area measuring five inches by one and a half inches. Escape of the contents had, however, been prevented by the great omentum, which had become adherent over the gap and had closed it.* Dr. Goodhart has placed upon record a still more pronounced instance. In this case the stricture was also at the sigmoid flexure and the patient an adult. A great part of the transverse colon and nearly the whole of the descending colon were gangrenous, the mucous membrane here being especially involved.† Cases of less extensive gangrene leading to rupture of the gut are fairly common. The gangrene in these instances is due partly to obliteration of the vessels in the intestinal wall by pressure and distension, and partly to the irritating action of retained fæces.

When the colon is involved in a stenosis at the point of junction of the sigmoid flexure with the rectum, the flexure often becomes much distorted from distension. When so distended it may reach remote parts and become adherent to them. Thus it has been found to be adherent to the pelvic peritoneum, to the bladder, and to the serous lining of the right iliac fossa.

The condition of the stricture in its relation to the clinical aspect of the case.—The stricture at the time of death may be wide enough to admit the tip of the fore-finger; on the other hand it may be so narrow that water will merely trickle through it in drops, or it will admit only a probe or a goose-quill. As a rule the narrowest strictures are met with in the small intestine, although there are cases of stenosis of the colon where the obstructed part has, at the time of death, only allowed a

* Path. Soc. Trans., vol. xx., page 181.
† Ibid., vol. xxxi., page 113.

common probe to pass. Such extreme cases are, however, rare in the larger bowel. A stricture can attain to narrow dimensions without producing a rapidly fatal result when the contents of the part of the bowel that it involves are fluid. This is one reason why narrower strictures are more possible in the small than in the large intestine. In Fig. 47 is shown a narrow stricture of the jejunum that never caused obstruction symptoms, the patient dying with diarrhœa. Messrs. Coupland and Morris in their monograph allude to a case of annular stenosis of the jejunum that was so narrow as to only admit a No. 7 catheter, and yet the patient presented no intestinal symptoms during life. In like manner, if the contents of the colon be fluid, strictures of that gut that are comparatively narrow may cause no symptoms of obstruction. Such patients die with severe and persisting diarrhœa. Many cases have been recorded where this part of the bowel at the autopsy has appeared almost quite blocked by a cancerous new growth or by deposits of lympho-sarcoma, and yet the patient has presented no symptoms of obstruction. The contents of the colon have remained in a fluid condition and death has followed upon a long abiding diarrhœa.

The precise manner in which a stricture of the intestine brings about the death of a patient is by no means the same in every case.

In some instances the stricture becomes narrower and narrower, the obstruction becomes by slow degrees more and more complete until at last it causes death, after following a chronic and lingering course. In other cases the stricture, having obstructed the bowel to a certain extent, appears to undergo no further contraction, but the patient dies worn out by the long continued abdominal troubles, or succumbs to an increasing marasmus. In cases of malignant disease

also the effect of the morbid growth upon the patient's general condition must not be overlooked. There are cases that for a while adopt a lingering progress and then end somewhat more abruptly. That is to say, for some considerable time the malady may present the symptoms of a chronic obstruction, and the fatal issue be brought about by an attack of acute obstruction. Instances of this kind depend upon many different pathological conditions. Thus a plug of hard fæcal matter may have blocked up a stricture that had of itself caused no very serious amount of obstruction.* Or this blocking of the stenosed part may have been brought about by some foreign substance. Thus in a case reported by Dr. Peacock a dry raisin was found impacted in the stricture,† while in another specimen the final occlusion of the already narrowed bowel has been brought about by a cherry stone.‡ In other instances folds of mucous membrane from the gut above the stenosed part may so fall across the orifice of the stricture as to close it like a valve. In these cases water may be injected with ease from below, but only with much difficulty from above. To cases such as these must be added that extensive series where the small intestine at the seat of the stricture has become so bent as to have its lumen more or less abruptly occluded, or where "kinking" has occurred, or where the narrowed bowel has become still more occluded by adhesions and by matting of its coils together.

In stricture of the sigmoid flexure, moreover, an acute termination to the case is by no means uncommon. The greatly distended "flexure" becomes bent upon itself and thereby occluded, or its parts

* Dr. Platt; *Lancet*, vol. i., 1873, page 42.
† Dr. Peacock; Path. Soc. Trans., vol. xiii., page 137.
‡ St. Bart.'s Hosp. Museum, No. 2,017.

are so arranged that a volvulus is produced, or the extremity of its loop contracts adhesions that may serve to further narrow the lumen of the bowel.

CHAPTER XIII.

THE SYMPTOMS AND PROGNOSIS OF STRICTURE OF THE INTESTINE.

Position. Age. Sex.—I have collected twenty-six cases of stricture of the small intestine, eight cases of stricture of the ileo-cæcal valve, and forty-four of stenosis of the colon.* Total seventy-eight. Of this number thirty-five were males and forty-three females.

The cases are thus distributed:

26 cases of stricture of the *small intestine.*	10	cases of cicatrix after ulcer	6 males, 4 females.
	2	,, of cicatrix after injury	2 males.
	4	,, following strang. hernia	2 males, 2 females.
	10	,, of cancer	5 males, 5 females.
	26		15 males 11 females.

The average *age* of the ten patients with cicatricial strictures after ulcer was thirty-five. The youngest was a child of nine. The rest were between twenty-one and fifty-eight years of age.

The average age of the ten patients with cancer was forty-two; the youngest being thirty-seven, the oldest sixty-five.

The ages of the four patients with stricture following hernia were twenty-six, thirty-four, fifty-two, and fifty-seven. (Three of the herniæ were inguinal and one was femoral.)

* The last-named are exclusive of the cases collected by Dr. Fagge and by Messrs. Coupland and Morris.

8 cases of stricture of the *ileo-cæcal valve.*	3	cases of simple stricture .	1 male, 2 females.
	5	„ cancer . . .	1 male, 4 females.
	8		2 males 6 females.
44 cases of stricture of the *colon.*	28	„ cancer . . .	14 males, 14 females.
	13	„ simple stricture .	2 male, 11 females.
	3	„ nature unknown .	2 males, 1 female.
	44		18 males 26 females.

The average age of the twenty-eight patients with cancer was forty-eight. Only six were under forty years of age. The youngest patient was twenty-two; the oldest sixty-six.

The average age of the thirteen patients with non-cancerous stricture was forty-four, the youngest being nineteen and the oldest seventy-six.

The situation of the stricture in the forty-four cases was as follows:

Sigmoid flexure	27
Descending colon	5
Splenic flexure	2
Transverse colon	3
Hepatic flexure	5
Ascending colon	1
Cæcum	1

Adding to my forty-four cases sixteen that were collected by Dr. Fagge, and thirty-eight by Messrs. Coupland and Morris, the following result is obtained in the total of ninety-eight cases:

Sigmoid flexure	58
Descending colon	11
Splenic flexure	7
Transverse colon	7
Hepatic flexure	9
Ascending colon	2
Cæcum	4
Total	98

The following general conclusions may be drawn from the above statistics :

Stricture of the intestine is a little more common in females than in males. In one form of stenosis, however (viz. in the non-cancerous stricture of the colon), the number of females is greatly in excess of the males, the proportion being as eleven to two. As regards the ages of the patients it will be seen that this malady is practically limited to adults. Cases of cancer are extremely rare before forty, while cicatricial strictures are met with, taking the average, at a slightly earlier age.

Previous history.—Facts in connection with the previous history of patients suffering from stricture of the intestine are of comparatively little value. Many of the stenoses follow, as we have seen, upon ulceration. Certain forms of intestinal ulceration are associated with very definite symptoms, as is the case in typhoid fever and dysentery. A history of dysentery is of much value in the clinical account of certain of these cases, since many of the cicatricial strictures of the large intestine depend upon this malady. A history of typhoid fever, on the other hand, is practically valueless, on account of the extreme rarity of stenosis of the bowel as a consequence of the disease. The frequency of syphilis and the rarity and the indefiniteness of syphilitic affections of the bowel above the rectum render the evidences of that disorder in any given patient of little use in attempting a diagnosis of the case. A history of tuberculosis in any case, or the presence of any evident tubercular malady, may suggest a stenosis due to tubercular ulceration in instances where symptoms of obstruction of the bowel appear. The suggestion, however, would be as feeble as it is indefinite.

In connection with the less precise forms of intestinal ulceration it must be remembered that even

extensive disease in the tube may be attended by no symptoms. It is by no means uncommon to find at an autopsy ulcers in the bowel that gave not the least evidence of their existence during life. Indeed, if one make exception of typhoid and dysentery I think it may be said that ulceration of the intestine is associated with symptoms so vague, so uncertain, and frequently so contradictory, that the malady can hardly be said to have a clinical existence. Many examples may be given in illustration of this. One may be selected. Dr. Fuller reports the case of a man aged fifty, who suffered for six months before his death with general and progressive wasting. He had no abdominal symptoms of any kind. His bowels were always regular and his motions natural. He was never sick and had no tenderness over the belly. He died suddenly of perforative peritonitis. The autopsy revealed extensive ulceration of the ileum, nearly the whole of that segment of the gut being involved. Indeed, in a length of five feet of that bowel there were no less than twenty-five large ulcers. One of these had caused perforation. There were some ulcers also in the colon. In nature they were supposed to have been tubercular.*

In cases where symptoms are excited there may be constipation, but more frequently diarrhœa. Sometimes blood is found in the evacuations in cases of disease in the colon, and when the ulceration involves the lower part of this bowel tenesmus is not uncommon. There may be some pain in the abdomen, but it is very indefinite and usually most insignificant. As a rule vomiting only occurs in cases of duodenal ulcer, and in instances where the peritoneum is inflamed. Leube observes that in the case of the so-called follicular ulcer small plugs of mucus like sago grains may be passed with the stools.

* Path. Soc. Trans., vol. xi., page 103.

Among other elements in the etiology of stricture that may be displayed in the history of the case, are injury to the abdomen, strangulated hernia, typhlitis, perityphlitis, and diarrhœa. If, however, we consider the frequency of these affections on the one hand and the comparative rarity of cicatricial stricture of the bowel on the other, it will be seen that a history of any of these affections in a suspected case will be of but little clinical value.

As to the interval of time that elapses between the causative affection and the symptoms of obstruction of the bowel, the greatest uncertainty exists. Much depends obviously upon the extent of the initial lesion. The only fact that is to any extent constant is the circumstance that the evidences of stenosis will appear at an earlier date when the lesser bowel is involved than is the case when the stricture implicates the colon.

In two cases of stricture of the small intestine following injury, three and four months respectively intervened between the lesion and the appearance of obstruction symptoms. In four cases of stenosis of the ileum following upon strangulated hernia, the interval that elapsed between the reduction of the rupture and the onset of symptoms of stricture was one month, six weeks, seven months, and "some years" respectively.

With regard to the large intestine I find that periods often of several years have elapsed between an attack of dysentery and the appearance of obstruction symptoms due to contraction of the dysenteric cicatrices. Rokitansky mentions a case where symptoms of constriction of the bowel did not appear until thirty years after an attack of dysentery. I find a case of stricture of the ileo-colic valve that induced symptoms eleven years after a typhlitis, and an instance of stricture of the hepatic flexure of the colon

that produced evidences of constriction twelve months after an attack of severe diarrhœa.

The symptoms that precede the actual evidences of obstruction in cases of cancerous stricture will be considered when dealing with the general symptoms of those stenoses.

THE SMALL INTESTINE—SIMPLE STRICTURE.

Mode of onset and general course.—The simple stricture of the small intestine belongs distinctly to the chronic variety of intestinal obstruction. The symptoms are usually extended over a comparatively long period of time, and become, as the case advances, progressively worse. The stenosed canal simply becomes narrower and narrower until at last it produces a degree of obstruction that, either from its long duration or its completeness, leads to results that produce death. Thus it happens that many cases of this form of constriction develop very slowly and very insidiously, follow a tedious course and bring about gradually a fatal result. While this can be said of many cases it cannot be said of the majority. Owing to the fluid character of the contents of the small intestine it happens that the stenosis may become pronounced before very serious symptoms are produced. But the narrow stricture is constantly liable to be abruptly closed. A valvular fold of mucous membrane is laid across it, or it becomes suddenly plugged by a mass of undigested food, or a foreign substance that has been swallowed, or the involved coil of gut may become abruptly closed by kinking or by some of those methods of producing obstruction that depend upon adhesions.

Thus it happens that in the clinical history of stricture of this bowel we very often find the symptoms of chronic obstruction ending in an attack of acute obstruction that has a fatal issue. Before

the final attack the patient may have had several previous attacks of similar nature, from which, however, he has recovered, the lumen of the tube becoming restored. Lastly it may be that the bowel has become gradually much narrowed without any symptoms having been excited that have caused attention. The narrowed tube is suddenly occluded by some of the means just alluded to, symptoms of acute obstruction develop which may rapidly lead to death. Thus there are cases of cicatricial stricture of the lesser bowel that have appeared with all the evidences of acute obstruction, the patient having been free from any marked symptoms of abdominal trouble at the time of the onset of the attack. Examples of such cases will be detailed subsequently.

Symptoms.—The course of the disease is extremely irregular and is marked by great fluctuations in the occurrence and nature of the symptoms.

The most conspicuous and constant feature consists in certain **attacks of paroxysmal pain** that occur at intervals. The pain in these attacks is of the nature of colic and is often severe. It is associated with constipation and is usually attended by vomiting. The colicky pains are often described as radiating from the navel, and are never, so far as I can ascertain, distinctly localised in any one part. It is most significant to note that these attacks usually come on after food, and as a rule some three or four hours after the taking of the food. Sometimes they appear at a shorter interval after meals, but very rarely at a longer. These attacks may begin most insidiously, may appear in patients who present absolutely no abdominal symptoms, or, as is more usual, come on after a long continued intestinal disturbance, sometimes marked by diarrhœa, but more often by constipation. At the commencement the patient often complains merely of indigestion and flatulency after

food. In time the attacks become more definite and more severe, until at last the individual is liable from time to time to sharp paroxysms of colic associated with vomiting and other symptoms.

In other instances the individual attacks are somewhat severe from the first. They may appear once a month or once in three or four months. They may last several hours or even days. During the intervals between their appearance the patient may be well, or have a little indigestion, or be troubled, as is very common, with constipation, or with diarrhœa alternating with constipation.

In any case, as time advances the attacks occur more and more frequently, while at the same time they lessen in duration. At last the patient may have attacks of pain every few hours or every quarter of an hour, each attack not lasting probably more than two or three minutes. There is every reason to believe that the attacks of pain are due to a temporary blocking of the stricture. This blocking is effected by imperfectly digested food or fæcal matter, aided possibly by some kinking of the bowel incident to peristaltic movements passing through a diseased segment of intestine. In some cases it is possible that kinking is a conspicuous feature in these attacks. So long as the stricture is of good size it will be obvious that these obstructive attacks can only occasionally occur, and thus we find that they appear at very irregular intervals; at first at intervals that may sometimes be reckoned by months, and at others by weeks or even days. As the stricture becomes narrower the obstruction becomes more abiding.

The attacks become much more frequent and more constant and at the same time their duration is lessened. The obstructive paroxysms are now brought about by ordinary intestinal matters and are

not dependent upon exceptional masses of unassimilated food.

The association of these attacks with the ingestion of food is a matter of great importance and of much diagnostic value. Usually the patient recognises the association and has to exercise great care in his diet. In several instances the attacks were warded off for a long while by adopting a perfectly fluid diet, and reappeared at once on any relaxation of the rule.

Some of the earlier attacks are not unlike attacks of subacute obstruction, but as the case advances the chronicity of its course becomes evident. The patient is seen to be suffering from some grave intestinal disturbance associated, among other features, with attacks of pain that are of a paroxysmal character and appear at frequent intervals.

In most instances the patient dies of a definite obstructive attack. The stricture becomes actually or practically closed, and, no passage being re-established, death ensues.

It is well to note that when complete obstruction sets in the character of the pain changes. It becomes continuous, being, however, at the same time liable to exacerbations at intervals. Unlike the previous attacks, the patient is not now free from pain in the intervals.

Vomiting in these cases, although a constant symptom, is by no means a very pronounced or distressing one. During the more severe of the earlier attacks (attacks that occur at long intervals and last some time) vomiting is present. It appears late and is often scanty. If the attack, however, last for some time, a matter of days, the vomiting is apt to become feculent, although examples of this are infrequent.

As a rule the vomiting only becomes feculent towards the termination of the final attack of

obstruction. In these attacks it may be severe, but it scarcely ever reaches the severity of the vomiting seen in cases of acute obstruction.

The symptom shows great fluctuation. During the final attack of occlusion the vomited matters may become feculent, the sickness may then abate and only alimentary and bilious matters be rejected. After awhile the vomit may again become stercoraceous. The symptom depends in a marked manner upon the degree of the obstruction, and fæcal vomiting never appears until absolute constipation has become a pronounced feature.

As may be gathered from what has been already said, **the state of the bowels** is subject to the greatest variation. In about 60 per cent. of the cases constipation is the predominant feature. In something less than 40 per cent. there is constipation alternating with diarrhœa; but in only a very few cases is diarrhœa the more usual condition of the bowels. During the initial attacks, and during the final attack, constipation is almost invariable and may remain absolute for many days or even for two or for three weeks. The constipation at first yields to treatment, but soon becomes more and more obstinate. It is important to note that the earlier attacks are often at once relieved by an aperient. The purge would not only render the intestinal contents more fluid, but would remove the cause of the obstruction, if it be a mass of undigested matter. Like relief may follow the use of an enema.

Sometimes an attack of long-continued constipation is suddenly relieved by a copious and spontaneous stool. In such cases the plug or other obstructing agent has probably abruptly yielded.

It is not very uncommon for the patient, after days or weeks of absolute obstruction, to pass a copious motion just before death. This indicates, I think, in

nearly every case a perforation of the bowel. A pressure within the intestine is removed by this perforation, and one factor in the production of the occlusion being removed, the stricture yields for the last time.

In only one case was there any **tenesmus.** It was in a case of stricture following strangulated hernia, and was apparently very slightly marked. The stenosis was in the lower part of the ileum.*

As regards the **general condition** of the patients, it only remains to be said that they become progressively weaker as the disease advances, being worn out by the frequent attacks of pain and vomiting and enfeebled by the loss of appetite that is often a conspicuous symptom. Emaciation is usually pronounced, and the patient's wasted and cachectic aspect may be such as to suggest the presence of malignant disease.

The **state of the abdomen.**—The abdominal walls remain flaccid except during some of the more painful paroxysms or after the development of peritonitis.

During the duration of the attacks of obstruction there will be some meteorism which, however, is never excessive. In the intervals between the attacks the abdomen will not be swollen, and its walls indeed are commonly retracted in cases associated with much wasting and with diarrhœa.

It is very usual for the movements of the intestinal coils to be visible through the parietes, a circumstance that is to be especially noticed during the paroxysms of pain.

In no instance among the reported cases was any tumour to be felt, nor any localised dullness present that could assist in the diagnosis of the ailment.

* Bull. et Mém. de la Soc. de Chir., tome vi., 1880, page 607; M. Berger.

Cases with an acute course.—It has already been said that cases of stricture of the lesser bowel are usually attended by certain painful attacks at intervals, which indicate a temporary obstruction of the strictured part. It may be readily understood that the first occurrence of this obstruction may also be the last; that, in fact, the stenosis, after existing for some time without causing symptoms, may become suddenly occluded, and that that occlusion may bring about a fatal issue. Such a case is reported by Réfrégé. It concerns a man, aged forty-nine, who had been liable for some months to constipation. For some days before his admission into hospital he had had some pain in the lower part of his abdomen. On admission the limbs were cold and cyanosed, the face livid, the eyes sunken, the patient much troubled by vomiting, and the pulse very small and feeble. There was constipation. An epidemic of cholera existed at the time, and the case was taken for an example of that disease. The patient was treated with hot baths and by such measures as were then in vogue for the treatment of cholera. He died on the eighth day after admission. Before his death stercoraceous vomiting had occurred and the general character of the case had been recognised. The autopsy revealed a stricture in the lower ileum that would barely admit a crow-quill.* Another very interesting case is reported by Dr. Platt. In this instance the patient, a child aged nine, appears to have had no evidence of previous abdominal trouble. The symptoms of obstruction appeared suddenly, and rapidly assumed an aspect of great gravity. Death took place on the seventh day. The case had been diagnosed as acute intussusception. The autopsy revealed a stricture of the lower extremity of the

*Le Diagnostic de l'Étranglement intestinal à Symptomes choléiformes, by Félix Réfrégé. Paris, 1867.

ileum, which had become obstructed by a plug of clayey fæces.*

THE SMALL INTESTINE—CANCEROUS STRICTURE.

The **symptoms** of this form of stenosis are practically identical with those just detailed as incident to simple stricture. In perhaps the majority of cases it would not be possible to distinguish one from the other. Taking a general view of the cases collected, it will be seen that in "cancerous" stenosis there are the same paroxysmal attacks of pain and the same general symptoms with regard to the state of the bowel, the nature of the matters vomited and the physical condition of the abdomen. The usual tendency is towards constipation, although there are cases marked by diarrhœa or by constipation alternating with diarrhœa. The tendency to fæcal vomiting is about the same. In one case of so-called "colloid cancer" of the lower ileum there was complete constipation for fifty days before death, with feculent vomiting that appeared some thirty days before the termination of the case. The vomiting, even after it had become stercoraceous, ceased for a while (for twelve days), and on recommencing no longer presented the stercoraceous character.†

The duration of the symptoms is certainly longer in cases of cancerous stricture than it is in those of simple stricture. It would be, perhaps, more correct to say that the symptoms appear earlier in the former than in the latter form of obstruction. In no instance could the malady have been said to pursue a subacute course. In the least chronic case the symptoms had lasted for at least four and a half weeks before death. In several instances distinct relief attended the administration of aperients.

* *Lancet*, vol. i., 1873, page 42.

† Dr. Hilton Fagge; Guy's Hospital Reports, vol. xiv., 1869.

In one case of "cancer" involving the lower part of the ileum there were severe and repeated hæmorrhages from the anus.* The case was associated with persistent diarrhœa. In these forms of stricture there appears to be more pain than in the simple forms, and especially is there more frequently a fixed pain, which may exist in addition to the pain that is paroxysmal.

Emaciation is much more marked, appears earlier, and advances more rapidly. There is also, throughout the case, a more distinct impairment of the general health.

In three out of the ten instances of cancer of the small intestine that I have collected the new growth formed a distinct *tumour* that was readily felt through the abdominal parietes.

Duration and prognosis.—In two of the cases of simple stricture, intestinal symptoms, as already mentioned, existed for not more than eight days before death. In another case (that of Kœberle's) the symptoms of stricture had existed for two or three years before the patient was relieved by operation. Putting aside these exceptional instances, I find that the average duration of the remaining thirteen cases was three months. By the duration of the disease is merely meant the interval of time between the first appearance of obstruction symptoms and the termination of the case.

Kœberle's patient recovered after resection of the diseased intestine. The cause of death in the remaining cases was as follows: Two died after operation, eight of perforation, and five of exhaustion attending upon persistent obstruction.

The average duration of the cases of "cancer" was five months. In one case death followed upon operation, in two cases it was due to perforation, in three to acute peritonitis independent of perforation, and in the remaining four instances to exhaustion.

* Bull. de la Soc. Anat. de Paris, 1875, page 299.

The **prognosis** in stricture of the small intestine is absolutely unfavourable unless the case be relieved by operation. In instances of malignant stricture it will be obvious that even an operation, successful at the time, can only lead to temporary relief.

Spontaneous relief to the obstructed part may be given by ulceration of the bowel above the stricture. By means of such ulceration this part of the intestine may communicate with the bowel below the seat of the stenosis and through this communication the intestinal contents may be passed along. Although I am aware of no actual case where continued relief was obtained by these means, yet many cases show that it is quite possible, and indeed in one reported instance of stricture of the ileo-cæcal valve this method of spontaneous cure had taken place. In this instance the ileum above the stricture had communicated with the colon below it.*

It would be quite possible also for a fæcal fistula to form above the stenosed part, which, by a communication with the surface, would play the part of an artificial anus. In a case under my care at the London Hospital an obstruction existed in the small intestine due to a matting together of the coils of the bowel. The mucous membrane had become the seat of tubercular ulcers, one of which had led to perforation, and subsequently to a fæcal fistula discharging near the umbilicus. Through this fistula the contents of the bowel were passed, and for many weeks before death no fæcal matter was passed in any other way than through this abnormal passage.

STRICTURE OF THE ILEO-CÆCAL VALVE.

No distinctive symptoms attend stricture of this part. They are practically identical with those associated with stenosis of the small intestine. Of the

* Path. Soc. Trans., vol. xxi., 1870, page 171.

eight examples I have collected, two patients died of causes not directly connected with the obstruction. In the remaining cases there was, among other symptoms, vomiting which became feculent in two instances, remained non-stercoraceous in three, and is indefinitely described in one example. In each instance the general condition of the bowels was that of chronic constipation. In no case was any tumour detected. As regards the duration of the symptoms, in one recorded case they appear to have existed for less than one month before death. In this example the valve was occluded by a new growth. In Dr. Wickham Legge's case obstruction symptoms had existed at intervals for at least eleven years. It is supposed that the stricture was in this instance congenital. In the remaining cases the average duration of the symptoms before death was seven months.

Two patients, as already noted, died of causes not directly connected with the obstruction. Of the rest, one died after operation, two from perforation, while three succumbed to the effects of long-continued obstruction of the bowel.

THE LARGE INTESTINE—SIMPLE STRICTURE.

The **symptoms** of stenosis of this part have a considerable resemblance to those depending upon stricture of the lesser bowel. In many instances it is difficult and even impossible to precisely differentiate simple stricture localised in these two segments of the intestine.

The most conspicuous symptom consists of attacks of **paroxysmal pain** that appear at intervals. These attacks much resemble those already described when speaking of the lesser bowel. They may be the first indications of the disease, but usually appear after some such intestinal disturbance as chronic constipation, or constipation alternating with diarrhœa. They

depend, no doubt, upon some temporary obstruction of the stricture. The pain is usually less severe than is the case in the paroxysms attending stricture of the small intestine. There is also less vomiting which will appear later in the attack, will be comparatively scanty, and will never be stercoraceous unless after many days of absolute constipation.

The interval of time between the earlier attacks is often considerable. Thus in one case nine months elapsed between the first and second attacks. In other instances there have been three or four attacks a year for some years. As the stricture narrows these occurrences become more frequent and more troublesome.

Unlike the strictures of the small intestine, stenosis of the colon is generally unattended by symptoms of the nature of indigestion. There is usually no connection between the attacks of pain and the ingestion of food. Indeed, in only one of the recorded cases have I found this connection. The case in question was one of simple stricture at the hepatic flexure. Attacks of pain and vomiting came on some two or three hours after nearly every meal, so that the patient at last became almost afraid to eat.*

The attacks in cases of stenosis of the lesser bowel are commonly relieved by the administration of a purge. In cases, however, involving the colon the opposite obtains. Aperients are apt to aggravate existing symptoms, a circumstance that depends, no doubt, upon the more solid character of the contents of the larger bowel. The final obstruction is usually preceded by many attacks of paroxysmal pain. Between these attacks the patient may feel fairly well, although he is usually troubled by constipation, or by constipation alternating with diarrhœa and with much flatulence. When the obstruction becomes absolute

* Bull. de la Soc. Anat., 1870, page 322.

the character of the pain changes, just as is the case in the small intestine; it ceases to be distinctly intermittent and becomes more continuous.

The prevailing **condition of the bowels** is one of chronic constipation, that is now and then associated with a little spurious diarrhœa, just as is seen in cases of stricture of the rectum. In thirteen cases of simple stricture constipation was the prevailing condition in eleven instances. In the remaining two examples there was constipation alternating with marked diarrhœa. The final attack is characterised by absolute constipation. Nothing may pass the rectum for ten or twenty days before death. In some cases the period of absolute constipation has exceeded these limits, and has attained a duration of thirty* and even of forty days.† During the earlier attacks there is also constipation.

The constipation at first yields to aperients or enemata, but in time becomes more and more obstinate. Enemata usually act more efficiently than purgative medicines. It has been shown that in some cases water can be injected through the stricture from below, but not from above.

Vomiting is even less marked in stenosis of the colon than in that of the small intestine. In the earlier attacks it may be entirely absent, or appear late and be very scanty. In the more serious attacks vomiting is more frequent, and in the final attack it is constant. It is seldom a distressing symptom and often fluctuates in severity, being sometimes absent for days even during the final obstructive attack. It is rarely feculent except during the obstruction that immediately precedes death. Even in such a circumstance the cases of stercoraceous vomiting are to those of non-feculent vomiting as five to seven. Feculent

* Dr. Coupland; Path. Soc. Trans., vol. xii., page 94.
† *Lancet*, vol. ii., 1869, page 80.

vomiting depends more upon the duration and completeness of the occlusion than upon its situation in the colon. There are, however, some striking exceptions to this. Thus, in the two cases above alluded to, where the duration of complete constipation was respectively thirty and forty-six days, the vomiting was not severe and never became feculent.

In another case the ejected matters did not become stercoraceous until the fourteenth day of absolute constipation, the patient dying about the sixteenth day.

Sometimes the vomiting appears at fairly regular intervals, as in one case of stricture of the sigmoid flexure, where the patient vomited every half hour with some regularity.

Among the more special symptoms may be noticed the occurrence of **tenesmus.** This is especially apt to occur in cases of stricture low down in the colon, and particularly in cases associated with diarrhœa. It is more marked in the early than in the later stages of the disease, and is, I think, not present in more than one-third of the cases.

In several instances of stricture in the sigmoid flexure the motions passed have been distinctly flattened or otherwise altered in shape. When the stricture is in a higher part of the colon the fæcal matter passed through the stenosed part becomes remodelled in the lower portions of the bowel as it passes towards the rectum.

In one case the patient was for a while troubled with stranguary.

The **general condition** of the sufferer in these cases may be expressed in the same words that have been applied to the cases of those afflicted with stricture of the lesser intestine.

The abdominal walls remain flaccid unless some peritonitis has developed. There is but little meteorism

so long as the bowels act, and in cases associated with diarrhœa the parietes may be retracted. As the obstruction becomes more complete the abdomen becomes more and more distended, and in fatal cases there may be a considerable enlargement of the belly by the time that death occurs. Very often the outline of the colon distended with fæcal matter is very evident, and in any case the distension will be most marked in those parts of the abdomen that are occupied by the large intestine. The outline of the colon, moreover, may be indicated by some dullness on percussion, while the region of the small intestine remains tympanitic.

Often large fæcal masses can be felt in the bowel above the obstruction, masses so prominent as to sometimes form very distinct tumours, the nature of which has not always been accurately diagnosed.

Great assistance in the diagnosis of the seat of the stenosis is afforded by the auscultation of the abdomen during the administration of enemata, and by these means it is possible in some cases to arrive at a very correct knowledge of the site of the trouble.

A stricture in the sigmoid flexure or even in the lower part of the descending colon may be felt by the finger when the entire hand is introduced into the rectum. Dr. Sands, however, reports a case where a stricture situated within fifteen inches of the anus was not recognised, although the entire hand had been introduced so far as the sigmoid flexure.*

CANCEROUS STRICTURE.

In the stenoses of the colon described under this heading the **symptoms** that arise so closely resemble those appertaining to simple stricture that little more is required than to point out certain matters of difference.

* *New York Med. Journ.*, vol. xix., 1874, page 622.

The duration of the symptoms is a little longer in cases of so-called cancer than it is in the cicatricial stenoses. Duration of symptoms, however, need not correspond with duration of disease, and of these cancerous obstructions it would be more correct to say that they lead to the production of evidences of occlusion at an earlier period than do the other species of stricture.

In some instances the patient has had symptoms of narrowing of the intestine for twelve and even for twenty-four months previous to death, and the autopsy has then revealed a stricture of a "cancerous" character. I think that in these cases the "cancer" may either have been an innocent growth or that an epithelioma may have developed upon the tissue of a cicatrix that had caused some symptoms for months.

The general course of the malady resembles that of stricture generally. There would appear to be more pain than is common in non-cancerous cases, and it is usually of a more fixed character.

In one case the malady appears to have commenced with severe pain in the back that lasted for two or three months. The stricture was, in this instance, in the sigmoid flexure.* The pain is often worse just before an action of the bowels, a circumstance that is especially to be noticed in stricture low down in the colon. It is also apt to be increased by the use of aperients.

The general state of the bowels is a little different from that usual in the previous class of stricture. The malady would appear to begin often with diarrhœa, followed by diarrhœa alternating with constipation and then ending in a constipation that is more or less obstinate. From an analysis of twenty-eight cases it appears that in fourteen cases constipation was the prominent state of the bowels, in eleven

* *Lancet*, vol. i., 1875, page 369.

instances there was an alternation of constipation with marked diarrhœa, while in three cases diarrhœa was the predominant feature.

The cases of diarrhœa and of constipation alternating with diarrhœa mostly concerned the higher part of the colon, while nearly all the instances of obstruction in the sigmoid flexure were attended by constipation as the most pronounced condition.

The fatal termination is usually preceded by a period of absolute constipation, although this circumstance is not quite so common as it is in cases of cicatricial stricture. The duration of this fatal obstruction varies from a few days to two or three weeks. In one patient, whose case is recorded by Mr. Cooper Forster, no motion was passed for eighty-eight days before death.* Absolute constipation for thirty days is not very uncommon.

When the obstruction involves the sigmoid flexure the motions, when solid, are often flattened or much narrowed, or in other ways altered in outline.

A bloody discharge from the anus is met with in about 15 per cent. of all the cases, and is mostly observed in connection with strictures of the sigmoid flexure.

Tenesmus is more common in this form than in the previous one. It is the more frequent the nearer the occlusion is to the anus, and is most usually met with in cases associated with diarrhœa or with constipation alternating with diarrhœa.

Vomiting nearly always appears at some time during the progress of the malady. It usually sets in late, is very irregular in its occurrence, is scanty, and seldom becomes a very distressing symptom.

In one case reported by Dr. Bristowe vomiting occurred during the early but not during the final

* Guy's Hosp. Reports, vol. xiv., 1869, page 377.

attack, in spite of there being pronounced constipation.*

In not a few instances the vomiting was quite insignificant in amount and the cause of comparatively little trouble to the patient. Out of twenty cases, the vomited matters became stercoraceous in eight instances and remained throughout non-feculent in twelve. Most of the instances of feculent vomiting occurred in the final attack and were associated with constipation. Among the cases of feculent vomiting were the greater number of the cases of stricture high up in the colon. In the case already alluded to, in which there was absolute constipation for eighty-eight days, the vomited matters never became stercoraceous.

The **general condition** of the patient is similar to that described in speaking of cancerous stricture of the lesser bowel, with the exception, perhaps, that emaciation proceeds less rapidly.

Nothing especial remains to be noted as to the physical condition of the abdomen. The coils of intestine are usually distinctly visible, especially during the occurrence of paroxysms of pain, just as is the case in the simple strictures.

From an examination of the recorded cases it would appear that an abdominal tumour has not been observed in more than 40 per cent. of all the cases, understanding the term "tumour" to refer to a mass formed by the new growth itself. In some of these recorded instances the abdomen was not especially examined for evidences of a tumour. In others, a tumour that might have been detected in a flaccid abdomen was concealed by the meteoristic condition of the belly. Then again a new growth situated in the hepatic or splenic flexure may attain considerable dimensions before it becomes large enough to be evident upon the surface. Moreover the

* Path. Soc. Trans., vol. xxiii., page 119.

epitheliomatous stricture very commonly leads to no tumour at all in the sense of a mass that projects beyond the normal lines of the intestine.

Duration and prognosis.—The average duration of the symptoms in simple stricture of the colon is five months and in the so-called cancerous stricture six months. In a few instances the earlier symptoms have been so insignificant that little has been noticed in the record save the final attacks, and such cases would appear to show examples of stricture fatal in sixteen days or even less. The fallacy in such cases is obvious. In thirteen cases of cicatricial stenosis the causes of death were as follows: operation 2, perforation 4, peritonitis independent of perforation 2, and exhaustion from the effects of persisting obstruction 5.

Out of a total of twenty-eight instances of "cancer" of the colon four patients recovered after operation, six died within a short period of operation, five deaths were due to perforation, and four to peritonitis apart from perforation, while nine died from exhaustion incident to persistent obstruction and to the constitutional effects of the neoplasm.

The prognosis in all forms of stricture of the colon is entirely bad provided that the stenosed part be narrow enough to offer a definite obstruction.

The only prospect of spontaneous relief is afforded by ulceration of the gut above the stricture and the subsequent formation of a fistula which can act the part of a præternatural anus. Thus a fæcal abscess may form in the subserous connective tissue and be evacuated externally either by nature or art; * or the intestine above the obstruction may communicate with the gut below it, as is possible in a case of stricture in the lower part of the sigmoid flexure, where the flexure is much distended and freely movable;

* Dr. Dickinson, case; Path. Soc. Trans., vol. xxiii., page 161.

or, lastly, the fistulous opening may discharge itself through the wall of the bladder or vagina.* Such attempts at spontaneous relief are efficacious only for a little while and the changes that attend the formation of the fistula usually lead to such further destructive processes as are incompatible with life.

CHAPTER XIV.

OBSTRUCTION OF THE INTESTINE BY NEOPLASMS.

In addition to the malignant growths from the bowel to which attention has been already directed, notice must be taken of certain benign neoplasms that sometimes lead to obstruction. In the production of such stenoses it is possible to recognise many different forms of innocent tumour.

1. **Adenomata.**—These grow from the mucous membrane and appear to have their origin in the follicles of Lieberkühn. They present on section a number of tubes, passages, and spaces, all lined with columnar epithelium and supported by connective tissue that may vary in structure from a lax myxomatous meshwork to a substantial fibrous substance. It is upon the character of this supporting tissue that the physical characters of the growth in some part depend, the laxer tissues forming soft, and the denser structure firm, polypoid masses. The mode of origin of these growths has been very elaborately described by Mr. Harrison Cripps, in regard, at least, to their appearance in the rectum. It would appear that the line of demarcation between them and the cylindrical epitheliomata is very faint, and that one

* Mr. Simon, case; Path. Soc. Trans., vol. i., page 264.

species of growth may shade off, as it were, into the other. The majority of these growths assume the aspects of a projecting tumour and have been described under the names of papilloma, fibrous, or mucous papilloma, benign villous polyp and the like. Sometimes the neoplasm spreads laterally under the immediate surface of the mucous membrane, producing the growth known as a "flat adenoma."

These adenomata are most frequently met with in the rectum and colon and form the commonest variety of benign growth. They frequently occur in children, and are perhaps more often multiple than single.*

2. **Fibromata.**—These are said to arise from the submucous tissue. A large number of growths are described as "fibrous polypi," but reliable microscopic evidence is wanting to show that even the majority of these are composed of fibrous tissue. It is probable that they belong rather to the next variety.

3. **Fibro-myomata.**—Several examples of this kind of benign growth have been placed on record, the nature of the tumour having been verified by microscopical examination. They arise from the submucous and muscular coat, and have an arrangement of parts like that seen in simple fibro-myomata of the uterus. Those having origin from the submucous coat spring, no doubt, from the mucosa muscularis.†

4. **Lipomata.**—These growths spring from the submucous layer, take a polypoid form, are often multiple but seldom of great size.‡

5. Among the still rarer growths may be mentioned **angiomata,** examples of which have been described by authors. Some of these are probably in reality very vascular fibro-myomata.

* *See* a remarkable case reported in the *Brit. Med. Journ.*, March 1, 1884, page 410.

† *See* specimen in Lond. Hosp. Museum, No. Ad. 41.

‡ For specimen *see* Lond. Hosp. Museum, No. Ae. 45.

Rokitansky has described cases where multilocular cysts filled with serum were found partly embedded in the intestinal wall. It may be that these were cystic adenomata.

Considered collectively, benign tumours of the intestine are usually met with in the form of polypi. As such they may have very distinct pedicles. In a case of Sir Prescott Hewett's the pedicle was the size of the finger and one and a half inches in length. In shape they are round, oval, or pear-shaped. In size they vary from the dimensions of a pea to that of a small orange or a pear. They are usually covered by normal mucous membrane, which may, however, be in a condition of ulceration. As regards their place of origin, the great majority, probably not less than 80 per cent., are met with in the rectum. Next in frequency comes the ileum and then the colon. They are rare in the jejunum and still rarer in the duodenum. As regards the small intestine, the favourite site is the lower extremity of the ileum.

The growth is usually attached to the convex border of the gut, or at least away from the mesenteric border. It is not uncommon for the polyp to drag in that part of the intestinal wall to which it is attached and so produce a depression or umbilicus upon the surface of the gut. In one case, where an intussusception had been produced, this depression was sufficiently deep and definite to admit the tip of the little finger.*

Benign polypi are often very numerous. Allusion has already been made to an instance where no less than thirty of such growths were found in the lower ileum. The occurrence of three, four, or five polypi in the same division of the bowel is quite common.

Benign growths of the intestine may give rise to no symptoms during life and may even attain large

* M. Fernet; Bull. de la Soc. Anat., 1863, page 296.

size and become quite numerous without affording any evidence of their existence. Thus, in two cases of very large polypi of the ileum, reported by Sir Prescott Hewett, no symptoms appear to have been induced until an intussusception arose. One of these growths was as large as a pear, the other measured two and three-quarter inches by one and a half inches.* These polypi most usually cause symptoms when in the rectum, producing tenesmus, bleeding from the bowel, difficult defæcation and a sense of a foreign substance in the gut. The same symptoms in a less marked degree may attend growths arising from the sigmoid flexure.

In other parts of the intestine the polyp usually causes obstruction, if it occlude the gut at all, by inducing an invagination. This is particularly the case with such as grow from the ileo-cæcal valve and from the terminal part of the ileum. Benign tumours have also produced intussusceptions in other parts of the bowel, in the rectum, in the sigmoid flexure, and in all parts of the colon.

When the mass is of large size, or when the growths are multiple, symptoms of obstruction may be produced that more or less closely resemble the symptoms of stricture, save that they are usually more chronic and for a while at least less marked. Some of the most marked examples of this form of obstruction have been met with in connection with growths springing from the margin of the ileo-cæcal valve.

So far as I am aware, it would be impossible to diagnose cases of obstruction due to simple neoplasms from cases of stricture. I can find no instance recorded where the growth was felt through the parietes during life, except perhaps when associated with an invagination.

In one or two instances these polypi have excited

* Path. Soc. Trans., vol. i., page 95.

some chronic peritonitis in the wall of the bowel from which they have taken origin.

In a few cases the polyp has separated from its attachment and has been passed per anum. This mostly occurs in connection with such growths as spring from the rectum or sigmoid flexure; although I am disposed to believe that some reported cases where strange fleshy masses have been passed with motions might have been examples of the spontaneous removal of a polyp. An excellent example of separation of such a tumour from the sigmoid flexure or rectum is reported by M. Afezou. It concerned an old woman, aged eighty-three, who had been troubled for a number of years with indigestion, attacks of colic and constipation alternating with diarrhœa. At last the constipation became so pronounced that no relief to the bowel could be obtained except by enemata. One day after an examination of the bowel a soft mass was passed. It proved to be a lipomatous polyp. All the patient's intestinal troubles at once ceased and the bowels became regular again.*

Sarcomatous tumours have been met with in the intestine both as primary and as secondary growths. They are usually of the spindle-celled variety, and are, according to Leichtenstern, very seldom of the small-celled kind. They very rarely indeed appear as polypi, but rather tend to spread around the bowel, and then probably produce one form of what is vaguely known as a "cancerous" stricture. To this allusion has been already made.

In a specimen in the London Hospital Museum is shown a tumour that is apparently a primary melanotic growth arising from the ileum. So far as I can ascertain such tumours are extremely rare. The case from which the specimen is taken is peculiar. The

* Bull. de la Soc. Anat., 1875, page 195.

patient, a woman, died of an intussusception at the apex of which the growth was found. She had a small lump in her groin which was supposed to be a strangulated hernia. It was cut down upon and found to be a gland affected with melanosis.*

Several examples of lympho-sarcoma of the intestine have been recorded in connection with Hodgkin's disease. The neoplasm in these cases appears in the adenoid tissue of the gut and in Peyer's patches, and may attain considerable dimensions. At many parts the whole calibre of the gut has been surrounded by an extensive morbid growth, while in other places only portions of the intestinal wall have been invaded.† The most remarkable feature in these cases is, that so far as recorded examples at present show, no obstruction is usually produced. Indeed, the subjects of the disease appear to have had either no special abdominal symptoms or else a more or less pronounced diarrhœa. Dr. Carrington has recently reported a case where a lympho-sarcomatous mass weighing no less than half a pound occupied the cæcum, and yet no symptoms of obstruction were produced, nor indeed does special attention appear to have been directed to the abdomen during life.‡

* Lond. Hosp. Museum, No. Ad. 48.

† *See* case by Dr. Moxon; Path. Soc. Trans., vol. xxiv., 1873, page 101. And another by Dr. Murchison; ibid., 1870, page 194.

‡ *Brit. Med. Journ.*, vol. ii., 1883, page 773. *See also* observations by Birch-Hirschfeld; Ziemssen's Cyclopædia of Medicine, vol. xvi., page 837.

CHAPTER XV.

COMPRESSION OF THE INTESTINE BY TUMOURS, ETC., EXTERNAL TO THE BOWEL.

Tumours of various kinds and even displaced viscera may press upon some part of the intestine and cause thereby an occlusion of its lumen.

In the majority of the cases this compression has been effected by a tumour having origin in the pelvis.

Thus the bowel may be compressed by a retroverted or retroflexed uterus, especially when enlarged by pregnancy,* or by maglignant or other tumours growing from the uterus,† or by ovarian tumours of any kind.‡ The last-named variety of growth is a frequent cause of obstruction by compression. Leichtenstern has found instances of compression by a large vesical calculus. Mr. Pye gives an example of compression due to a large abscess situated between the rectum and the uterus.§ Dr. Hall Davis has reported a very interesting case in which the cæcum was occluded by the pressur › of a tumour due to tubal pregnancy of the right side.‖ Among other causes of pressure upon the gut may be mentioned subperitoneal tumours, tumours of the mesentery or omentum, various tumours of the kidney, psoas abscesses and abscesses about the cæcum,¶ hydatid cysts,** enlarged

* *Journ. de Méd. de Chir., etc.* Bruxelles, 1867.

† Mr. Gay ; Path. Soc. Trans., vol. iii., page 108.

‡ Le Dentu ; Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 661. Mr. Heath ; Path. Soc. Trans., vol. xvi., page 197. M. Verneuil ; Bull. de la Soc. Anat., 1870, page 411.

§ *Brit. Med. Journ.*, vol. ii., 1882, page 1152.

‖ Path. Soc. Trans., vol. iv., page 230.

¶ Cases quoted by Leichtenstern, loc. cit., page 573.

** Path. Soc. Trans., vol. v., page 302.

spleens.* The duodenum especially may be compressed by tumours growing from the pancreas,† by growths arising from the liver and by masses of enlarged glands about the portal vein. Dr. Baimbrigge reports a case of obstruction of the gut brought about by pressure indirectly exercised by a displaced supplementary spleen,‡ and Dr. Servier quotes an instance where a hypertrophied spleen had dragged upon the pancreas and had displaced it so that it had compressed some coils of intestine that had found their way beneath it.§ Rollet‖ gives an instance of compression by the pedicle of a movable kidney, and lastly cases have been reported where a piece of intestine has been engaged and compressed between the ribs and the convexity of the liver.¶

With regard to the segment of the intestine involved in these cases, the rectum, as it may be supposed, is the part that most frequently suffers. This is owing to the preponderance in the pelvis of tumours capable of exercising this particular compression. The rectum, moreover, is fixed and lies against the solid wall of the pelvis. The parts that are involved next in frequency after the rectum are the sigmoid flexure and the lower ileum. It will be seen that the sigmoid flexure could readily be compressed by a pelvic tumour, and that the coils of small intestine that most constantly occupy the pelvis belong to the lower ileum. I have collected twenty-two examples of this form of compression of the bowel, which may be thus divided with regard to the matter of site. Rectum 10, colon 6, cæcum 1, small intestine 5. Leichtenstern gives the

* Case quoted by Duchaussoy.
† Mr. Nathan; *Med. Times and Gazette,* vol. ii., 1870, page 238.
‡ *London Med. Gazette,* 1846.
§ De l'Occlusion Intestinale, page 47. Liége, 1871
‖ Path. u. Therp. d. bewegl Niere, 1866.
¶ Cases by Lavater and Kellenberg, quoted by Leichtenstern.

following table as a result of the examination of a large number of cases collected by himself.

Compression of the rectum, in	.	.	60 per cent.
,, sigmoid flexure and descending colon, in	.	12	,,
,, lower ileum, in	.	10	,,
,, duodenum, in	.	7	,,
,, ascending colon, in	.	6	,,
,, middle ileum, in	.	4	,,
,, transverse colon, in	.	1	,,

It will be seen that the more fixed parts of the bowel suffer the most, and that the more mobile parts, such as the jejunum and transverse colon, are practically exempt from this form of obstruction.

In all the instances that I have collected the patients were adults.

The symptoms of obstruction that arise in these cases show considerable variety. In no less than twelve out of the twenty-two examples above alluded to the compression led to acute obstruction, the patient dying after symptoms the duration of which varied from two to nine days.

In two instances the symptoms were subacute, the duration being in each case eighteen days. In the remaining eight examples the obstruction produced was of a decidedly chronic character.

The acute cases depend upon sudden compression of the gut due to abrupt change of position in the tumour or in some abnormally arranged viscus, such as an unduly movable spleen or kidney. Or they may be due to kinking of the intestine or to abrupt bending of the more mobile part of the bowel above that fixed by the tumour or to the engagement of a loop of intestine beneath the mass or between it and the pelvic or abdominal walls. The acuteness of the case appears to have nothing to do with the segment of the bowel involved, but to depend solely upon the

abruptness of the occlusion. Many of the more rapidly fatal cases, cases ending in death on the fourth, sixth, or seventh day, have depended upon sudden occlusion of the rectum or of the lower part of the colon. The case alluded to above as fatal in forty-eight hours was Dr. Baimbrigge's case of compression by a displaced spleen. The part of intestine involved was the colon.

The symptoms that appear in these cases are simply those of acute obstruction. There is less pain and less collapse than in instances of strangulation by bands, and the whole progress of the malady is less violent; but the points of difference are not sufficiently accentuated to render a diagnosis certain. In many instances the tumour has been felt and the nature of the case has been from the first evident; but in other examples the diagnosis has been actually complicated by the presence of the tumour. A good instance of the latter condition is afforded by Dr. Hall Davis's case of tubal pregnancy. The patient was aged thirty-two, and was seized with symptoms of acute intestinal obstruction that ended in death on the ninth day. A fixed and tender tumour could be felt in the right iliac fossa, vaginal examination revealed nothing abnormal, and "all certain signs of pregnancy were absent." The tumour depended upon a tubal pregnancy and had occluded the cæcum by pressure.

In some of the cases there had been no evidence of intestinal trouble previous to the final attack.

In certain of the chronic cases the symptoms were precisely like those of stricture of the intestine, the progress of the case being marked by paroxysmal attacks from time to time. In other instances there was simply an increasing constipation that occasioned no great amount of disturbance until it became absolute, and, after resisting all attempts at relief, ended in death.

CHAPTER XVI.

OBSTRUCTION OF THE INTESTINE BY FOREIGN BODIES.

By a "foreign body" as applied to the intestinal tract is meant any substance that can resist the digestive action of the fluids of the stomach and bowels.

These substances may be swallowed by accident, or during fright, or they may be taken intentionally. It would appear that in several instances swindlers endeavouring to pass false coin have swallowed the spurious pieces to escape detection. Some of these foreign substances have been swallowed with suicidal intent. A great many of the reported cases have occurred in the persons of lunatics and in the subjects of hysteria. In not a few instances the substance has slipped down the throat during sleep or unconsciousness from anæsthesia, and this especially applies to false teeth.

These foreign bodies may be conveniently divided into three classes: 1. Rounded or regularly-shaped substances that may be considered capable of passing readily through the intestine. Among such are pebbles, stones, fruit stones, coins, bullets and the like. 2. Sharp-pointed bodies and substances of irregular shape that may readily catch in the mucous membrane or are of an outline that would favour their becoming fixed in the alimentary passages. Such are pins, needles, hooks, plates carrying false teeth, pieces of bone, pieces of metal or of porcelain, nails, screws, and other such substances, many of which have been frequently found in the intestine or have passed

through it. 3. Indigestible materials of small size which are apt to accumulate until they form huge masses. Indeed, the largest foreign substances found in the alimentary canal have been of this character. They are composed of husks of the oat, vegetable fibres, grape skins, or of hairs, or of wool or yarn. The latter materials have either been swallowed as a matter of habit by dressmakers and others, or have been intentionally taken by lunatics and hysterical individuals.

There is no doubt but that the majority of the foreign substances that are swallowed are in time passed by the anus. Most of those placed in the first of the above classes would be so evacuated in the course of a few days or even after forty-eight hours. Others would be retained for a week or fortnight or longer without causing inconvenience. Many foreign substances that may be placed in the second class have also been passed with comparatively little inconvenience. Some of such bodies have lingered in the alimentary tube for weeks, for months, and even for years. How many of these substances pass the pylorus and the ileo-cæcal valve must remain an anatomical mystery. Thus, in the College of Surgeons Museum is a specimen (No. 1,184) showing a dessert-spoon seven inches long and with a bowl one and a half inches wide lying fixed in the cæcum. The spoon is quite unaltered in shape and had been swallowed by a lunatic. Mr. Pollock quotes a case where a plate carrying six false teeth was swallowed and passed at the end of three days. In another like instance where the plate held together four teeth the mass was evacuated per anum at the end of six months.* In Dr. Marcet's celebrated case a sailor swallowed clasp-knives from time to time until

*Holmes' System of Surgery, vol. i., page 910, 3rd ed. Lond., 1883.

he had, in a period of ten years, consumed thirty-seven in all. Many of these were passed per anum entire, others in fragments.* A door-key was passed in another case four days after it was swallowed.† In another instance a piece of a horse-shoe was passed at the end of two months.‡ In the intestine of one lunatic were found three cotton reels, two bandages partly unrolled, some skeins of thread, and a pair of braces. Among other strange substances that have passed the whole length of the alimentary canal may be mentioned the following: a pencil-case, a dagger-blade, a small flute, a long breast-pin, and a brace buckle.

When the foreign substance is not passed *per vias naturales* it is apt to remain lodged in certain special parts of the tube, viz. in the stomach, the duodenum, the lower end of the ileum, the cæcum or the rectum. Of all these situations the cæcum is the one in which lodgment is most likely to take place.

As a foreign body passes along the canal it may cause obstruction at any point, and that obstruction may prove fatal. The progress of the larger and more irregular substance is marked by pain, by attacks of temporary obstruction associated with colic, vomiting, and constipation. In other instances an impacted foreign body has given rise to long continued symptoms of partial obstruction, symptoms that may become very chronic yet never severe.

There is plenty of evidence to show that these bodies may remain for weeks, months, or years in the stomach or in some part of the intestine without causing active mischief, but that, when so lodged, they may almost at any time induce changes leading to

* Med.-Chir. Trans., vol. xii., page 52.
† *Lancet*, vol. i., 1870, page 757.
‡ Ibid., vol. ii., 1874, page 574.

a fatal result. Moreover even when they have been long retained they may be safely discharged by the natural passages. Thus in one of Mr. Pollock's cases a plate carrying false teeth had been swallowed, and after remaining in the stomach for ninety-seven days was finally ejected by vomiting. The impacted foreign substance, however, is very apt to induce some ulceration of the mucous membrane. This may lead to perforation and to fatal peritonitis; or some local chronic peritonitis may be excited in the part lodging the substance and the gut may become thereby narrowed. Such narrowing may increase after the evacuation of the body, and may lead to obstruction. According to Leichtenstern, "foreign bodies give rise, more frequently than gall or intestinal stones, to a constriction by cicatricial bands or chronic peritonitis, at the spot where they have remained for a long time."

In another class of cases the ulceration of the mucous membrane leads to the formation of a fistula through which the foreign body may be discharged. This fistula may communicate with the exterior. Thus in the College of Surgeons Museum is a specimen (No. 1,187) from a boy, aged eleven, where many cherry and plum stones, that had been swallowed, were discharged through an external abscess. The fistula may form between the stomach and the transverse colon, or between the ileum and the colon, or even between the coil lodging the foreign body and the rectum or the vagina. By such fistulous channels has the substance been, after a long interval, evacuated.

With regard to small sharp-pointed bodies, like needles, they may readily penetrate the intestine and work their way to the surface, where they may be recognised and removed. Thus I extracted from under the skin of the groin a needle that had been swallowed by a child some months previously.

The foreign bodies of the third class that cause

obstruction by accumulation may form immense masses. When in the intestine they may lead to chronic and fatal obstruction, or may induce chronic or acute peritonitis. Thus Marshall mentions an occlusion of the duodenum by a pound of pins that had been swallowed.* In an instance quoted by Duchaussoy in his memoir the obstructing mass was composed of seven hundred cherry-stones. In a case recorded by Dr. Quain the mass consisted of four pounds of cocoanut fibre.†

It is unnecessary to deal here with those numerous cases in which foreign substances of various kinds have been accidentally or intentionally introduced into the rectum and have caused more or less obstruction. The matter belongs rather to another branch of surgery.

CHAPTER XVII.

OBSTRUCTION OF THE INTESTINE BY GALL STONES.

The lumen of the intestine may be obstructed at certain points by a gall stone that has entered it from the gall bladder and is passing along its way to be discharged at the anus. In the first place, however, it must be acknowledged that in the great majority of cases the gall stone passes without any difficulty along the intestine, and without, indeed, exciting symptoms of any kind. The instances where obstruction, whether temporary or permanent, is produced must be regarded as quite rare and exceptional, although the gross number of such instances is not small. It may be surmised that a stone that will pass along the

* Med.-Chir. Trans., vol. xxxv., page 65.
† Path. Soc. Trans., vol. v., page 145.

narrow and somewhat rigid bile-duct cannot expect to meet with any obstruction in the intestine. Even the lumen of the ileo-cæcal valve is many times greater than is that of the common duct. But the gall stones that cause occlusion do not usually enter the intestine by the biliary passage. They enter by means of a temporary fistulous communication between the gall bladder and the duodenum. In very rare examples the communication has been between the gall bladder and the colon at the hepatic flexure. Indeed, it appears to me, after examining a large number of cases, that at present decided evidence is lacking that would show that a biliary calculus that has passed along the bile duct is capable of causing obstruction symptoms when it reaches the intestine. In many of the reported cases the condition of the gall bladder is not stated. In a case placed on record by Dr. John Abercrombie it would appear that the calculus had reached the bladder through the duct. The patient was a man, aged forty-five, who died of acute obstruction lasting five days. He had had previous obstructive attacks. In the ileum was impacted a gall stone measuring four inches in its largest circumference and three and a half in its least. The common duct easily admitted a finger. Then in the account comes the following statement, which serves to throw some doubt upon the mode of entrance of the stone: "The gall bladder was in a state of inflammation and was softened and partially disorganised."*

As to the size of the calculus that may cause occlusion it must be noted that stones of considerable dimensions have been spontaneously evacuated. Thus calculi have passed the anus measuring $2\frac{1}{2}$ inches by $1\frac{1}{2}$ inches, and presenting a circumference of $3\frac{1}{2}$ inches. Cases of the evacuation of stones so large as

* Path. and Pract. Researches on Diseases of the Stomach, etc., page 127, 3rd ed. London, 1837.

these are by no means uncommon. The calculi that have been found impacted in the bowels have in many instances attained considerable dimensions. As examples I might mention the following: a stone measuring $4\frac{1}{2}$ inches by $2\frac{1}{4}$ inches lodged in the upper part of the jejunum;* one with a circumference of $3\frac{3}{8}$ inches impacted in the lower jejunum;† one 2 inches in length and with a circumference of 4 inches, also in the jejunum;‡ and another 1 inch in length and with a like circumference impacted in the ileum.§ An interesting case has been recorded of a woman, aged sixty-three, who after presenting for five days the symptoms of complete intestinal obstruction passed a gall stone of more than 1 inch in diameter. She had an irreducible enterocele through which the calculus must have passed.

Some of the larger gall stones appear as casts of the gall bladder which they probably entirely occupied before they were discharged. It must be remembered that a gall stone when once lodged in the intestine may become enlarged by subsequent deposit upon it of earthy matters. Leichtenstern describes such a stone that had a circumference of about 5 inches, and a diameter of about $1\frac{1}{2}$ inches.

The point in the intestinal tube at which the stone lodges is most frequently in the lowest part of the ileum or in the duodenum and commencement of the jejunum. An examination of thirty-two cases by Leichtenstern gives the following result:

In the duodenum and jejunum . . .	10 cases
In the middle ileum	5 „
In the lower part of ileum	17 „
	32

* Mr. E. Pye Smith; Path. Soc. Trans., vol. v., page 163.
† Dr. Baly; ibid., vol. x., page 184.
‡ *Revue Med. de la Suisse Romande*, No. 2, 1882, page 82.
§ Dr. Murchison; Path. Soc. Trans., vol. xx., page 219.

In sixteen recorded cases collected by myself a very similar result is to be noticed.

It is obvious that if the calculus has passed the small intestine and the valve it can hardly become impacted in the colon, although there may be some difficulty in the way of its evacuation from the anus. In all the fatal cases of obstruction by a calculus the impaction has been always in the lesser bowel.

In cases of occlusion by gall stones sex and age have much influence. The condition is much more frequent in females than in males and usually concerns those who have passed middle life. The proportion of females to males is nearly that of four to one. The average age of the patients, as estimated from sixteen cases, was fifty-seven years. They were, with one exception, all over the age of forty. The youngest patient, the exception just alluded to, was a woman aged twenty-seven.* The oldest patient was a woman aged seventy-eight.

With regard to the clinical aspects of these cases it will be evident that there need be no history of hepatic colic in a given instance if it be true that the stone usually reaches the duodenum by ulceration from the gall bladder.

In many of the cases there has been no history of hepatic colic; in others there have been such attacks, which depended, however, most probably upon the passage of smaller calculi previous to the entrance into the bowel of the large stone that caused obstruction. There are instances where the patient was practically free from any abdominal symptoms up to the time of the final obstructive attack. Dr. W. H. Draper has recorded an excellent example of this circumstance.† On the other hand are examples showing evidence of local peritonitis in the vicinity of

* Dr. Peacock; Path. Soc. Trans., vol. i., page 255.

† *New York Med. Journ.*, vol. xxxvi., 1882, page 17.

the gall bladder and associated with symptoms that may be very properly ascribed to the passage of the stone direct from the bladder into the duodenum. As to the length of time that may elapse between the passage of the calculus into the gut and the appearance of obstructive symptoms there is little to be said definitely, owing to the vagueness of the symptoms that mark such passage. In several cases the establishment of a fistulous communication between the gall bladder and the duodenum appears to have been effected without producing any noticeable symptoms.

In many instances symptoms of obstruction have appeared very soon after the supposed entrance of the stone into the bowel, and in other cases a long interval has elapsed. Thus in one example there was evidence of local peritonitis in the right hypochondrium three months before the final attack of obstruction, but in the interval the patient had not been wholly free from intestinal symptoms.* I cannot think with Leichtenstern that so long a period as three years, as he maintains, can elapse between the introduction of the stone into the intestine and the development of obstructive symptoms. Attacks occurring at so long a period before the final attack of obstruction were probably instances of hepatic colic due to the passage of stones along the bile duct, stones that had long since been evacuated from the bowel. In one instance the local disturbance incident to the passage of the stone from the gall bladder into the gut appears to have been associated with very marked symptoms. The patient was a woman, aged fifty-four, who, six weeks before an attack of obstruction that ended in death, had had an abscess opened in the right hypochondrium that was supposed at the time to have been connected with the liver.†

* Path. Soc. Trans., vol. v., page 163.

† *Revue Med. de la Suisse Romande*, No. 2, 1882; Dr. Carrard.

In some cases, and perhaps in a large number of cases, a gall stone of considerable magnitude may pass along the bowel without exciting any marked disturbance, and may indeed only cause trouble when it comes to be evacuated at the anus. In other instances the passage of the calculus is marked by attacks of colic from time to time, by irregularity in the motions, by some meteorism, and by vomiting. The symptoms may be very severe while they last, and indicate, no doubt, a complete but temporary obstruction. The symptoms after being violent are not infrequently suddenly relieved, and the patient passes in a few moments from a state of intense suffering to a condition of almost perfect ease. Such a transition is probably coincident with the passage of the concretion through the ileo-cæcal valve into the colon, where it ceases to give trouble. The length of time that may intervene between an attack of obstruction and the actual passage of the stone may be considerable. It may amount to one or two weeks.

In a great number of the cases *the clinical history* is as follows: The patient dies of an attack of intestinal obstruction that, so far as its duration is concerned, may be called acute. In these attacks there will be pain of a more or less persisting nature and of a colicky character, vomiting that may become stercoraceous, constipation that soon develops into absolute obstruction and more or less meteorism of the abdomen. These attacks do not, as a rule, develop suddenly. They are not associated with the severe pain that marks some forms of acute obstruction, such as strangulation by a band, and as a consequence are not attended by much collapse, if by any at all. The vomiting is often very copious, and in the majority of the cases, where the lower ileum is concerned, becomes feculent before death. There is no marked abdominal tenderness unless peritonitis be

developing, and the amount of meteorism is usually quite slight. I can find no case where any definite tumour was detected, in no such case was there any tenesmus, and in no instance any evacuation of blood.

In one instance, where death followed in five days, the patient, a woman of sixty-nine, was seized with cramps and died comatose.

The average duration of these somewhat acute final attacks is seven days. The shortest period being four days, the longest fifteen days.

These attacks have often been preceded by similar evidences of obstruction, which may or may not have been brought about by the same stone. Thus one patient had two attacks only, the previous one occurring three months before death, another had three attacks that appeared eighteen months, twelve months, and six days respectively before death. In another instance the patient is described as having many attacks of a nature akin to that that proved fatal in the end.

In the intervals between such attacks the bowels have usually been irregular and the patient liable to digestive disturbances and to sickness; or in the absence of such attacks there may have been some intestinal irregularities simply or certain symptoms that would have been associated with the passage of the stone into the intestine.

In another set of cases the obstruction leading to death has been more chronic. There has been, perhaps, absolute constipation for twenty days before the individual's decease, and the progress of the case has been indolent and gradual. Such cases also may or may not have been associated with previous attacks of intestinal disturbance. In these more chronic cases all the symptoms are less marked. The pain may be intermittent, the vomiting is less pronounced and is rarely feculent, there may be some meteorism, and

the coils of intestine may be visible through the parietes.

In a third series of cases the stone would appear to cause but partial obstruction, and symptoms are produced that are identical with those of stricture of the small intestine. That is to say, there are attacks from time to time of paroxysmal pain, some vomiting that rarely becomes feculent until quite the end of the case, and constipation that may not become absolute, and that may be relieved by aperients and enemata. The coils of intestine also will be visible if the patient be thin. The symptoms will often be aggravated by food and, indeed, the whole aspect of the case closely resembles that of a case of stricture. Such cases are apt to end by an acute attack, the partial obstruction becoming complete.

Apropos of partial obstruction, it should be noted that an impacted calculus may in time push out a diverticulum from the intestinal wall and become encysted without offering a great obstacle to the passage of intestinal matters. This is said to occur most frequently in the duodenum, although it has been also met with in the ileum.

It will be obvious that the symptoms will depend somewhat upon the position of the calculus in the intestine. The nearer the obstruction to the stomach the more marked is the vomiting, and the less marked, or the longer delayed, are the evidences of interference with the action of the bowels. In some cases of impaction in the duodenum the vomiting has been very severe. The symptoms have become almost immediately exaggerated by the taking of food, while constipation has not become pronounced until the other symptoms have existed for some time. In the case of Dr. Pye Smith's, already alluded to, the gall stone was in the upper part of the jejunum. The vomiting was profuse, no less than one and a quarter gallons of

bilious fluid having been ejected in forty-eight hours. The patient died on the sixth day after the commencement of the symptoms.

It may here be convenient to note two or three anomalous cases which possess some interest.

It would appear that under some circumstances the obstruction of the intestine is much assisted by an abrupt bending of the bowel at the point of impaction of the stone. Such bending may at least render a partial occlusion a complete one.

Thus, in the case from which Fig. 54 was taken, the gut was not only blocked by a large gall-stone, but the intestine was acutely bent upon itself and fixed in that position by adhesion of its peritoneal surfaces.* In another instance, where such a bend had developed, the calculus was at the extreme angle of the bend, and there is little doubt but that the altered contour of the bowel was the cause of the complete obstruction that existed.† In one remarkable case the pressure of the stone had produced gangrene of the gut in *two* places. The calculus was found in the ileum and was covered by a gangrenous piece of intestine. Higher up in the ileum was another patch of gangrene one inch square. At this point fatal perforation had occurred. The calculus had a circumference of three inches, and the patient, a woman of sixty-eight, had had more or less severe attacks of intestinal obstruction for the six weeks that preceded her death.‡

In a case placed on record by M. Cuffer the patient died of an obstruction situated in the hepatic flexure of the colon. The cæcum was enormously distended and had become perforated. The hepatic flexure was

* Middlesex Hosp. Museum, No. viii. 57. *See also* Path. Soc. Trans., vol. viii., page 231.

† *New York Med. Journ.*, 1882, page 17.

‡ Path. Soc. Trans., vol. ix., page 203; Dr. Scott Allison.

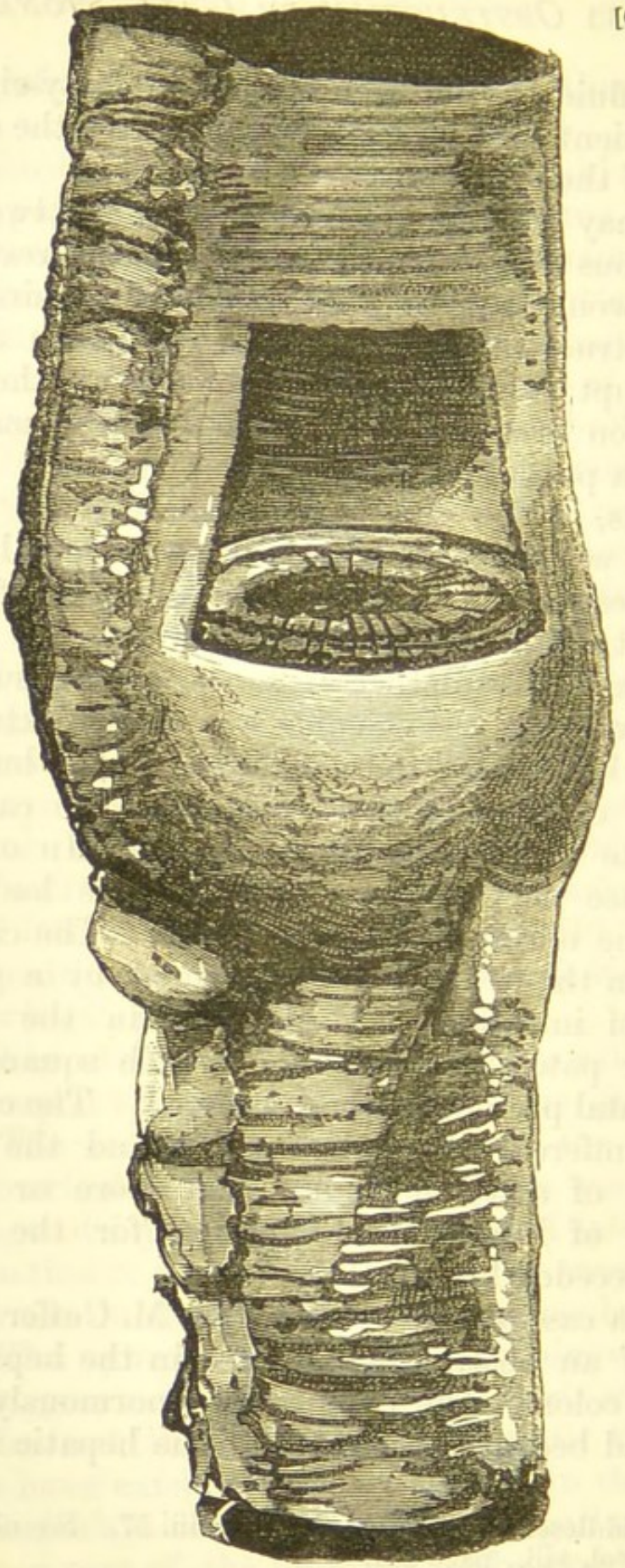


Fig. 54.—Gall Stone impacted in the Ileum. A section has been made of the Gall Stone.

adherent to the under surface of the liver by many adhesions, and among these adhesions was a gall stone, the size of a bean. The bile ducts were in a normal condition, but the gall bladder had been destroyed. The obstruction was due to a narrowing of the colon from contraction of the adhesions. In this case it is most probable that the calculus had set up inflammation in the gall bladder, that that structure had in consequence become adherent to the colon, and that the stone, had the case been a little more favourable, would have been discharged into the large intestine and so have escaped.*

In a case of chronic obstruction, where the diagnosis rested between cancer and impacted gall-stone, a long needle was repeatedly thrust into the abdomen at various points in the hope of striking the stone should one exist. The stone was at last struck at a depth from the surface of four and three quarter inches. No inconvenience followed upon the use of this means of diagnosis.†

In another instance Dr. George Harley ‡ struck an impacted calculus in the bile duct by means of a slender trochar which had been introduced through the parietes to a distance of six inches. The patient died twenty-seven days after the sounding. This and like modes of examination are to be condemned except in very special cases. When a distinct tumour can be felt or when the site of the obstruction is well localised, it may be excellent practice to introduce a needle for the purpose of searching for a gall stone or other foreign substance; but when these indications are lacking I imagine that a surgeon is hardly justified in thrusting a needle vaguely through the abdominal parietes for the purpose of obtaining aid in diagnosis.

* Bull. de la Soc. Anat., 1875, page 176.
† *Med. Record of New York;* Dr. James Whitaker, 1882.
‡ Paper read before Med.-Chir. Soc.; *Lancet*, May 17, 1884.

Fifty such punctures may be made before a gall stone impacted in some parts of the bowel may be hit.

Prognosis.—There is no doubt that by far the greater majority of all gall stones that find their way into the intestine pass through that canal without causing any definite disturbance. Biliary calculi are common enough, but the instances in which they cause intestinal obstruction may be regarded as comparatively rare, and indeed as very rare. Leichtenstern in a total of 1,152 cases of intestinal occlusion from various causes includes only forty-one examples of obstruction by gall stones.

It is still open to some question whether a gall stone that has passed into the bowel along the common duct is capable of producing an obstruction in the intestine, provided that the intestine be normal. The calculus may be arrested above a stricture or above any point the seat of a stenosis; but if it will pass the bile duct it is more than probable that it will also pass the ileo-cæcal valve, especially if we take note of the large and strangely shaped foreign bodies that have succeeded in passing that aperture.

It is true that calculi may become lodged in the cæcum and may cause typhlitis, etc., and some obstruction has been offered by an accumulation of small stones;* but putting these cases aside, the matter remains as we have just expressed it.

Then, again, quite large calculi, calculi that may have entered the duodenum direct from the gall bladder, have passed through the intestine without causing symptoms or at least without producing definite obstruction of the bowels.

Finally there are cases where stones of large size have become impacted, have produced severe evidences of occlusion of the bowel, and have, after a varying interval, been spontaneously evacuated. Indeed, out of

* *See* case by Mr. P. H. Watson; *Edinb. Med. Journ.*, 1868.

twenty cases where gall stones produced definite and severe symptoms of obstruction I find that six patients recovered by the spontaneous passage of the stone, while in the other fourteen instances the obstruction remained unrelieved and led to death.

Spontaneous evacuation of the stone may occur even after symptoms of great severity. Thus, in a case recorded by Dr. C. Martin the patient suffered from absolute obstruction lasting six days, the vomiting became severe and was at last stercoraceous. But on the morning of the seventh day a motion was passed that was followed by the evacuation of a large stone. The patient rapidly recovered.* The concretion had a circumference of three and a half inches.

In another case, quoted by Dr. Sands, a woman, aged forty, suffered from obstruction due to the impaction of a gall stone. The constipation was complete for *four weeks.* At the end of that time a motion was passed, and seven days later a biliary calculus with a circumference of three inches. Stercoraceous vomiting commenced on the third day and lasted for *three weeks.* The patient had been treated by aperients and by enemata. She made a good recovery.†

Relief, however, may be afforded by other means than the escape of the stone by the natural passages. The impacted stone may excite inflammation which, passing on to suppuration, may produce a fistula discharging upon the surface, and through this fistula the calculus may be expelled. Leichtenstern well observes that this mode of cure is extremely rare, but quotes no example. I have found one recorded case that bears very directly upon this matter. It concerned a child, aged ten, who had been liable for some time to attacks of indigestion

* Bull. de la Soc. Anat., 1875, page 570. Paris.
† *New York Medical Record*, vol, xxxi., 1882, page 427.

and bilious vomiting. Some time after one of these attacks a fluctuating swelling appeared in the right side of the back. This was incised and some thin fœtid brown pus escaped. The discharge was followed in four days by the evacuation of a body the size of a nutmeg. This when cleared of fæces showed a nucleus the size of a large pea composed wholly of cholesterin. The child did well.*

In another instance an abscess was set up by the process involved by the passing of a calculus from the gall bladder to the duodenum. This abscess was evacuated externally and through it the stone might readily have passed.†

Some of those who die from the effects of obstruction die from mere exhaustion, others succumb to acute peritonitis and a comparatively small number to perforation of the bowel above the seat of the impaction.

Mr. Ward has placed upon record a case of cicatricial stricture of the terminal part of the ileum, which was, without much doubt, due to ulceration set up by impacted and long-retained gall-stones.‡

CHAPTER XVIII.

OBSTRUCTION BY INTESTINAL STONES.

Intestinal calculi or enteroliths may be divided into three classes.

1. Concretions formed in great part of phosphate of lime, or of phosphate of magnesia, or of the triple

* Dr. Thorowgood ; Path. Soc. Trans., 1877, page 131.

† Dr. Carrard ; *Revue Méd. de la Suisse Rom.*, No 2, 1882, page 82.

‡ Path. Soc. Trans., 1852, page 357.

phosphate, or stones formed of mixtures of these salts.

Such calculi may contain also some carbonate of lime together with soda, and are nearly always combined with a certain amount of animal matter and occasionally with a little cholesterin. In appearance they are heavy and stone-like, and of a grey or pale brown colour when cleared of fæces. On section they show a concentric arrangement of chalk-like or dirty white layers. With such layers often alternate others of a brownish colour. In outline they are rounded or oval, and often appear to have been polished by peristaltic movements. They would appear to be always formed around a nucleus of some indigestible substance. Among such may be mentioned vegetable fibres and husks, hairs, fruit-stones, biliary calculi, pieces of bone and little foreign bodies that have been accidentally swallowed.

The concretion is usually single and of quite small size. It is seldom larger than a chestnut, although a few isolated instances of large stones have been recorded.

In Leichtenstern's list of such calculi are three whose respective circumferences are $4\frac{1}{2}$, $7\frac{1}{2}$, and 9 inches. Mr. P. H. Watson records one $1\frac{3}{8}$ inches in length and $1\frac{1}{8}$ inches in width. In cases where several stones exist they will usually be found to be facetted by mutual contact and pressure. In a case of Monro's twelve calculi were evacuated, and in a case of Niemeyer's no less than thirty-two that collectively weighed two and a half pounds.

2. Enteroliths of low specific gravity and of irregular form that are porous in appearance and have the consistence of compressed sponge. They are composed mainly of densely felted masses of vegetable fragments mixed with particles of fæcal matter and with a certain amount of calcareous

material similar to that met with in the above species of stone. These concretions comprise the "oat stones" or avenoliths that are composed of the indigestible fragments of oatmeal. They are said to be not infrequently observed in Scotland and amongst people where much coarse oatmeal is eaten. These stones are usually small and single. Leichtenstern states that there are seldom more than two together,* and adds that they vary in size from a chestnut to that of an orange.

Closely allied with such enteroliths are certain concretions of indigestible matters that belong perhaps more properly to the list of "foreign bodies." (*See* page 320.) Thus Dr. Harley reports a case in a man, aged fifty-six, where a solid mass measuring nine inches in length and six and a half in circumference was passed after five weeks of suffering. It was composed of undigested animal matters of various kinds densely felted together. The same author mentions the case of a woman, aged twenty-five, who, after having dysentery for two months, passed a hard mass the size of a small hen's egg. The mass had the appearance of a phosphatic calculus, but proved upon examination to be composed solely of starch.† In a case by Dr. Down, fatal obstruction was caused by a stone-like mass the size of a hen's egg that had become impacted in the lower ileum. It was composed of densely packed cocoa-nut fibres, and had probably been formed in the stomach and then passed into the bowel. The patient had been engaged in mat-making.‡

* Dr. Harley reports a case where twenty oat-stones had been passed at different times. They were small, were the colour of brown sandstone, had a section like felt and floated in water. Path. Soc. Trans., vol. xi., page 87.

† Ibid.

‡ Ibid., vol. xviii., page 98. For other cases *see Brit. Med. Journ.*, March 29, 1884, page 608.

3. Concretions formed of insoluble mineral matters that have been swallowed as medicines. These are most frequently composed of magnesia. In a case recorded by Mr. Hutchinson a huge mass with a circumference of at least fifteen inches was felt in the rectum. It had a surface that was hard and rough

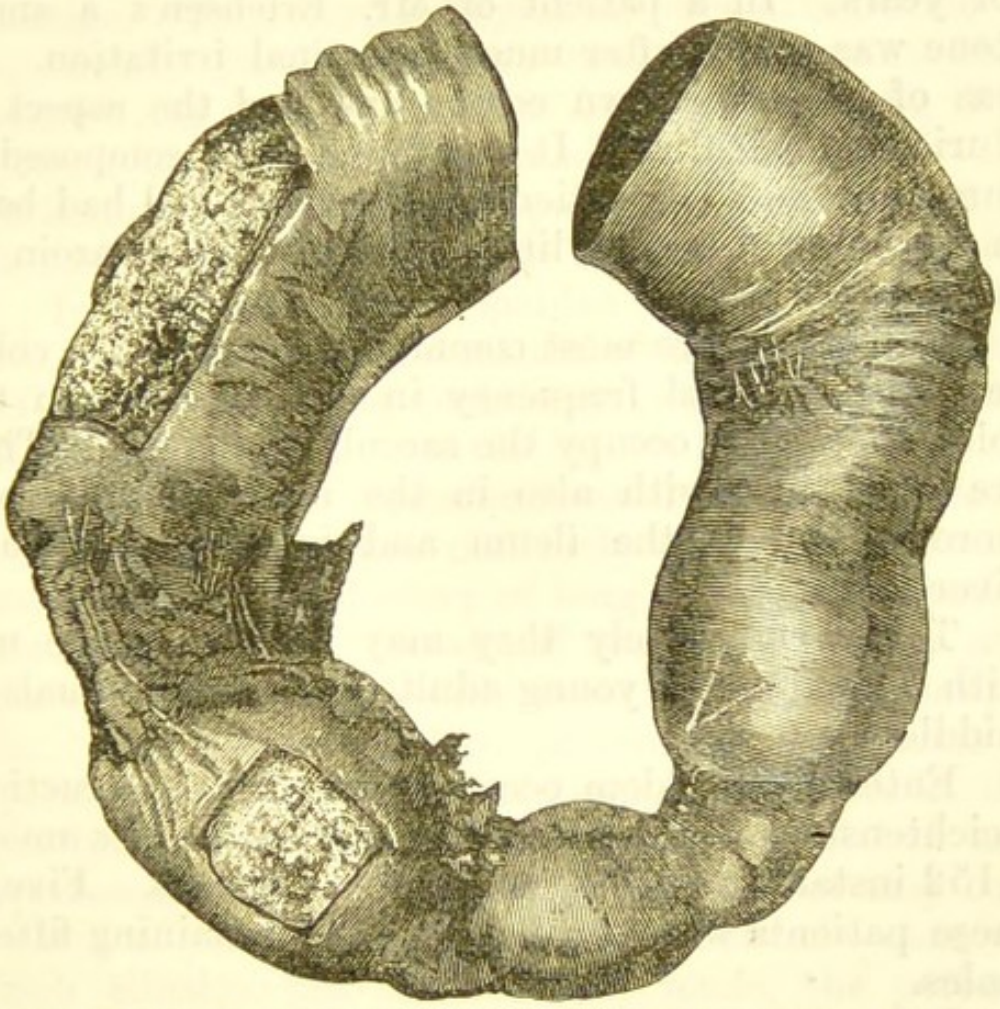


Fig. 55.—Obstruction of the small Intestine by a Concretion of Magnesia. The wall of the bowel has been cut away in two places to show the concretion.

like an oyster shell. It was broken up and removed at several sittings. It was found to be composed of magnesia and iron with some earthy matters and many thousands of strawberry seeds. The patient had been in the habit of taking large doses of carbonate of magnesia and of iron.*

* Path. Soc. Trans., vol. vi., page 203.

Fig. 55 is taken from a specimen in St. Thomas's Hospital Museum,* which shows the small intestine at one point almost entirely blocked by a dense mass of magnesia which fills the gut for several inches. Bamberger noticed a stone containing mainly carbonate of lime in a patient who had taken much chalk for years. In a patient of Mr. Erichsen's a small stone was passed after much intestinal irritation. It was of a dark brown colour and had the aspect of a uric acid calculus. It was found to be composed of gum benzoin. The patient was a singer and had been in the habit of taking little pills of gum benzoin to improve his voice.

Enteroliths are most commonly found in the colon and with especial frequency in the cæcum. In the colon they often occupy the sacculi of the gut. They are often met with also in the rectal ampulla and more rarely in the ileum and in true and false diverticula.

Taken collectively they may be said to be met with most often in young adults and in individuals of middle age.

Enteroliths seldom occasion intestinal obstruction. Leichtenstern could find only twenty examples among 1,152 instances of obstruction of the bowels. Five of these patients were females and the remaining fifteen males.

It is evident that these stones, especially the more calcareous, are of very slow formation. They may moreover be dormant, as it were, for years, or excite during that time but insignificant symptoms. In Mr. Hutchinson's case of magnesian enterolith the patient was an elderly woman. She had been in the habit of taking magnesia and iron *thirty years* before she came under observation, and she had discontinued the use of those drugs for no less than twelve years.

* No. R 1.

For the eleven years that preceded the evacuation of the concretion she had simply suffered from constipation.

As to the **symptoms** produced by enteroliths, it may be at first said that they vary greatly and depend a good deal upon the situation of the mass in the intestine. They very rarely cause sudden occlusion of the bowel. In Dr. Down's case of cocoa-nut fibre "stone" the patient, an idiot boy aged sixteen, died of acute obstruction that lasted for fifteen days. In this instance the mass had probably been formed in the stomach, and passing into the bowel had occluded it. In other cases also of sudden occlusion the calculi have been formed in diverticula of the small intestine and have then made their way into the bowel and suddenly occluded it.

Apart from rare cases such as these the symptoms of intestinal stone are distinctly chronic. In some instances there is a history of long continued digestive disturbances, with occasional attacks of pain and sickness, and with generally some amount of constipation. The patients indeed present the symptoms of a persisting, incomplete, and inert obstruction in the intestine. They are apt to become emaciated and hypochondriacal. Symptoms such as these may continue for years. In Mr. P. H. Watson's case, to which allusion has been already made, the patient, a man over fifty, had had evidences of abdominal trouble for no less than twenty years; and in other instances the symptoms have lasted for four, for six, and for seven years before the evacuation of the stone. The mass also is not infrequently to be felt. In Mr. Watson's remarkable case a large mass was felt in the right hypochondrium some years before the enterolith was evacuated. This mass gradually moved towards the left hypochondrium and then disappeared. Its disappearance was immediately

followed by evidences of a foreign substance in the rectum. In Dr. Down's case also the mass of fibre could be felt through the parietes. It is needless to say that many concretions have been detected by rectal examination when they occupy the terminal part of the bowel.

In other cases, the calculus when lodged in the cæcum may cause typhlitis or perityphlitis and may finally lead to perforation and death.

When lodged in the ampulla the patient presents all the symptoms of a foreign substance in the rectum.

The **prognosis** is good on the whole, since in the great majority of the cases the concretion is either spontaneously evacuated or is removed by forceps from the rectum. As already stated, cases of fatal obstruction are extremely rare. It is not improbable that an enterolith that forms a tumour to be felt through the parietes and that is associated with emaciation and chronic obstruction may be mistaken for a case of cancer of the bowel.

It is probable that some of the so-called enteroliths that have been passed have been merely unusually hard scybala.

It will here be convenient to mention the subject of certain *skin-like cylinders* that are sometimes evacuated from the bowel. Thus, in a case recorded by Mr. Hutchinson,* the patient, a woman aged forty-nine, passed for several months "skins," some of which were many inches in length, while others attained a length of several feet. She was at the same time troubled with diarrhœa, bloody evacuations, some vomiting, and epigastric pain.

These cylinders are composed of mucus and are the products of a certain form of chronic intestinal catarrh. Speaking of the presence of mucus in the stools in intestinal catarrh, Leube says, "In rare

* Path. Soc. Trans., vol. ix., page 188.

cases, particularly in hysterical women, coherent cylinders of mucus are discharged in the form of membranous casts of the intestine from an inch to a foot in length. Their discharge is accompanied by attacks of colicky pains (often above the umbilicus), distension of the abdomen and an aggravation of the previously existing obstinate dyspepsia (Da Costa). The masses are composed almost entirely of mucin, but sometimes of albumen and fibrin (Whitehead). In some cases these casts are formed in great abundance, and may appear in every stool for months; but usually the attack lasts only for a few weeks."*

Dr. Harley† reports a case in a woman, aged twenty-eight, where symptoms of severe obstruction were caused by some fibrinous concretions, four in number, that were finally discharged from the anus with immediate relief to a long continued train of distressing symptoms. One of these masses measured $3\frac{1}{2}$ inches by 2 inches. They were densely laminated and fibrous looking on section. They appeared to be composed merely of "lymph." It may be that these masses were thin "skin-like cylinders," that had been long retained, had accumulated into masses and undergone alteration in their physical properties.

M. Martignon describes the intestine as being sometimes blocked by a *mass of worms* which forms a definite tumour that is dull on percussion and can be felt through the abdominal parietes. The nature of the mass he asserts can be recognised by "une sorte de mouvement vermiculaire sensible à la main."‡ Many less recent writers describe this variety of intestinal obstruction, and lay stress upon the characteristic movement that can be felt in the occluding mass.

* Diseases of the Stomach and Intestines; Ziemssen's Cyclopædia, vol. vii., page 369.

† Loc. cit.

‡ Du Traitement de l'Occlusion Intestinale par le Mercure métallique. Paris, Thèse, No. 340, 1879.

I can find no trustworthy illustration of this somewhat improbable form of intestinal obstruction. Heller in his able monograph upon "Intestinal Parasites" thus refers to this matter: "The larger species (of intestinal worm) have been accused of giving rise to intestinal obstruction, being able, it is said, when entangled into a ball, to close mechanically the whole calibre of the intestine. Davaine very properly considers this an erroneous idea; for cases have been known where the intestine was literally crammed with hundreds of round worms, and still the circulation of the chyme through the interspaces was not in the least interfered with."*

CHAPTER XIX.

OBSTRUCTION OF THE INTESTINE BY FÆCAL MASSES —CHRONIC CONSTIPATION—ILEUS PARALYTICUS.

Into the consideration of this form of intestinal obstruction, which concerns rather the physician than the surgeon, it is unnecessary to enter at great detail. It is needful only to consider the matter in so far as it concerns the diagnosis of cases of obstruction of the bowels, and in so far as the pathology of the affection throws light upon the nature of the other varieties of occluded intestine.

The morbid condition that forms the basis of the present form of obstruction is an insufficiency in the forces that move the intestinal contents forwards. This condition may pass on to absolute paralysis of a segment of the bowel, leading to complete arrest of the intestinal contents and symptoms of obstruction.

* Ziemssen's Cyclopædia, vol. vii., page 679.

In chronic constipation it can only be said that the peristaltic movements are very feeble, or are at least inadequate to accomplish the effects expected of them. In ileus paralyticus, *i.e.* in the absolute obstruction to which such constipation may lead, a considerable portion of the bowel is incapable of any peristaltic movements. Fæcal matters collect in this segment and form a species of plug which even vigorous action in the bowel above is not able to dislodge. The retained fæces become more and more solid by absorption of their fluid parts, and the intestine below the obstructed segment usually becomes contracted, if it be empty, and so offers an additional impediment to the progress of the contents. As the case progresses the paralysed intestine becomes more and more distended, its muscular fibres are stretched and even ruptured, and the possibility of a restoration of peristaltic movement is rendered gradually more remote. The condition may be further complicated by the development of chronic peritonitis starting about the paralysed and distended part of the intestine.

In the mucous membrane above the obstructed segment certain ulcers may form, known as stercoral ulcers. These are due partly to gangrene of the mucous membrane from pressure, and partly to the irritating and chemical effects of the long retained and altered fæcal masses. They generally appear in the form of sloughs of the mucous membrane, which may extend until ulcers of large size are produced. There may be many of such ulcers. They are most commonly met with in the cæcum, and in the lower part of the ileum. They may lead to chronic peritonitis or to acute peritonitis due to perforation, or may in cicatrising lead to a stricture of the bowel. In some cases the ulcers appear rather in a linear form following the transverse diameter of the bowel, and attack especially the summits of the mucous folds. Such ulcers may

be seen in both the large and in the small intestine. The frequent occurrence of stercoral ulcers in the cæcum is not difficult to understand.

Ileus paralyticus may affect both the small and the large intestine, but it is much more common in the latter. The cæcum is a part of the colon where the contents are normally disposed to remain for some time and where they become more solidified. There is no doubt that in the great majority of cases of this form of obstruction the valve remains efficient. Fæcal matter cannot pass back from the colon to the ileum, but a vigorous small intestine above the valve may continue to propel the contents of the bowel in the opposite direction. The cæcum thus has to bear the brunt of internal pressure exercised in two directions, while its shape and general arrangement make it well adapted as a receptacle but not as a part for resisting great strain. In cases, therefore, where the main obstruction has been in the rectum, or in the sigmoid flexure, or in the descending colon, stercoral ulcers will most commonly be found located in the cæcum. If not in this part they will be found more or less directly above the seat of the main obstruction, and more especially in the flexures of the colon.

The colon above the main seat of obstruction may become ruptured from distension without previous ulceration of the mucous membrane. This lesion is most usually met with at the hepatic or splenic flexures.

In distinctly chronic cases the distension which the colon may undergo is enormous. The cæcum may be found almost as large as an adult's head, the sigmoid flexure or the transverse colon may appear to occupy the greater part of the abdomen, while the diameter of the distended bowel may attain to six, eight, or ten inches.

The immense quantity of fæces that may accumulate in such cases is remarkable. We read of cases where after death a "bucket-full" of fæces was removed from the colon. Lemazurier mentions a case where a mass of fæcal matter weighing thirteen pounds was removed from the rectum. In an instance reported by Renauldin it is said that at the time of the patient's death sixty pounds of fæces had accumulated in the colon. Leichtenstern in his comments upon this case wisely remarks that we may entertain "legitimate doubts" of its authenticity.

The intestine above the obstructed part is apt to become hypertrophied in its long-continued attempts to overcome the stoppage. The hypertrophy may assume considerable dimensions. Thus in a case reported by Dr. Little an idiot, aged thirty-four, died of the effects of long-continued constipation. He had possessed an enormous appetite and had been in the habit of eating great quantities of indigestible food. At the autopsy the transverse colon was found to be six inches in diameter, while the descending colon and sigmoid flexure formed a huge pouch measuring twenty inches by twelve inches. The walls of the sigmoid flexure are said to have been from one-third to one-half of an inch in thickness.*

The causes of chronic constipation are numerous and complex. Hereditary influence has some effect, and in certain cases the tendency to constipation has been congenital.† Exercise appears to assist the action of the bowels, and chronic constipation is particularly common in those who lead sedentary lives. There are forms of constipation that depend upon the condition of the fæces. These matters may become too solid, either by the accumulation of much undigested food or by a diminution in the amount of

* Path. Soc. Trans., vol. iii., page 106.

† *See* case by Dr. Peacock, ibid., vol. xxiii., page 104.

water left unabsorbed in the intestine. They may moreover, lose some of the direct stimulating effect they are supposed to exercise upon the intestine, as in cases where they contain a diminished quantity of bile. There are, again, forms of constipation that depend upon nerve influences, as seen in the confined bowels of the cachectic, of those suffering from certain brain and cord affections, and in the subjects of hysteria, hypochondriasis, and idiocy. Among other causes that have a more direct local effect are the infiltrations of the muscular coat observed in chronic peritonitis; the œdema of that tunic that may account for the constipation in chronic Bright's disease; and the injurious effect upon the intestinal wall of prolonged inflammation, as seen in the chronic constipation that follows or attends chronic catarrh. The tendency to fæcal accumulation, moreover, may be assisted by abnormalities in the colon, by a misplaced cæcum, by an abnormally arranged transverse colon, by an unduly tortuous sigmoid flexure.

Symptoms.—Obstruction of the bowels by fæcal accumulation is more common in females than in males, is most frequently met with in those who have passed middle life, and is very common in the subjects of hysteria and hypochondriasis. The patients are liable to habitual and troublesome constipation. Their bowels are seldom opened without the aid of aperients or enemata. Many days may elapse without a stool, normal in amount, being passed, and from time to time enormous quantities of fæcal matter will be evacuated by artificial aid. Sometimes there is a brief interlude of so-called diarrhœa. This diarrhœa is wholly spurious. It depends upon catarrh excited in the bowel above the fæcal accumulation. The catarrh causes a free exudation to be poured into the intestinal canal, this dissolves a certain amount of fæcal matter, which, finding its way

beyond the main mass, appears at the anus as a slight watery motion.

In such cases an examination of the rectum may reveal the fact that that gut is blocked by fæcal matter. These symptoms may exist for years without causing more than a little malaise or a little digestive disturbance, and at no time may severer abdominal disturbances arise.

In more marked cases the abdomen becomes distended, evacuations are less frequent and more difficult to obtain. The patient complains of a sense of fulness and weight in the abdomen. His appetite is poor, his tongue foul, his breath offensive. He is much troubled by indigestion, by distension after food, by flatulency, and by eructations, etc. He not infrequently becomes much weakened and loses flesh. He may become lethargic and morose, or fretful and uneasy, and present some phase of hypochondriasis.

If the abdomen become greatly distended other symptoms may appear. There may be palpitation, a sense of oppression in the chest and a little dyspnœa from a pressing up of the diaphragm by the distended bowels. Pressure may be exercised upon the lumbar or sacral nerves, and the patient may complain of discomfort in the genitals, or in the thigh (genito-crural nerves), or down the leg along some part or parts of the great sciatic nerve. Or injurious pressure may be exercised upon certain veins; upon the spermatic veins, producing varicocele; upon the pelvic veins, causing piles, catarrh or hyperæmia of the uterus; upon the iliac veins, producing uncomfortably cold feet or even œdema of the extremities.*

The constipation may remain absolute for weeks and months. All the symptoms may become worse. The abdomen may become enormously distended, the

* *See* case, Path. Soc. Trans., vol. xxiii., page 104.

apex of the heart may be pushed up to the third intercostal space,* the distended coils may be visible through the thinned parietes, and there may be much rumbling and gurgling heard in the abdomen. When in this condition the patient has most probably lost his appetite, he is troubled with frequent and foul eructations, he is greatly distressed by the distension of the abdomen, he suffers from nausea and ultimately from vomiting. This vomiting may become feculent. But even when the symptoms have advanced to an extreme degree, relief may be afforded either by enemata or by a spontaneous evacuation, and after the bowel has been emptied recovery may follow. On the other hand, the case progresses from bad to worse, the patient begins to experience pain in the abdomen, or an increase in the comparatively slight pain that may have existed for some time, he develops all the symptoms of ileus, and dies of the effects of the unyielding obstruction.

In several cases there has been complete constipation for two or three months, and the patient at the end of that time has had a relief of the bowels and has rapidly recovered. Mr. Pollock reports the case of a lady, aged thirty-five, who only had one evacuation of the bowels every three months, that is to say, four evacuations in the year.† Dr. John Blake reports the case of a man, aged forty-six, whose bowels were confined absolutely for *eighteen weeks.* At the end of that time he passed a motion spontaneously, but died within a few days. Not the least interesting fact in this case is the circumstance that an aspirator-trochar was introduced into the abdomen of this unfortunate person no less than 150 times during the continuance of the constipation. Before the conclusion of the case the patient was

* Path. Soc. Trans., vol. iii., page 106.

† Holmes' System of Surgery, vol. ii., page 725, 3rd ed.

taking twelve grains of morphia a day.* In another case, reported comparatively recently, a man, aged twenty-six, who had been always liable to constipation, had at one time no evacuation of any kind from the bowels for the almost incredible period of *eight months and sixteen days.*† Dr. Thomas Strong, who reports this case with considerable detail, alludes to instances of patients who suffered from absolute constipation for periods respectively of seventy-six days,‡ fifteen weeks,§ seven months,‖ eight months,¶ and nine months.**

In another and common class of cases the patient is liable from time to time to what may be termed obstructive attacks or attacks of ileus. In these attacks it is probable that the much narrowed canal becomes more or less suddenly blocked, whereas in the previous class of case the occlusion is brought about by very gradual processes. The more abrupt stoppage may be due to the dislodgment of a hard mass of fæces; or it may depend upon bending or kinking of the distended bowel. The latter condition may be met with in the transverse colon and in the sigmoid flexure, and especially at the point of junction of the flexure with the rectum.

A patient, therefore, who has presented for months the symptoms of chronic constipation may be more or less suddenly attacked with severe colicky pains in the abdomen. Associated with this symptom are absolute constipation, increased distension of the abdomen, and very probably tenesmus. The patient is troubled by

* *Boston Med. and Surg. Journ.*, vol. xiv., Nov., 1876, page 601.

† *Amer. Journ. of Med. Sc.*, vol. lxviii., 1874, page 440.

‡ *North Amer. Med. and Surg. Journ.*, vol. iv., page 262.

§ Dr. Baillie, Trans. of a Soc. for the Promoting of Med. and Chir. Knowledge, vol. ii., page 174.

‖ Staniland; *Lond. Med. Gazette*, vol. xi., page 245.

¶ Dr. Crampton; Dublin Hosp. Reports, vol. iv., page 303.

** Dr. Valentine; Bull. des Sc. Méd., tome x., page 74.

nausea and foul eructations, and soon begins to vomit. The vomiting is not so easily established as it is in some of the other of the less chronic varieties of obstruction, nor is it usually very severe. It may, however, become feculent. All the symptoms are commonly aggravated by taking food. Coils of intestine may be visible, and more or less constant borborygmi will be heard in the abdomen. The symptom may become worse, and worse and the patient may finally die of exhaustion.

Before death he may or may not have developed evidences of peritonitis.

The first of these attacks may prove fatal; but such an occurrence is very rare. As a rule, the patient has many obstructive attacks, which probably increase in severity as time advances. These attacks may last from three and four to ten and fifteen days, may be associated with feculent vomiting, and may be at last relieved either spontaneously, or by the use of aperients and enemata. An enema, whether it at once produce an evacuation or not, is often followed by an improvement in the symptoms for a while.

In all cases of obstruction by fæcal masses, no matter what may be their particular clinical aspect, there is very usually present a diagnostic feature of much importance to which allusion has not yet been made. I refer to a *tumour formed by the mass of retained fæces.*

In the somewhat uncommon cases where the obstruction concerns the small intestine only no tumour will probably be detected. The distension of the abdomen will mainly concern the umbilical, hypogastric, and epigastric regions, while the district of the colon will reveal upon examination a more or less empty state of the bowel. It is when the obstruction depends upon the impaction of fæcal masses in the

colon that the fæcal tumour is most distinctly met with. This tumour is, as a rule, most readily to be felt in the cæcum. The cæcum, it is needless to say, occupies the right iliac fossa in such a way that its extremity reaches nearly to the middle of Poupart's ligament. The fæcal mass, therefore, will correspond to the outer half of the ligament. Such tumours feel hard and uneven, are of a globular shape, and are as a rule painless. Sometimes, however, the region of the tumour is the seat of much pain and tenderness, a circumstance that probably depends upon a little local peritonitis. In the ascending colon the tumour will possibly feel softer, will be cylindrical in outline and very like a chronic intussusception, especially as its limits cannot be usually well defined.

Masses in the transverse colon may, when near the hepatic flexure, give rise to the impression that the liver is enlarged, the extent of dulness over that viscus being increased. These tumours, when in a mobile part of the colon, are of course themselves movable. Masses in the transverse colon may cause the gut to become bent down, and the fæcal tumour therefore has in such cases been felt near to the symphysis. When in the descending colon or sigmoid flexure the fæcal mass will usually feel harder and its division into scybala may be detected. Indeed, tumours in this situation have been compared to a large rosary on account of their uneven and nodular surface.

In thin individuals and in others, when under an anæsthetic, the softer of these fæcal masses may be affected by pressure and may give to the fingers the reaction of a mass of dough or of putty. When such a character is presented by the tumour the diagnosis of its nature is placed beyond doubt.

Fæcal tumours may exist unchanged for weeks or

months, and may coincide with the passage of normal motions or with the spurious diarrhœa to which attention has already been directed.

These tumours have been mistaken for cancer, for chronic intussusception, for tumours of the liver, stomach, spleen, and kidneys, for ovarian and other pelvic tumours, and for pregnancy. The great distension of the abdomen and the presence of much flatus within the intestine in these cases are apt to obscure the details of the mass when it exists.

In a case of obstruction from impacted fæces brought before the notice of the Sheffield Medico-Chirurgical Society* by Dr. Thomas, it is stated that after aperients had been administered and massage applied, "the sound of the moving fæces was heard with the stethoscope." This experience is, so far as I am aware, unique.

With regard to the **prognosis** in this form of obstruction it may be said to be, upon the whole, good. Patients may present the symptoms of chronic constipation through the greater part of a lifetime. In the obstructive attacks also, no matter whether of gradual or of abrupt development, a termination by relief is more frequent than a termination by death. At the same time it must be noted that the longer the morbid condition persists, and the more frequent the attacks of ileus become, the more grave is the prognosis.

The causes of death in these cases are numerous. The patient may die exhausted by prolonged obstruction with its attendant effects upon the digestion and general nutrition. He may die of rupture or perforation of the distended bowel, or of chronic peritonitis, or of stricture following the healing of a stercoral ulcer, or of obstruction depending upon adhesions due to a previous chronic peritonitis. In the more rapid

* *Brit. Med. Journ.*, Jan. 5, 1884, page 12.

cases he may die of acute obstruction depending upon sudden blocking of the bowel, or upon acute bending or kinking of the elongated intestine, or upon a volvulus of the distended and tortuous sigmoid flexure. The dependence of volvulus of the sigmoid flexure upon chronic constipation has been already pointed out.

CHAPTER XX.

THE DIAGNOSIS.

The important and complicated subject of the diagnosis of the various forms of obstruction of the intestine may be most conveniently considered under the following headings:

1. The general significance of the leading symptoms.
2. The diagnosis of the different forms of intestinal obstruction.
3. The symptoms as modified by the position of the obstruction.
4. The various affections that have been most frequently confused with cases of obstruction of the bowels.

THE GENERAL SIGNIFICANCE OF THE LEADING SYMPTOMS.

Collapse.—The marked and often severe degree of shock observed in cases of acute obstruction does not depend obviously upon the mere abrupt occlusion of the intestine, but upon the sudden damage inflicted upon the peritoneum and intestinal walls by the strangulating agent. Shock in these cases is indeed precisely of the same nature as that

that attends wounds and other injuries to the abdomen and as that that results from the perforation of an ulcer of the stomach or intestine. Into the physiological processes involved in the production of the symptoms of collapse it is not necessary here to enter. The matter has been well and fully investigated by means of vivisection experiments, and has been illustrated by the effects of injury and disease occurring in the human subject. It has been shown that the manifestations of collapse depend upon a profound impression upon the nervous system, an impression that acts mainly through the sympathetic centres and displays itself through certain grave and violent vascular disturbances. The altered circulatory conditions are made evident by the lowering of the temperature of the surface, by the cold sweats, by the frequent lividity of the extremities, by the anæmia of the brain, by the small and rapid pulse.

The degree of the collapse depends mainly upon three circumstances: upon the disposition of the patient, upon the suddenness of the strangulation, and upon the amount of peritoneum or of intestine involved in the lesion. This symptom is usually most marked in cases of acute obstruction occurring in the very young or in the very old, although at the same time it must be allowed that some of the most profound cases have been met with in adults about middle life.

Those instances of collapse in intestinal obstruction of so grave and abiding a nature as to cause the patient's condition to be mistaken for cholera have mostly occurred in vigorous adults in the prime of life. Such individuals are, from the very activity of their bodily processes, capable of presenting violent forms of strangulation, wherein the lesion to the peritoneum outweighs the matter of age as a factor in the

production of collapse. It is certain also that the degree of the collapse depends much upon individual peculiarities, just as different individuals may present different capacities for enduring pain.

As regards the local conditions, the gravest amount of shock is met with in cases where a considerable segment of the intestine is suddenly strangulated, and an injury is thus abruptly inflicted upon an extensive nerve area.

It will be readily understood that this symptom is more usually associated with strangulation of the small intestine than with that of the large. This depends not only upon the circumstance that the small intestine is the part more commonly involved in acute obstruction, but also upon the more direct association of the nerves of the upper segment of the bowel with the great sympathetic ganglia of the abdomen. This matter will be again referred to in a subsequent paragraph.

Pain.—This symptom, which is so conspicuous a feature in intestinal obstruction, depends upon several conditions. It is due, in the first instance, to the lesion experienced by the peritoneum and by the intestinal walls as a result of the strangulation. It depends at a somewhat later period, or in the first instance in certain cases, upon the tumultuous and irregular peristaltic movements excited in the intestine. These movements are more or less arrested at the seat of obstruction, and the peristaltic wave, no longer moving regularly, leads to disordered muscular contractions that are the basis of the symptoms known as "colic." There is no doubt that by the undue reflex action excited by the peritoneal lesion, and by the actual obstruction, the movements in the bowel above the occlusion become unusually vigorous. The periodical exacerbations of pain are due to the passage along the intestine of periodic peristaltic waves that

hurl themselves, as it were, against the obstruction. This circumstance can often be well displayed in chronic cases associated with emaciation and with visible movement of the intestinal coils.

The intensity of the pain depends upon the excitability of the individual, upon the state of the sensorium, upon the extent of intestine and peritoneum involved, and upon the severity and abruptness of the occluding lesion. As time advances the nature of the pain is influenced by the distension of the gut and by the appearance or non-appearance of peritonitis.

In the matter of diagnosis, I would call especial attention to a feature in the character of the pain that has, so far as I am aware, not attracted notice. It is this. In cases where the obstruction is complete the pain is *constant*, although liable to periodic exacerbations. In cases where the obstruction is but partial the pain is distinctly intermittent, and the individual experiences intervals between attacks of pain during which he is free from suffering.

To this rule I have been able to find extremely few exceptions that may be regarded as satisfactory. As illustrations of the relationship I might draw attention to the constant pain in acute strangulation as compared with the markedly intermittent pain in stricture. If in a case of stricture the stenosed segment become suddenly occluded the nature of the pain will change almost as suddenly and will become continuous where before it was purely intermittent.

Moreover, one observes in cases of stricture that as the malady advances, and as the narrowed part becomes still more narrow, so does the pain appear at less lengthy intervals, until at last, when the intestine has become entirely occluded, the pain will have become also more or less continuous. In intussusception, again, the early pain is usually characterised by its distinctly intermittent character; and this

character it maintains while the lumen of the invaginated part remains patent, and while the patient evacuates bloody stools. On the occurrence, however, of complete obstruction, the character of the pain changes, and the suffering experienced by the patient is continuous, although aggravated by periodic exacerbations.

I would urge, therefore, that in the diagnosis of cases of intestinal obstruction, very particular attention should be paid to the nature of the pain, and especially to the length of the intervals of ease that occur in instances of intermittent pain.

In examples of intermittence, many of the recorded cases that I have collected show that the duration of the attacks of pain is apt to increase as the duration of the interval of ease diminishes.

The pain in the earlier stages of intestinal obstruction is usually not aggravated by pressure. It is unassociated, in fact, with tenderness, and is, indeed, very often much relieved by compression of the abdomen. The appearance of tenderness is coincident with great hyperæmia of the peritoneum, or with actual peritonitis.

The diminution in the severity of the pain that is not infrequently experienced towards the termination of a fatal case may depend upon the collapse following perforation, or upon diminished activity of the sensorium, or upon extensive paralysis of the intestine as a result of peritonitis, or upon a rupture or perforation of the bowel into some part other than the peritoneal cavity.

The great increase in the pain that is often experienced after food, or after the use of enemata, or even after digital examination of the rectum, depends upon increased reflex action and the fresh peristaltic movement that it excites.

In one or two cases a rectal exploration induced

very violent attacks of pain in examples of obstruction of the small intestine.

With regard to the situation of the pain, as distinguished from tenderness, I would decidedly dissent from the statements of the somewhat numerous authors who assert that it corresponds to the seat of the obstruction. In the case of the small intestines, I am convinced, not only that the situation of the pain is of no value in diagnosing the site of the occlusion, but that it is, if used for such diagnostic purposes, absolutely misleading. In the development of the human intellect, the factors upon which an appreciation of position and distance are founded are tolerably well known and allowed. These factors are constant. The child gradually acquires, by slow experience, a knowledge of the localisation of sensation upon various parts of its integument. There is probably a period in its existence when painful sensations are appreciated solely by their degree or quality without any reference to locality. It is a matter of gradual experience to distinguish a pain on the back of the hand from one on the back of the shoulder. The factors upon which that experience is founded are constant. The distances between the two painful spots are constant, and can be appreciated by sight as well as by feeling. It is by an unconscious process of repeated comparison that a child acquires a knowledge of its own skin, or of its own skin so far as it is concerned as a vehicle for sensation. With regard to the localisation of sensation in the intestine (and we will consider particularly the small intestine), it must be remembered that the length of the bowel is very considerable; that the coils are perpetually changing their position and altering the mutual relation they bear to one another; and that the part is not very directly supplied with spinal nerves. Without discussing the subject at greater length, I think it will be evident

that the small intestine at least does not possess that arrangement of parts which we are apt to regard as essential for the proper localisation of sensations painful or otherwise. The passage of a large foreign body along the lesser bowel is often associated with great and long-continued pain. But neither the nature nor the position of the pain appears to be in any way modified by the localisation of the intruding substance. If the passage along the intestine of a foreign body, capable of exciting pain throughout its whole progress, were a matter of daily occurrence, then in time it may be possible for an individual to localise painful sensations in certain vague segments of the gut; but even such an experience could never enable any one to localise a pain in one very limited portion of a tube that is many feet in length. In speaking of the symptom of pain in connection with the subject of strangulation by bands (page 73), I have pointed out that no matter in what part of the small intestine the obstruction is situated, the pain arising therefrom is very usually referred to the region of the umbilicus.

A little way above the umbilicus is situated the solar plexus, and it is to this centre that the pain is, I think, referred. In the paragraph above alluded to, I have given many examples to show the want of definite connection between the seat of pain and the seat of the lesion that caused it.

In the case of the stomach and of the colon it is possible to conceive that painful sensations occurring in those parts may be more or less definitely localised, since they are more constant in position and in the relation that their parts bear to one another. The position of the pain in gastric ulcer, and in some cases of cancer of the large intestine, would appear to support this notion, although in the great majority of the cases of stricture of the colon the situation of the

pain has been of no value in diagnosing the position of the stenosis.

Vomiting.—Vomiting in cases of intestinal obstruction is mainly due to peristaltic action. The bowel becomes occluded at a certain point. Above that point the contents of the tube collect, and some dilatation of the bowel from distension takes place. A wave of peristaltic movement passing along the intestine above the occluded part will tend to induce two distinct currents in the contents of the tube, in the place of the single current in the direction of the rectum that is the result of peristalsis under normal circumstances. One of these movements is in the downward direction and concerns such of the contents as are nearer to the wall of the intestine. The other is an upward movement that concerns the contents occupying the axial part of the bowel. This axial current, in the upward direction, is the direct result of the obstruction offered to the passage of matters along the intestine. Dr. Brinton, who first drew attention to this subject in his well-known monograph, illustrates the double current by the action of a piston, perforated in the centre, as it passes along a tube closed at one extremity (Fig. 56). He further pointed out that a series of such pistons passing down the tube one after the other would tend to indefinitely lengthen the upward axial current and render it perfectly continuous.



Fig. 56.

Dr. Brinton also showed that the distended segment of intestine immediately above the obstruction would be practically unaffected by the peristaltic movements, and would have the effect of

placing the starting point of the upward axial movement higher and higher in the intestine as the accumulation increased.

This latter circumstance, however, is by no means necessary for the complete demonstration of Dr. Brinton's theory of the emptying of the intestinal contents into the stomach by no other motor power than the peristaltic movements of the bowel itself. As a matter of fact, however, there is more than one factor concerned in the evacuation upwards of the intestinal contents. When the bowel above the occlusion has become filled by gradual accumulation of its contents, its degree of distension may be such that all pressure brought to bear upon the bowel so occupied can do no other than force the contents in the only direction in which they can go, viz. towards the stomach. This pressure may be exercised during every act of vomiting, every contraction of the diaphragm or of the abdominal muscles, and even by the mutual pressure that the distended coils would exercise the one upon the other.

It will be obvious that the more fluid the contents of the intestine the more easily will they be evacuated, and that ready and early vomiting is more likely to occur when the obstruction is near the upper than when it is near the lower segment of the bowel.

It is impossible to discuss this subject without some reference to the question of antiperistalsis, which was at one time accredited with being the main cause of stercoraceous vomiting. That antiperistaltic movements occur in the intestine has been placed beyond doubt by numerous observers. These movements have been seen also in cases of artificial obstruction of the bowels induced in animals. There is, however, not the least evidence to show that antiperistalsis is absolutely essential for the propelling of

the intestinal contents towards the stomach, much less that it is the main cause of stercoraceous vomiting. These movements, when observed, have been feeble, imperfect, and irregular, and of comparatively little significance by the side of the tumultuous peristaltic movements passing in the usual direction.

As Dr. Brinton has well observed, if antiperistalsis were the cause of the stercoraceous vomiting, then would one expect to find at an autopsy the gut above the obstruction empty and contracted, while the intestine nearer to the stomach would be in a state of distension. It is needless to say that the reverse is what is found. In many cases, moreover, metallic mercury, and other substances introduced into the stomach before death, have been found in the autopsy to have traversed the whole length of the intestine as far as the obstruction, in spite of severe feculent vomiting during life. Leichtenstern, who is entirely opposed to the theory of antiperistalsis as a factor in stercoraceous vomiting, mentions the following as the only facts that appear to favour such a theory: "1st. Those very rare cases in which stercoraceous vomiting is observed in the course of a diffuse peritonitis without demonstrable alteration of the permeability of the intestine. 2nd. The fact that in cases of acute internal incarceration the stercoraceous vomiting occurs only a few hours after the beginning of the attack, at a time when it cannot well be thought that there is any great accumulation of intestinal matter. 3rd. The movements of the intestine in cases of inflammation and other irritations of the peritoneum, differ, so far as their quality and effects are concerned, from what is normal." With regard to the first "fact," it must be noted that in peritonitis a large segment of the intestine may remain for a long time non-paralysed. The accumulation of intestinal contents in the paralysed segment would

constitute a definite obstruction, and if the non-paralysed part consisted of a continuous portion of the bowel extending from the stomach to the involved segment the very condition for the evacuation of the intestinal contents would be established. With regard to the second fact, stercoraceous vomiting within a few hours after the occurrence of strangulation is extremely rare, and it has yet to be shown that a certain accumulation of matters in the bowel is needful for the production of stercoraceous vomiting. The third fact to be of any value must prove that the abnormal movements are in the inverted direction and are of sufficient extent and of sufficient duration to move the contents of the tube (without other assistance) in the direction of the stomach.

In stercoraceous vomiting the matter is derived from the lower ileum or from the colon. It has been most conclusively shown that for the production of feculent vomiting it is by no means necessary to assume that matter regurgitates from the colon into the ileum through the ileo-cæcal valve. The contents of the lower ileum have often the distinct characters of soft fæcal matter in normal circumstances, and when retained in a disordered and obstructed intestine it is not difficult to understand that they may soon acquire those characters from decomposition, even if they did not originally possess them. At the same time it is now fully allowed that the ileo-cæcal valve may become insufficient during life and may permit fæcal matter to regurgitate from the colon into the lesser bowel.

This insufficiency may be met with in great distension of the cæcum and ileum associated with paralysis of the parts concerned in the valve. The occurrence, however, of this insufficiency is certainly very uncommon, as is proved by repeated examinations of the parts after death from stricture of the colon.

When the obstruction occupies the lower duodenum or jejunum the vomited matters are usually very copious and always deeply stained by bile. They can never become really stercoraceous, although if long retained they may become discoloured and acquire so offensive a smell as to be possibly mistaken for feculent matters. In the same way the vomiting in examples of obstruction in the middle of the ileum can never be stercoraceous in the strict sense of the term. If, however, the contents of the bowel have been long retained, as in cases where the vomiting has been subdued by opium, then they may become so altered from decomposition as to have a feculent odour.

In some cases the stercoraceous vomiting has been due to a fistula bimucosa between the colon and the upper part of the small intestine, as occurred in a case reported by Mr. Shaw.*

As already remarked, the main part of the vomiting in cases of intestinal obstruction no doubt depends upon peristaltic action taking place under peculiar conditions. This is, however, not the only cause, nor is it obviously the cause of the initial vomiting in acute strangulation.

This initial vomiting is due to the damage inflicted upon the peritoneal and intestinal nerves by the strangulation. It is a purely reflex act, and of precisely the same nature as the vomiting that may follow a wound of the abdomen or a crush of the testicle. The more excitable the reflex centres the more readily is the vomiting induced. It thus occurs peculiarly early in children and in delicate and unduly sensitive women. Since the nerve supply of the lesser intestine is more liberal and more directly connected with the great abdominal plexuses than is that of the colon, it may be surmised that lesions involving the former segment of

* Path. Soc. Trans., vol. iv., page 147.

the bowel will be more rapidly followed by sickness than will those implicating the large intestine.

The dependence of much of the vomiting upon reflex nerve disturbance is illustrated by cases of pseudo-strangulation, by cases where vomiting in instances of intestinal obstruction has been excited by exploration of the rectum, and by the close association of the symptom with the symptom of pain.

One of the best illustrations, however, of the possible independence of vomiting in intestinal cases of peristalsis is afforded by casual vomiting in individuals with an artificial anus. Thus Mr. Bryant reports a case of intestinal obstruction for which he performed enterotomy, leaving a permanent artificial anus connected with the small intestine. The patient was at a subsequent period much troubled by the fæces that had been retained in the colon below the abnormal opening, and that were unable to escape. The irritation of these masses induced much abdominal pain and vomiting. The interruption of the intestine between the obstructing masses and the stomach afforded by the artificial anus must have prevented peristaltic movement from taking any direct share in the production of the vomiting.*

In those cases where feculent vomiting has alternated with the vomiting of mucous and bilious matters only it must be assumed that the act concerned the stomach only in the latter case, but extended to the intestine also in the former.

There is without doubt a very direct association between the completeness of the constipation and the severity of the vomiting.

In a few exceptional cases of a chronic nature I find that vomiting persisted even while the bowels acted freely, and I have met also with two or three instances where a good appetite existed in patients

* *Lancet*, vol. i., 1878, page 743.

who had been the subjects of long-continued obstruction and had vomited at intervals for weeks.

Constipation.—The constipation in cases of obstruction of the bowels depends, of course, in the main upon the narrowing or occlusion of the lumen of the intestine.

It may depend also upon paralysis of a segment of the intestine without mechanical obstruction in the intestine itself, as has been explained in speaking of chronic constipation. It is also to a great extent due to reflex nerve-action. Thus, in cases of acute strangulation, the constipation is often absolute from the very commencement, although the obstruction may be in the small intestine and much fæcal matter be lodged between the point of occlusion and the anus. Then, again, constipation is very usual in those cases of partial obstruction of the intestine where a segment of the bowel is suddenly and severely nipped. This is well observed, as a rule, in Littre's hernia, where only a part of the circumference of the bowel is involved in the strangulation. Moreover, constipation of a pronounced type is observed in instances of pseudo-strangulation.

In cases of acute strangulation it is not infrequent for the part of the bowel below the obstruction to be emptied, and in examples where some catarrhal action has been set up in this segment of the bowel the patient may present the evidences of a copious diarrhœa.

It is not infrequent in acute cases of obstruction for a stool to be spontaneously passed just before death. This may be derived from the bowel below the occlusion, and may be due to certain altered nerve conditions associated with impending death, or the stool may be derived from the intestine above the point of stoppage and may indicate the yielding of the obstruction from perforation or by other

spontaneous means. Or the occlusion may have been incomplete, and the nerve conditions that maintained the constipation may have become modified as death approached.

The amount of urine passed.—The statement of Dr. Barlow, that the higher the obstruction is situated in the intestine the less is the amount of urine passed by the patient, has been fully combated and shown to be incorrect. The anuria or oliguria so often observed in instances of intestinal obstruction does not depend upon the position of the incarceration or occlusion, but upon its nature.

Anuria, or marked oliguria, is met with in examples of acute obstruction, and, provided that the general severity of the cases is the same, the symptom is as marked when the strangulation involves the sigmoid flexure as it is when it involves the jejunum.

It is true that in the great majority of cases of acute obstruction the part involved is the small intestine, while the greater number of the chronic cases have a locality in the large intestine, yet this fact, although it has no doubt been the great cause of error, can obviously not influence the statement just made.

A like diminution in the amount of urine excreted is met with in cases of severe injury to the abdomen, in wounds involving the peritoneum, and in violent attacks of hepatic colic. The symptom, indeed, in these cases, as well as in the earlier stages of acute obstruction, is one of the phenomena of shock, and a direct result of the diminished pressure of the blood in the aorta. It is well known, moreover, that the amount of the renal excretion may be affected by nerve conditions other than those associated with collapse.

Another cause of anuria in acute obstruction

depends upon the rapid withdrawal of water from the body by the violent vomiting and by the not infrequently profuse sweating. The symptom, therefore, is very often associated with another symptom, intense thirst.

The influence of opium in increasing the amount of the urinary excretion, when once it has been seriously diminished, is often very marked. The drug acts in this matter by modifying the effects of shock, by stilling certain violent nerve movements, by moderating peristalsis in the intestine, and by rendering the vomiting less copious and severe. "The symptom of oliguria has a significance in the differential diagnosis of the seat of the obstruction only in cases of chronic and incomplete occlusions or constrictions of the intestine. If these are situated high up, the amount of urine, for the same well-known reason as in stenosis of the pylorus, is constantly diminished, and this is not the case when the occlusion is in the lower part of the ileum or in the colon" (Leichtenstern).

The subject of *meteorism* will be discussed when speaking of the symptoms, as modified by the position of the obstruction.

Visible intestinal coils in movement form a symptom often noted in intestinal occlusions, and one that is of considerable diagnostic value.

The outlines of the convolutions and their peristaltic movements are not to be seen through the abdominal walls in cases of acute obstruction, except in very rare and exceptional instances. In examples of chronic obstruction, however, this phenomenon is quite common. It becomes, therefore, of much value in differential diagnosis, and especially in helping the surgeon to distinguish between an acute attack that has supervened upon a condition of chronic obstruction and an attack that has been acute from the first.

The distinctness with which the intestinal coils are seen when in movement depends mainly upon three circumstances: upon the degree of emaciation of the patient and the consequent thinness of the abdominal parietes, upon the hypertrophy of the intestine above the obstruction, and upon the extent of distension of the hypertrophied coils. It will be evident that the first two of these conditions are especially prone to be associated with a chronic form of obstruction.

CHAPTER XXI.

THE DIAGNOSIS OF THE DIFFERENT FORMS OF INTESTINAL OBSTRUCTION.

The difficulties in the way of a complete diagnosis of the various forms of intestinal obstruction are both numerous and great.

In spite of the comparative frequency of the condition, the simple recognition of its existence, quite apart from any attempt at differentiating its various aspects, is often a matter of considerable difficulty. It is doubtful if any ailment of an equally common nature has been the subject of so many errors in diagnosis. Our knowledge of the pathology of the affection is by no means imperfect, and yet an increase in that knowledge has not been attended by a corresponding increase in our familiarity with the clinical history of the condition. There are not many maladies that present so slight a relationship between pathological data and clinical data as does the general subject of intestinal obstruction, while there are few in which it is more important that that relationship should be most intimate.

Many circumstances conspire to make differential diagnosis in cases of obstruction a matter of peculiar difficulty. In the first place, the different forms of intestinal occlusion depend upon a number of very diverse conditions. The bare list of the possible forms of obstruction that are concerned in a complete differential diagnosis is almost appalling. Then, again, certain common symptoms are capable of being induced by very many different causes, although those different causes may act probably in a common direction. How many and diverse are the morbid conditions that may excite simultaneously the great symptoms of obstruction, viz. pain, vomiting, and constipation!

It must be remembered also how many anomalous cases are met with that interfere sadly with any general diagnostic conclusions. Thus, without making any special enquiries, I have found among the recorded cases of intestinal obstruction that I have collected no less than twenty-two examples of a double obstruction existing at the same time in a particular case. In some of these instances the small intestine had been occluded in two places while in other examples an obstruction had involved both the large and the small intestine at the same time. One can understand also how any definite conclusions as to stercoraceous vomiting as a means of diagnosis can be scattered to the winds by a case of obstruction associated with a fistulous communication between the colon and the upper extremity of the small intestines.

Many of the errors in diagnosis are due to an incomplete investigation. Every case should be subjected to a systematic method of examination. The previous history should be carefully studied, as well as the precise mode of onset of the disease and the time and mode of appearance of the principal symptoms. In many of the recorded cases no information is furnished as to the nature of the pain, as to its situation,

the duration of its attacks, their manner of commencement and of cessation, nor of the length of the interval between given attacks of pain, nor of the condition of the patient during those intervals. All evacuations should be personally inspected, and repeated examinations of the abdomen made. A tumour not evident at one time may be distinct a few hours afterwards, and it is absurd to suppose that in any given case all information derived from an examination of the belly is likely to be obtained during one isolated inspection.

In no instance should the surgeon fail to examine all the hernial orifices, and to make a complete exploration of the rectum.

In discussing the different forms of intestinal obstruction in a previous chapter, I have entered with some detail into the nature of the symptoms that are associated with those various forms, and have also pointed out many of the features essential to a differential diagnosis.

In the present chapter I propose, with as little repetition as possible, to take a general view of the whole subject with reference solely to the matter of diagnosis, and to indicate the general scheme upon which I venture to think that all attempts at diagnosis may be most conveniently conducted.

For purposes of diagnosis all cases of intestinal obstruction may be divided into three great classes or divisions.

1. CASES OF ACUTE OBSTRUCTION.
2. CASES OF CHRONIC OBSTRUCTION.
3. CASES WHERE SYMPTOMS OF ACUTE OBSTRUCTION SUPERVENE UPON THOSE INDICATIVE OF A CHRONIC OBSTRUCTION.

This division is of course quite arbitrary, and it may not always be easy to place a given case definitely in one of these three divisions. Many cases of

intestinal obstruction adopt such a course as to enable a division to be established for subacute forms. Such examples, however, will be found to be made up of forms of intestinal obstruction that usually adopt either an acute or a chronic course.

1. Acute Obstruction.

Let it be supposed that a patient presents the symptoms of acute obstruction.

The symptoms that he will display will be in general terms as follows: He has been seized more or less suddenly with severe abdominal pain. This pain has been of the nature of colic. It may be constant and liable to exacerbations, or be more or less distinctly intermittent. In any instance, the longer the pain lasts the more does it tend to become constant and continuous. The patient has vomited. The vomiting has appeared early, is copious and severe, and may soon become stercoraceous. There is more or less absolute constipation with some distension of the abdomen. There is great constitutional depression with evidence of the effects of shock. Symptoms such as these may depend upon the following different forms of acute obstruction:

A. Strangulation by bands or through apertures.
B. Volvulus of the colon.
C. Acute intussusception.
D. Some forms of obstruction by foreign substances.

A. **Strangulation by bands or through apertures.**—Under this heading are included the following:

Strangulation by isolated peritoneal adhesions.
" by omental cords.
" by Meckel's diverticulum.
" by normal structures abnormally attached, as by an adherent appendix or Fallopian tube.
" through slits and apertures of various kinds.

The instances of obstruction that come under this heading form collectively more than one-fourth of all the varieties of intestinal obstruction.

Sex. Age.—They are a little more common in males than in females. Are most usually met with in young adults, and are very rare after forty.

Previous history.—A distinct history of previous peritonitis in 68 per cent. A history of previous attacks of obstruction like to the present in 12 per cent.

Mode of onset.—Sudden in over 70 per cent.

Pain is the earliest or one of the earliest signs. Is extremely severe, colicky, continuous, and persistent. It may abate a little as the case advances. It is very often situated about the umbilicus.

Local tenderness is usually quite absent at first, but may come on in a few days.

Vomiting appears early; is a marked symptom, being constant, copious, and severe. In 60 per cent. of the cases it becomes stercoraceous, on an average on the fifth day. It affords the patient no relief.

Constipation is continuous and absolute from the first. Enemata may evacuate the contents of the colon. No discharge of blood.

Prostration is marked. There is often profound collapse, intense thirst, diminished urine, etc.

Tenesmus is absent.

Abdominal parietes flaccid, unless peritonitis has set in.

Meteorism slight. Appears usually about the third day. Involves first the epigastric and umbilical regions in most cases.

Tumours or localised districts of dullness caused by the distended and strangled loops are extremely rare, and are in any case very indefinite.

Coils of intestine are not visible.

The average *duration* of this variety is about five days.

Under this form of intestinal obstruction may also be included the following (all very rare) :

Strangulation over bands.
Acute kinking of the small intestine.
Volvulus of the small intestine (certain cases).
Certain cases of tumour outside the bowel producing an obstruction of the small intestine by sudden pressure.

In the great majority of instances it will not be possible to diagnose these different varieties from one another, but all the facts that can be adduced in the support of a differential diagnosis will be found noted in the account of the symptoms that attend each of these varieties.

B. **Volvulus of the colon.**—This, with very few exceptions, which will not be here considered, involves the sigmoid flexure only.

Sex. Age.—Volvulus of the sigmoid flexure is more common in males than in females in the proportion of four to one. It is very rare before forty. The patients' ages being usually between forty and sixty.

Previous history.—In nearly every case there is a history of previous constipation.

Mode of onset.—Usually sudden.

Pain appears early. Is a marked symptom. Is severe, but not usually so severe as in the previous form. Is commonly intermittent at first, becoming subsequently continuous but with exacerbations. Is very often complained of about the umbilicus, and later on about the region of the sigmoid flexure.

Local tenderness appears early over the region of the distended coil of colon, and is constant.

Vomiting appears less early and is less marked and severe than in the previous form of obstruction. It may be absent. It is often scanty. Is feculent in only 15 per cent. of all the cases. It may abate. It often affords much relief to the patient.

Constipation.—Early and absolute. No discharge of blood.

Prostration not so marked as in the above form of strangulation. There may, however, be marked collapse, diminished urine, etc. The patient often suffers from dyspnœa and a sense of suffocation, symptoms not met with in the previous class of case.

Tenesmus is a marked feature in 15 per cent. of the examples.

Abdominal parietes soon become rigid owing to the early and almost constant appearance of at least local peritonitis.

Meteorism appears very early, increases rapidly and becomes very extreme. The thoracic viscera are often displaced by the distended intestines.

Tumours of a definite character are not met with; nor are coils of intestine visible.

The average *duration* is six days.

Under this form may also be included the following (all rare):

Volvulus of other parts of the colon (certain cases).
Cases of acute bending and kinking of an adherent colon.

The symptoms that may serve to distinguish these different forms from one another will be found noted in the accounts given of the clinical features of each separate variety.

C. **Acute intussusception.**—*Sex. Age.* Somewhat more common in males. Occurs mostly in the young, and more than 50 per cent. of all cases are under the age of ten years.

Previous history.—In a few rare instances there is an account of previous attacks of obstruction due probably to intussusception.

Mode of onset.—Sudden in 75 per cent. of the cases.

Pain.—One of the first symptoms. Is apt to be severe at first, to increase up to a certain point, and

then to subside. Is, on the whole, not so severe as in cases of strangulation by bands, etc. Is at first usually distinctly paroxysmal or continues with distinct exacerbations. It may be localised about a tumour to be felt in the abdomen.

Local tenderness about a tumour is common.

Vomiting does not appear so early as in the two previous varieties of obstruction, and is usually by no means so severe. In three-fourths of the cases it is among the earlier symptoms, while in the remaining one-fourth it does not appear until, on an average, the third day. In 8 per cent. of acute and subacute cases there is no vomiting. This symptom is moreover liable to great fluctuations, and may be absent for a while and then reappear. In 25 per cent. of the cases the vomited matters become feculent, on an average upon the fourth or fifth day.

Constipation.—Absolute constipation is extremely rare. Constipation, as a conspicuous feature in the state of the bowels, is noted only in 30 per cent. of the cases. Diarrhœa is more usual, and in 80 per cent. of the cases there is an evacuation of blood from the anus.

Prostration.—In the more acute cases there is much collapse, especially in the young, but on the whole the amount of shock is less than in cases of strangulation by bands.

Tenesmus is met with in no less than 55 per cent. of the cases, and is often an early symptom.

The abdominal parietes are flaccid unless some peritonitis has set in.

Meteorism is quite rare except in cases associated with pronounced constipation.

Tumour.—A definite tumour having the distinctive character described in chapter x. is met with in 50 per cent. of the cases. A tumour is frequently to be felt in the rectum.

Coils of intestine are not visible.

The average duration of ultra-acute cases is twenty-four hours, of acute cases two to seven days, of subacute cases from seven to thirty days.

D. **Obstruction by foreign bodies.**—The principal form of acute obstruction met with under this heading depends upon

Gall stones.—It must be distinctly understood, however, that the great majority of gall stones are passed along the intestine without producing any symptoms, and that many in their passage cause but insignificant symptoms. In other instances the stone remains in the intestine quiescent for a long time, and in another set of cases evidences of *chronic* obstruction are produced.

In a few examples the biliary calculus may cause acute obstruction. In such cases it will be found lodged in the duodenum, jejunum, or more usually in the lower ileum.

Sex. Age.—Gall stones are much more common in females than in males. The average age is fifty-seven years.

Previous history.—Gall stones may have been passed previously. In many cases, however, there is no history of an antecedent hepatic colic. There may have been evidences of local peritonitis about the gall bladder. There will probably have been previous attacks of acute obstruction, which will have passed off after varying short periods.

Nature of attack.—The onset is usually abrupt. There is severe pain of a continuous character, with exacerbations.

The *pain* is seldom so severe as in strangulation by bands.

Vomiting appears early, is often copious, and may in time become stercoraceous.

There is absolute *constipation.*

The average *duration* of an acute fatal attack is seven days.

In the intervals between the various attacks of acute or subacute obstruction the patient will probably have suffered from indigestion, irregular action of the bowels, and the like.

Under this heading may also be included :

Some cases of obstruction by foreign bodies that have been swallowed.
Some cases of obstruction by enteroliths.

In the case of the *foreign body* there will usually be the history of a substance swallowed.

When in the alimentary canal such substances may produce the same effects as have been just described as occurring in cases of gall stones.

Enteroliths lodge mostly in the cæcum or colon. In quite exceptional cases they may cause acute obstruction. An account of such cases is given with the account of intestinal calculi. The symptoms are simply those of acute obstruction of the nature incident to acute occlusion by gall stones. In some cases fragments of the concretion have been passed. In other instances the mass has formed a tumour that could be appreciated through the parietes.

2. Chronic Obstruction.

The causes of chronic obstruction of the bowels are very numerous and pathologically very varied. For diagnostic purposes the cases may be divided into the four following classes :

A. Stricture of the small intestine.
B. Stricture of the large intestine.
C. Fæcal accummulation.
D. Chronic intussusception.

A. **Stricture of the small intestine.**—*Sex. Age.* In the matter of sex there is nothing to notice. Non-cancerous strictures usually occur about early

middle life; while cancerous strictures are very rare before forty.

Previous history.—In non-cancerous cases there will often be a history of ulcer of the intestine or of conditions that may lead to destructive changes in the gut, *e.g.* tuberculosis, dysentery, injury, strangulated hernia, typhlitis (involving the ileum).

Course.—The onset is usually gradual. The course of the malady is peculiarly irregular. Acute attacks of obstruction are apt to appear from time to time, and the case is often fatal through an acute obstructive attack.

Pain.—The pain is distinctly intermittent, long intervals of absolute freedom from suffering often intervening between the attacks. As the intervals between the paroxysms shorten the attacks become of longer duration. These intervals may, in the earlier periods of the case, amount to many days or even weeks. The earlier attacks of pain are slight, and usually ascribed to indigestion, flatulence, etc. They are very usually provoked by food, and especially by indigestible food. As time advances, the attacks become more and more frequent, and more and more severe. When complete obstruction sets in, as in a definite attack of acute obstruction, the pain becomes continuous, but with exacerbations.

There is, in uncomplicated cases, no definite local tenderness.

Vomiting.—During the earlier attacks of pain there may be nausea. In the more severe attacks the patients vomit. The vomiting is often provoked by food. It is late to appear, is often scanty, and is rarely feculent, except towards the end of an acute obstructive attack. In the interval between attacks of pain the patient either feels well, or complains of indigestion or some nausea, and trouble with the bowels.

Constipation is a leading symptom in 60 per cent. of the cases. In 40 per cent. there is constipation, alternating with diarrhœa. During the more abiding acute attacks the constipation becomes absolute. In cases of cancerous stricture blood may, as a rare circumstance, be passed by the anus.

General condition.—The patient becomes emaciated, especially in the carcinomatous cases, and is worn out by the continued pain and digestive disturbances. During the more severe acute attacks there may be prostration, amounting in some cases to collapse.

Tenesmus is absent.

The abdominal parietes remain flaccid, unless peritonitis be present.

Meteorism is absent except during the attack and during absolute constipation.

Tumours.—In non-malignant cases no tumour is to be felt. In the cancerous cases a tumour is to be felt in 30 per cent. of the examples.

Coils of intestine.—The movements of coils of hypertrophied intestine are visible through the parietes, especially during attacks of colicky pain. This symptom is the more distinct the more marked the emaciation.

The average *duration* of the cases taken together is from three to five months.

With this form of intestinal obstruction the following different varieties may be associated for diagnostic purposes:

1. Some cases of bending of adherent small intestine.
2. Some cases of adhesions binding a portion of the bowel into a fixed loop.
3. Cases of compression of the gut by adhesions.
4. Cases of matting together of several coils of intestine.
5. Cases of narrowing of the gut from shrinking of an inflamed mesentery.
6. Cases of stenosis as an effect of traction.

7. Some instances of volvulus.
8. Obstruction by neoplasms.
9. Some cases of obstruction by gall stones and foreign bodies.
10. Some cases of compression by a tumour outside the gut.

All these forms of intestinal obstruction may present symptoms that more or less closely resemble one another, and that may be considered to find their typical representation in a case of stricture of the lesser bowel. In each instance it will be noted that there is some permanent but partial occlusion of the intestine.

The resemblance between these various forms of intestinal obstruction is very commonly so close that a certain differential diagnosis is impossible.

Any distinctive features (such as they are) that may be associated with any of the above forms of obstruction will be found detailed in the account given of each of these varieties in the previous parts of this work.

In the first four forms there will probably be some history of a local peritonitis that gave rise to the adhesions producing the obstruction. In the fifth form there may be the same feature in the previous history, or some evidence of mesenteric gland disease. In the ninth form there will be the history associated with gall stones and foreign bodies, to which attention has just been directed. In the tenth variety, the tumour, which will probably have origin in the pelvis, may, in many instances, be obvious upon examination.

B. **Stricture of the large intestine.**—In these cases the symptoms are very similar to those associated with stenosis of the small intestine. In the matter of *sex* and *age* and *previous history* there are the same circumstances to be noted that have been alluded to in the previous paragraph.

The *course* of the malady is attended by a similar

irregularity, and by the same kind of paroxysmal attack. The character of the *pain* is the same, although upon the whole it is less severe. *Vomiting* appears with less frequency, is often absent, and in any instance supervenes at a later period. It is usually less profuse than is the case in stenosis of the lesser bowel. It never becomes stercoraceous except after many days of absolute constipation. Unlike what is the case in stricture of the small intestine, the symptoms, when the colon is involved, are usually but little affected by food.

The *bowels* are usually in a condition of constipation, and the size and outline of the motions is frequently altered.

Tenesmus is very commonly present. Aperients often give relief in cases of stricture of the small intestine, but are apt to aggravate the symptoms when a like narrowing involves the colon. In cases of cancerous stricture, diarrhœa with constipation is common, and in 15 per cent. of the examples there was a *bloody discharge* from the anus. Tenesmus is especially marked in such cases as are associated with diarrhœa.

Meteorism is often very pronounced, and the *coils of intestine* are visible through the wasted parietes. In cases of simple stricture no *tumour* is to be felt, but in the cases of malignant disease a tumour is to be detected through the abdominal walls in no less than 40 per cent. of the examples.

With this form the following different varieties may be associated for diagnostic purposes :

1. Some cases of bending of adherent colon.
2. Compression of the gut by adhesions.
3. Some cases of volvulus of the cæcum.
4. Obstruction by neoplasms.
5. Compression by a tumour outside the gut.
6. Some cases of enterolith.

The symptoms associated with these different varieties will be found detailed in the accounts given of them in previous chapters. These symptoms generally accord with those of stricture of the colon, and the features in the differential diagnosis are not well marked. Some diagnostic value attaches to the previous history of the patient, as has been already pointed out in connection with the different forms of obstruction that resemble stricture of the lesser bowel.

C. **Fæcal accumulations.**—This form of obstruction is mostly met with in adults, and more frequently in females than in males. It is especially common among lunatics, and the subjects of hysteria and hypochondriasis.

The symptoms consist mainly in a gradually increasing constipation, which more and more resists the action of aperient medicines. The patient's appetite declines, his tongue becomes foul, he is liable to eructations and nausea, and often feels languid and depressed.

As the case advances, the abdomen becomes more and more distended. Some of the coils of intestine are visible through the parietes. The accumulated fæcal masses may press upon the lumbar or sacral nerves, or upon the iliac or pelvic veins, and so produce certain symptoms as a direct result of that pressure.

As the obstruction becomes more complete, the abdomen may become painful. This pain will assume, at first at least, a paroxysmal character, becoming, later on, continuous, but with exacerbations. Vomiting may occur. It appears late, comes on very gradually, is scanty, and rarely becomes feculent unless the obstruction have remained absolute for a considerable period.

The patient may be liable from time to time to

obstructive attacks associated with pain and vomiting, which are usually soon relieved by enemata.

The diagnosis is assisted by the history of the case, by the account given by the patient of long-continued and increasing constipation, and possibly also of certain previous obstructive attacks that have been relieved by enemata.

The most important feature, however, in the diagnosis is the fæcal tumour. This mass is usually most distinctly marked when it occupies the cæcum. Its characters are pronounced, and have been fully described in the account of obstruction by fæcal masses given in chapter xix.

At almost any time the patient may develop the symptoms of acute obstruction. This depends upon an absolute blocking of the intestine as a result of paralysis of a portion of it. An account of this form of obstruction is given under the title of ileus paralyticus.

D. **Chronic intussusception.**—No form of intestinal obstruction offers so many difficulties in the way of its recognition as does chronic intussusception, and no form has been the subject of more errors in diagnosis.

The term is applied to cases having a *duration* of not less than one month. The cases may last for many months. The *course* of the malady is extremely irregular. There may be at one time constipation and at another diarrhœa, at one time pain and at another none. There is, moreover, no method in this irregularity.

Sex. Age.—These cases are met with more frequently in males than in females, and are most common during the period of active adult life.

The mode of onset is sudden or abrupt in about 35 per cent. of the cases, the symptoms subsequently becoming more chronic. This feature when present is

of much value when diagnosing this from other forms of chronic obstruction.

Pain is distinctly intermittent, and for long intervals may be entirely absent. These intervals become shorter as the disease advances, while the duration of the attacks of pain is increased. The pain is seldom severe, and is often, indeed, insignificant.

Vomiting is a marked feature in only a little over 50 per cent. of the cases. In 6 per cent. it is entirely absent throughout the progress of the disease. It is very irregular in its appearance, and commonly coincides with the attacks of paroxysmal pain. It is seldom copious or distressing, and is feculent only in about 7 per cent. of the cases. It may be induced in the earlier stages, and made worse in the later stages, by food.

Constipation.—The state of the bowels varies greatly. They may be normal. As a rule they are irregular, sometimes with a tendency to constipation, but more frequently with a tendency to diarrhœa. In no less than 50 per cent. of the cases a *bloody discharge* from the anus is to be expected.

In about 13 per cent. of the examples of this affection there is marked *tenesmus.*

General condition.—The patient wastes, becomes cachectic and anæmic, and not infrequently dies of exhaustion and marasmus.

The *abdominal walls* are quite flaccid.

Meteorism is absent except during attacks of temporary obstruction or during pronounced constipation. In any case it will be quite slight.

Coils of intestine are often very clearly seen in movement through the wasted parietes.

Tumours.—An abdominal *tumour* of a more or less distinctive character is to be felt in about one half of the cases. In 32 per cent. of the examples the invaginated mass reached the rectum.

3. Cases where an attack of acute obstruction supervenes upon symptoms indicating a chronic obstruction.

There is no one of the many forms of chronic obstruction alluded to in the preceding paragraphs in which there may not abruptly develop all the evidences of acute occlusion. So important is it to recognise these cases that I have ventured to make of them a special class.

If the acute obstructive attack develop while the case is under the observation of the surgeon there can of course be no difficulty in the diagnosis. If, however, the patient is seen for the first time during the height of one of such attacks, then the symptoms may be very readily considered to depend upon one or other of the pathological conditions that lead to acute strangulation. Thus the abdomen has been opened under the impression that a coil of intestine was strangulated by a band, and the primary cause of the occlusion found to be a stricture of the bowel. It might be said at once that there is no one special form of intestinal obstruction that can be placed in this class and in no other. There is no form of chronic obstruction of the bowels that invariably leads to an acute attack.

The most common varieties of chronic obstruction are those that depend upon fæcal accumulation and upon stricture of the colon. In the former, the condition known as ileus paralyticus may at any moment develop, and the surgeon be confronted with a form of intestinal obstruction that often presents very pronounced and violent features. In connection with strictures, also, the case may proceed quietly for months, the stenosed part becoming narrower and narrower, and the symptoms more and more clearly defined. Suddenly the patient develops an acute attack of ileus; and if death results the gut will

be found to have become suddenly occluded at the narrowest part. This occlusion may be due to kinking or to acute bending of the bowel, or to blocking of the stricture by some foreign substance, or by a fæcal mass or a mass of undigested food. If the stricture involve the upper parts of the rectum then the distended sigmoid flexure above the stenosis may be found to have become twisted upon itself, and to have brought about the condition of volvulus.

In the less common forms also of chronic obstruction the same conditions may be met with. Thus, chronic intussusception very often ends in an acute attack which may prove rapidly fatal. Coils of intestine matted together by adhesions may become suddenly occluded by bending or kinking, at one or more points, and so lead to acute manifestations. A case of chronic volvulus, or of volvulus associated with slight symptoms, may, as a result of distension or of paralysis, become at any moment an example of acute volvulus with the appropriate symptoms. Any portion of the bowel partially occluded by compressing adhesions or by a tumour outside its walls, or by a neoplasm or a foreign substance within its lumen, may become at a moment completely obstructed by any of the causes just referred to when speaking of the sudden occlusion of strictures.

The patient may have many of such attacks, and these very often exhibit an increasing degree of severity.

With regard to the diagnosis between these quasi-acute attacks and cases of acute strangulation of the bowel, such as may be due, for example, to bands, the most important factor is the patient's past history. There will be usually a history of such symptoms as have been described as incident to chronic obstructions, and there will probably have been previous attacks of like character but of less pronounced severity.

These attacks also are distinctly less abrupt and less violent than are the examples of acute strangulation. The pain is usually by no means so severe, nor is the condition of prostration so marked. To one sign, however, in the differential diagnosis too much importance can scarcely be attached. It is this. In the acute attack supervening in a chronic case, the coils of intestine may be visible through the thinned parietes, a symptom that will be absent in cases of primary acute obstruction. In the former variety of case the symptom may be lost sight of if the meteorism become extreme, or if peritonitis develop, and it may be rendered much less distinct if the peristaltic movements have been moderated by the use of opium.

There are unfortunately a few rare cases in which the presence of a partial obstruction of the intestine is revealed for the first time by an acute attack. That is to say, a stricture exists in the intestine (most probably in the small intestine), but it has not yet so narrowed the lumen of the tube as to cause symptoms. On a sudden, however, the stenosed part becomes blocked by a mass of undigested food, or the bowel becomes occluded by kinking at the seat of stricture, and symptoms are thereby produced that assume at once an acute character. An acute attack occurring under these circumstances may be fatal, and there are cases recorded where a stricture of the small intestine has revealed itself by one attack of rapidly developing obstruction which has ended in death. The diagnosis of such a case would in the present state of our knowledge be an impossibility.

CHAPTER XXII.

THE SYMPTOMS AS MODIFIED BY THE POSITION OF THE OBSTRUCTION.

The questions to be considered under this heading practically resolve themselves into an examination of the clinical differences between obstruction situated in the small and in the large intestines.

The differences between cases of stoppage situated in these two segments of the bowel have frequently been described in great detail, but I think that the supposed distinctions laid down are often entirely fallacious.

It is true that the larger number of the cases of obstruction of the colon tend to assume a chronic course, while the larger number of cases situated in the small intestine tend to take on an acute character. Thus, a very slight observation of a series of instances of intestinal occlusion may appear to demonstrate conspicuous differences between an obstruction in the large intestine and one in the small.

When, however, cases of like degree are compared, when cases of chronic obstruction in the colon are compared with chronic cases involving the lesser bowel, and when acute obstructions in the one segment are compared with like obstructions in the other, it will be found that the great bulk of the fancied distinctions entirely disappears. Thus it would seem to be commonly supposed that obstructions of the colon, when compared with those of the small intestine, are apt to assume a tardy course, to be associated with comparatively little pain, and with a slighter degree of constitutional disturbance, and to be attended by

vomiting that appears late and is much less profuse and distressing.

This will be true as regards the more common forms of obstruction of the colon, but it does not apply to the acute forms. A case of volvulus of the sigmoid flexure may present symptoms as violent and as rapidly developed as any met with in cases of acute strangulation of the small intestine. Indeed, the more extensive the comparison between obstructions in the large and obstructions in the small intestine, the more distinctly does it become evident that the clinical distinctions are not emphatic, and that they depend more upon the nature of the occlusion than upon its situation.

Still, however, after all these reservations have been made, it will be found that there are a few features that may be made a basis for comparison in cases of a fairly equal degree of severity, although it is desirable that their individual value should not be over-estimated in diagnosis.

In comparing obstructions of the colon with those of the lesser bowel, it is desirable, in the first place, to note the physiological differences between these two segments of the alimentary canal. The small intestine is active and very vigorously concerned in the business of the organism, it takes a large and important share in the process of digestion, its walls are muscular, its blood-vessels are numerous, and its nerves, having origin from the superior mesenteric plexus, are brought into very direct connection with the great nerve-centres of the abdomen. On the other hand, the function of the large intestine is to a great extent passive. It serves as a receptacle for the contents of the bowel, so that long intervals may elapse between the evacuation of those contents. In one sense the ileo-cæcal valve may be regarded as a kind of internal anus. An accumulation of matter in

the small intestine soon causes distress, but such accumulations in the colon are, within certain limits, normal. The large intestine is not so muscular as the small, nor so freely supplied with blood. Its nerves also are in great part derived from the inferior mesenteric plexus, and have thus a comparatively indirect connection with the principal abdominal nerve centres. Such parts of the colon as are supplied by the superior mesenteric plexus are supplied by the filaments of that plexus that are most remote from the main source of origin of the nerves. It is said also that the intraparietal nerve plexuses of the intestine are more elaborately developed in the small than in the large intestine. Lastly, the colon has a less extensive connection with the peritoneum, and has therefore a correspondingly less elaborate nerve relation.

From all this it would appear that life is more active in the small gut than in the large; processes in the former are more vigorous, and morbid changes are likely to show an equivalent degree of activity in the lesser bowel; moreover, one may expect to find all reflex nerve movements carried on with a much greater alacrity than in the colon.

This last matter, however, is somewhat modified by the peritoneum. There is no evidence to show that there is any anatomical or physiological difference between the serous membrane as it covers the small intestine and as it covers the colon. When, in two cases of obstruction (one in the small gut and one in the large), an equal amount of peritoneum is damaged to an equal extent, it may be anticipated that the nerve disturbances arising from that lesion will not be very dissimilar. And in connection with this matter it is noticeable that the form of obstruction of the colon that most closely resembles acute strangulation of the small intestine is volvulus of the

sigmoid flexure, where, as is well known, a very extensive surface of peritoneum is involved.

In these cases it would appear that the greater surface of serous membrane involved in the volvulus, as compared with the amount usually implicated in small gut strangulations, has been able to overbalance the anatomical differences between the large and small intestine as regards their ability to form the basis of symptoms.

After these preliminary remarks, a comparison may now be made between the clinical features of obstructions in the large and small intestines.

Pain.—In the small intestine the pain usually appears earlier, is more pronounced, more abiding, and more severe.

Vomiting.—In the small intestine, as compared with the large, this symptom appears earlier, is more distressing, and is more persistent. In the obstructions of the lesser bowel the vomited matters are often copious, are apt to be influenced by food, and more readily become feculent than is the case when the stoppage is in the colon. Vomiting due to trouble in the large intestine may become irregular, may cease for awhile, and may be comparatively slight.

Constitutional disturbance is, other things being equal, certainly more marked in small gut obstructions than in those of the colon. There is a greater tendency to severe collapse, and consequently a more frequent appearance of the various remote phenomena connected with shock.

Meteorism.—When the lower part of the small intestine is obstructed, the meteorism first shows itself, and remains for awhile most marked, in the hypogastric, epigastric, and umbilical regions. In typical cases the abdomen presents the appearance of a six months' pregnancy, and the flanks and iliac fossæ are depressed. This symptom, however, is of no great

value, for the appearance may be almost exactly imitated by a distension of the sigmoid flexure, when that part of the gut forms a large coil, which projects towards the middle line of the abdomen.

When the lower part of the colon is involved the meteorism will attain a much greater degree than it does in small gut obstructions. Indeed, upon the whole, it may be said that meteorism is less in the latter cases than in the former.

Distension of the colon, especially when with solid matters, may map out very precisely the anatomical outline of the bowel and leave the central parts of the abdomen comparatively undistended. In any case, however, the meteorism tends to become general, and any appearances that may be regarded as typical are soon lost. In diagnosing acute volvulus of the sigmoid flexure from some acute strangulation of the small intestine, great importance attaches to the rapid development of a high grade of meteorism in the former affection.

Apart from this point in diagnosis, I do not think that anything like the importance attaches to meteorism as a means of diagnosis that has been ascribed to it. In certainly the great majority of cases the rules given in connection with this matter in many text-books and monographs are not reliable.

In obstruction situated *in the upper part of the jejunum and in the duodenum* we find that the symptoms are more distinctly influenced by the seat of the stoppage. In acute cases collapse appears early and assumes a grave degree, and the progress of the case is usually rapid and deliberate. In any case vomiting is among the earliest symptoms. The matters vomited are usually very copious, are always stained with bile, and never become feculent. The vomiting then gives temporary relief, and is, with the other symptoms, often distinctly aggravated by taking food. There

may be no meteorism and the abdomen may indeed be even retracted. When meteorism is present it will be slight in degree, limited to the epigastrium, and apt to be greatly diminished by a copious vomiting. In cases of chronic obstruction there will be evidences of ectasia of the stomach.

It now remains to consider certain means of investigation that have been adopted with the especial object of diagnosing obstructions of the large and of the small intestine from one another. These means are: 1, enemata; 2, the passage of the long tube; 3, auscultation of the colon.

1. **Enemata.**—A great deal has been written by various authors upon the value of enemata as a means of diagnosing the seat of the obstruction. The feature in this method consists in a comparative estimation of the amount of water that can be held by certain segments of the bowel. Thus elaborate statements have been made to the effect that if a certain amount of water can be readily injected then the obstruction must be in the sigmoid flexure, if a certain additional quantity can be introduced then the stoppage must be in the descending colon, and finally if a certain number of ounces or pints can be received then the whole of the large intestine must be occupied and the occlusion must be situated in the small bowel. Dr. Brinton, for example, has given very detailed instructions upon this head. The statements are usually based upon experiments made upon the cadaver with reference to the actual amount of fluid that various segments of the colon can accommodate.

For diagnostic purposes this method is, I venture to think, absolutely useless. In the first place, observations made upon the cadaver, where the parts are relaxed and where muscular action has ceased, are not likely to be identical with those made upon the living subject. The method, moreover, does not take into

consideration the condition of the bowel below the obstruction. This part of the tube may be dilated or contracted, may respond vigorously to certain forms of irritation or remain absolutely inert. Then, again, as Dr. Hilton Fagge has pointed out, there are certain strictures, especially those associated with some bending of the gut or with a valvular arrangement of the mucous membrane above the stenosed part, through which water may be injected from below while fluids above the stricture are unable to find a way to escape. I have myself in many cases had an opportunity of verifying the fallacies in this reputed method of diagnosis, and many published cases serve also to illustrate these errors. As an example I may cite one instance of stricture of the sigmoid flexure where over three pints of water were introduced by an enema and were retained for twenty-five minutes. This large quantity of fluid must have been accommodated in the rectum, since the autopsy revealed that none had passed beyond the stricture.*

2. **The passage of the long tube.**—In this method a flexible tube or sound is passed into the rectum, and an attempt is made to diagnose the seat of the obstruction by noting to what distance the tube can be introduced. This procedure applies mainly to stenosis of the lower part of the colon. As a means of diagnosis it is, I believe, entirely valueless. In some cases the sound has lodged early in its career against a fold of mucous membrane, and the diagnosis of an obstruction low down in the bowel has been in consequence made. In other instances in stricture of the termination of the sigmoid flexure the tube has reached the upper extremity of the rectum, and has then turned upon itself, or become coiled up in the rectal ampulla, until so much has been introduced that the whole of the colon downwards from the splenic

* Path. Soc. Trans., vol. vii., page 207.

flexure has been diagnosed to be free from obstruction. I have good reasons for doubting if these rectal sounds ever go beyond the sigmoid flexure. This impression is fully confirmed by experiments made upon the dead body. If the segment of the colon that forms the sigmoid flexure and the free part of the rectum be uncoiled it will appear in the form of a large loop of intestine extending from the psoas muscle to the spot where the rectum becomes fixed opposite about the middle of the sacrum. This loop has the outline of a capital omega, and is usually provided with an extensive mesentery. Such is occasionally the length of this mesentery that the summit of the omega loop can be made to touch the cæcum or to reach the level of the umbilicus. In some examples I have found this loop to be from eighteen to twenty inches in length. If the long tube be introduced into such a coil its extremity may reach the level of the umbilicus and yet not have passed beyond the sigmoid flexure. In one case that I saw in an emaciated subject with chronic obstruction, the surgeon passed a long tube, and demonstrated with triumph that its end could be felt near the umbilicus. He maintained that the instrument had reached the centre of the transverse colon, and that the bowel below that point was free. The autopsy that came to pass in due time revealed an impervious stricture of the commencement of the sigmoid flexure where it joined the descending colon. Apart from this, this present method of diagnosis takes no account of abnormalities in the colon. Even if it be presumed that the sound has found its way into the sigmoid flexure, it may then have reached one of those very extensive and tortuous coils that are at times found to represent this segment of the large intestine.

3. **Auscultation of the colon.**—This method of investigating the intestine is of much value, and is hardly estimated at its proper importance.

It consists in auscultating the region of the colon and cæcum while fluid is being introduced into the rectum by means of an enema syringe. If the colon be entirely clear, and the stethoscope be placed over the cæcum, the water can be heard to reach that part, and if such be the case pretty conclusive evidence is afforded that the obstruction, wherever it may be placed, is at least not in the large intestine.

I have had several opportunities, both in the healthy subject and in individuals suffering from intestinal obstruction, of testing the value of this method of investigation. In making use of this means it is very desirable that the surgeon should first familiarise himself with the various sounds that may be heard in the abdomen, especially in the subjects of obstruction. Certain borborygmi closely imitate the noise made by the enema as the water passes along the bowel. Moreover, when the injection is forcibly administered there is some little difficulty at first in localising the sound it makes, since the noise of the rush of water may be heard over nearly every part of the abdomen. The enemata should be quietly introduced, and the water injected be without any admixture with air. If the injection be made in an intermittent manner the particular sound caused by the enema may be more readily differentiated. The sound of water passing into the cæcum must be distinguished from that made by the first rush of the fluid from the enema tube into the rectum.

CHAPTER XXIII.

THE VARIOUS AFFECTIONS THAT HAVE BEEN MOST FREQUENTLY CONFUSED WITH CASES OF OBSTRUCTION OF THE BOWELS.

A VERY large number of diseases fall under this head, and, indeed, it may be said that there are not very many examples of abdominal disease that have not been confused at one time or another with cases of intestinal obstruction.

A large proportion of the examples of this confusion is derived from records that may now be regarded as ancient, and deals with instances of error that could hardly be possible at the present day.

To discuss every possible form of mistaken diagnosis seriatim would involve more space than this work could permit, and at the same time produce material that would be of very little value.

I propose, therefore, to consider in detail the two morbid conditions that I think most frequently and most seriously complicate the diagnosis of intestinal obstruction, viz. pseudo-strangulation and peritonitis, and then to deal with the remaining causes of error *en masse*, and in as brief a manner as possible.

1. **Pseudo-strangulation.**—There have been recorded from time to time certain cases, that collectively assume no inconsiderable proportions, where a patient has presented all the most conspicuous symptoms of internal strangulation, has died, and has exhibited at the autopsy an intestine entirely free from any mechanical obstruction.

There is little doubt that these cases are mainly due to paralysis of some segment of the intestine,

whereby at a certain spot the peristaltic movements cease and the passage of the contents is thereby arrested. While this condition may fully explain the constipation observed in these cases, and while that constipation may in its turn induce such symptoms as vomiting and colic, it must at the same time be allowed that these latter symptoms are often due to reflex nerve disturbance, and are thus, to a great extent, independent of the interruption in the peristaltic wave. This statement may perhaps be more conveniently considered in connection with the examples to be given of this form of "obstruction."

The subject of pseudo-strangulation of the bowel was very elaborately dealt with by Henrot in an oft-quoted monograph that, although produced nearly twenty years ago, is still to be regarded as a masterpiece.*

Henrot's arrangement of the subject is (with some trifling modifications) still the best that can be adopted.

He divided all cases of paralysis of the intestine leading to obstruction symptoms into three classes: (1) Direct paralysis of a segment of the gut due to changes in its walls. (2) Indirect paralysis depending upon reflex nerve action. (3) Paralysis of the bowel as a feature in a general affection of the nervous symptom.

(1) Of this form many examples may be given. A loop of intestine has been strangulated in a hernia; it is reduced; yet the symptoms of strangulation persist; the patient dies, and the autopsy reveals the bowel free from any mechanical obstruction and the peritoneum normal. Here it must be surmised that the involved coil has been paralysed as a result of the injuries sustained by its walls from the strangulation

* Des Pseudo-étranglements, by Dr. Henri Henrot. Paris, 1865.

and possibly also from the taxis. In such a case as this the persistence of symptoms is probably very largely due to reflex action taking origin in the damaged peritoneum and intestinal walls. The nature of this reflex disturbance will be discussed in dealing with the second variety of pseudo-strangulation. There are also cases where the symptoms of obstruction have followed upon a severe injury to the abdomen, such as a kick from a horse, and where they may be in the main ascribed to a paralysis of the injured portion of intestine.

In this category must also be placed cases of pseudo-strangulation due to peritonitis, cases where the changes that spread to the walls of the intestine from the inflamed serous membrane are such that the involved segment of the gut is rendered incapable of displaying peristaltic movements. "Furthermore," says Leichtenstern, in speaking of this matter, "those rare cases in which, during diarrhœa, or tuberculosis of the intestine, or typhoid fever, or in the course of a severe chronic intestinal catarrh, death follows with stercoral vomiting and other symptoms of impermeability of the intestine, while no mechanical obstruction can be found at the autopsy, cannot be explained otherwise than by serous infiltration, degeneration, and relaxing of the muscular coat, especially in the neighbourhood of large typhoid, tuberculous, or dysenteric ulcers, leading to a paralytic condition of the muscular coat, and thereby to arrest of the advance of the contents of the intestine."

(2) In the second class of case we have to do with a number of instances of reflex paralysis, and of symptoms due to reflex disturbances other than those causing loss of muscular power.

But a very limited inquiry into the subject of intestinal obstruction will show that for the production of its main symptoms it is by no means necessary that

the lumen of the bowel should be considerably narrowed. In Littre's hernia, for example, only a small part of the circumference of the gut need be involved in the strangulation, and yet although the lumen of the bowel presents a free passage the patient may die with all the symptoms of acute strangulation.

It is to be readily understood that the bowel in the immediate vicinity of the strangulation may become paralysed from more than one cause. This paralysis may produce constipation and subsequently vomiting, but it can hardly be the sole cause of the violent pain, the severe vomiting, and the appearance of collapse, all of which symptoms may be among the earliest manifestations of the condition. These symptoms must be largely due to reflex nerve disturbance starting from the damaged nerves in the strangulated part. The great nerve centres of the abdomen are excited by the lesion; vomiting is produced, and violent and disordered peristaltic movements are set up. The paralysis of the gut, which may be due to purely local causes, tends to give to these symptoms somewhat of the characters they present in true intestinal obstruction.

A crush of the testicle is often followed by great collapse and with severe and long-continued vomiting. These symptoms, which are also so conspicuous a feature in acute strangulation, are no doubt due to a damage to the spermatic plexus which arises so high up in the abdomen as to be in very near relation with the great solar plexus. Indeed, a morbid nerve impulse could reach the abdominal nervous centres as readily from the testicle as it could from such parts of the colon as are supplied by the inferior mesenteric plexus.

The collapse and vomiting that may attend lesions of the peritoneum are of the same character, and are also of reflex origin.

Pflugger found that the movements of the small intestine could be arrested by mechanical irritation of the skin of the abdomen. Now the integument over the abdomen is supplied by certain dorsal nerves, and from the trunks of these very same nerves are derived the main spinal nerve contributions to the splanchnic trunks, and these trunks, it is unnecessary to say, take a very important share in the formation of the great sympathetic plexus in the abdomen. The connection, therefore, between an irritation applied to the skin of the belly and an arrest of movements in the parts supplied by the superior mesenteric plexus is very direct.

Many cases of pseudo-strangulation are not difficult to interpret when viewed in the light of the above observations. Thus Henrot* mentions a case where the symptoms of strangulation of the intestine were produced by a phlegmon of the abdominal parietes. In this case the constipation, the colic, the vomiting, may all be ascribed to a morbid stimulation of certain reflex centres, the afferent impulse travelling from the surface nerves of the abdomen to certain dorsal nerves, and from them to the splanchnic trunks and the central plexus commanding the abdominal viscera.

As another example of this form of pseudo-strangulation I might mention the case of a male infant, to whom my attention was called by a house surgeon who had diagnosed in the child a strangulated hernia. The infant was in a condition of great prostration, it was troubled with incessant vomiting ; there had been no action of the bowels since the symptoms set in, and there was a fair degree of meteorism. In the groin was a hard and very tender irreducible tumour. This, as I soon discovered, was not a strangulated hernia, but an inflamed retained testicle. Soon after the application of ice to the part the child began to

* Loc. cit. page 81.

improve, and the symptoms of intestinal obstruction spontaneously disappeared.

Henrot's monograph contains many similar cases in which an inflamed condition of the testicle led to some of the chief manifestations of intestinal obstruction.

In several instances it would appear that an inflamed hydrocele has been mistaken for a strangulated hernia. In one instance no less a surgeon than Dupuytren was deceived by the resemblance, and proceeded to perform the operation of kelotomy.* In one case reported in Henrot's monograph, such grave symptoms analogous to those of intestinal obstruction followed the application of a ligature to piles that the patient's life was threatened.

In other examples of this form of pseudo-strangulation the exciting cause was an abscess or inflamed gland in the region of the groin, or a hernial sac, the walls of which were the seat of active inflammatory change. A complete collection of these cases is to be found in Henrot's paper.

(3) Under this head are included cases of supposed paralysis of some segment of the bowel, where the local nerve lesion is but an outcome of a more general disturbance of the nervous centre. Under this class are grouped cases of pseudo-strangulation occurring in connection with hysteria, meningitis, etc.

What may be termed a chronic form of the affection has been touched upon in the chapter on fæcal accumulations.

In some of the cases depending upon hysteria the symptoms have been quite acute, and have borne a very close resemblance to genuine examples of obstruction. Dr. Lusseau alludes to an instance of this kind, where the resemblance was so exact that an operation for the relief of intestinal obstruction was proposed.

* Clin. Chir., vol. iii., page 584.

The patient, however, soon recovered when treated by antispasmodics.

No especial rules can be given for guidance in the diagnosis of these cases of pseudo-strangulation. In most instances there will be no real difficulty, since a condition may exist that may be a known cause of obstruction symptoms, and at the same time there is generally some anomaly in the symptoms themselves, some flaw in the clinical completeness of the case that may at once suggest the spurious character of the disorder. Henrot and others have written a great deal upon the means of recognising these cases, but their observations have little practical utility, and it must be owned that as a knowledge of intestinal obstruction extends so must the number of errors in diagnosis diminish. It is significant that the great majority of the examples of an actual mistake in the diagnosis depending upon pseudo-strangulation are not derived from recent records, but belong to a period when the clinical account of intestinal obstruction was less complete than it is at the present day.

2. **Peritonitis.**—The association of acute peritonitis with intestinal obstruction is very common, and, indeed, the inflammation of the serous membrane is quite frequently the immediate cause of death in obstruction cases. Apart, however, from this association, it is to be noted that the symptoms of peritonitis present many points of resemblance to the symptoms of pure obstruction of the bowel, and so close may this resemblance be that the one affection may be mistaken for the other. It will be well, therefore, to consider (1) with what clinical manifestations the appearance of diffuse peritonitis is associated in obstruction cases, and (2) how cases of peritonitis may be diagnosed from cases of simple stoppage of the bowels from mechanical causes.

(1) The following are the principal symptoms that

indicate the accession of diffuse peritonitis in a case of intestinal obstruction. There may be, in the first place, a rise of temperature. This symptom is by no means constant, and the development of the serous inflammation may be associated with a normal or even with a subnormal temperature. Indeed, I have found cases on record and in hospital reports where the temperature, which was sinking when peritonitis set in, has continued to fall after the development of that inflammation. The pulse becomes smaller and more thready, and increased in frequency. The abdomen becomes more distended, and it is especially to be noted that the distension is uniform. If any coils of intestine were visible before the peritonitis set in, then, on the appearance of the serous inflammation, they will cease to be seen. The liver dullness disappears, there is very often increased dyspnœa and other evidences of pressure upon the thoracic viscera. The abdominal parietes, hitherto flaccid, become hard and tense, unless the patient be much collapsed or deeply narcotised. There is great tenderness on pressure all over the abdomen, and the patient, who has probably been restless and tossing to and fro in bed, now lies very still, and often with the knees drawn up. In cases associated with much effusion there will be evidences of the presence of fluid in the more dependent parts of the abdomen. While there is a distinct and very grave increase in the amount of tenderness (which may, indeed, have been absent before the peritonitis) there is not usually a great increase in the amount of pain. Owing to the paralysis of the intestine, due to the effects of the peritonitis, the pain depending upon irregular peristaltic movements abates, such suffering as there is becomes less paroxysmal, and the pain, therefore, is more continuous. In many instances, therefore, the appearance of peritonitis has been attended by increased tenderness but by a

diminished amount of pain. In some cases the vomiting becomes more severe, in other examples it is moderated, and, if feculent, may become again non-stercoraceous. The appearance of singultus is often associated with the onset of peritonitis.

(2) The differential diagnosis of peritonitis and intestinal obstruction.

The most usual form of peritonitis to be mistaken for a case of mechanical obstruction is that acute form due to perforation. Duplay, in an excellent monograph upon the subject, has collected no less than fourteen recorded examples of this error in diagnosis.*

In each instance the case was considered to be one of acute strangulation of the bowel. In several of the examples an operation was performed with the intention of relieving a supposed obstruction and the error only discovered when the abdomen had been opened. The great majority of the cases concerned perforative peritonitis following upon some mischief in the cæcum or appendix. In two instances the cause of the mischief was a perforation of the gall-bladder. In a case of peritonitis due to this latter cause, reported by M. Herbelin, laparotomy was performed under the impression that the case was one of mechanical obstruction.†

The resemblance between the cases of perforative peritonitis and those of acute strangulation is often close. In both the symptoms may develop suddenly during apparent health or after certain vague abdominal troubles, in both there is early and severe pain, in both there is constipation, vomiting that may become stercoraceous, and great prostration.

The following points may be noticed in the differential diagnosis.

* Archives gén. de Méd., vol. xxviii., 1876, page 513; and ibid., 1879, page 709. (*See also* Henrot's monograph.)

† Bull. de la Soc. Anat., July, 1878.

Mode of onset.—In both it is usually sudden and, in the case of the obstruction, more commonly without any definite preliminary symptoms. As already noted, most of the instances of perforative peritonitis that have been the cause of error have followed upon a typhlitis, or some trouble in the appendix. Now, in these cases the perforation may take place without any marked intestinal symptoms having been noted. In the majority of instances there *are* symptoms. The bowels are irregular, there are attacks of severe indigestion, there is tenderness over the region of the cæcum. The cæcum, distended with fæcal matter, may form a distinct tumour that is the seat of pain, and is also tender on pressure. There may have been vomiting, and very possibly some rise of temperature. In more distinct cases there will be some œdema of the abdominal parietes about the cæcum. When these symptoms have existed there should be little difficulty in recognising the condition of things when at last a perforation of the bowel occurs.

A rigor may usher in acute peritonitis, which will not be the case in acute obstruction.

The temperature in acute peritonitis is usually high at first, falling again as prostration advances. In certain examples attended by profound collapse the temperature may be subnormal from the first, but such cases are rare, and are not likely to be confounded with acute strangulation. In those instances where this confusion is apt to occur there will be almost always a distinct elevation of temperature at the commencement of the case, and this elevation may be maintained through the further progress of the malady, only sinking to or below normal at the termination. In acute diffuse peritonitis death may occur while the temperature is still at its height. The earliest rise of temperature may reach 104, although it is more usually not above 102, and throughout the progress of

the case the temperature is apt to show marked remissions. In acute obstruction the temperature is low at first, usually subnormal, and remains subnormal throughout the progress of the case.

Pain.—In the inflammatory affection the pain, which may be very severe, is attended by extreme tenderness upon pressure. This tenderness, which may be at first local, soon becomes diffused. In the earlier stages of the obstructive affection there is also very severe pain, but there is no marked tenderness, and, indeed, the suffering is often to be relieved by pressure.

Vomiting.—In both maladies vomiting appears early, but in acute strangulation it is a much more prominent symptom than in peritonitis. In the latter affection it rarely becomes feculent, and then only towards the conclusion of the case. Among the fourteen cases of acute peritonitis collected by Duplay there was feculent vomiting in three instances only. In these fourteen cases, as already observed, the diagnosis of acute obstruction had been in each instance made.

Constipation is absolute in the obstruction cases. In peritonitis it may be absolute also, but not infrequently a slight motion may be passed or flatus may be discharged by the anus.

The quantity of urine passed in both the conditions may be very small.

The abdominal parietes are tense and hard from the first in diffused peritonitis. In acute obstruction they are flaccid at first, and often remain so until peritoneal inflammation has set in.

The meteorism may be localised at first in the obstruction cases. It is diffused from the commencement in peritonitis.

Cases of **tubercular peritonitis** have been mistaken for cases of obstruction of the bowels. This error can but very rarely occur, for in the most usual

form of tubercular peritonitis the symptoms have but little resemblance to those due to occlusion. The manifestations of the disease develop very gradually, and the patients are usually first seen when suffering from great debility and ascites.

There is, however, an acute form of the malady which may be, and has been, a cause of error. In this form the disease commences acutely with a pain in the abdomen, either at a circumscribed spot or over a larger area. Associated with it are repeated vomiting, constipation, and meteorism. In a while all the symptoms may disappear, and then repeated attacks occur at irregular intervals. In this form there is no fluid effusion.* M. Lionville has given a good example of mistaken diagnosis in this variety of tubercular peritonitis. The subject was a man, aged twenty-three, who was taken suddenly with symptoms so severe, and so like those of intestinal obstruction, that an operation for his relief was proposed. In four days the bowels were opened spontaneously; the vomiting, which had been almost feculent, disappeared, and the patient returned to what seemed to be a condition of health. In fifteen days, however, the symptoms of intestinal obstruction appeared again, and again was an operation seriously considered. The symptoms, however, passed off. The patient died in three months, and the autopsy revealed nothing but the ordinary evidences of tubercular peritonitis.†

In the differential diagnosis of these affections it is especially to be noticed that the tubercular disorder is attended by fever, and by early and usually distinct tenderness of the abdomen. These symptoms are absent in the obstruction cases. After the attack there is usually a sense of undue resistance over the

* Bauer, Diseases of the Peritoneum. Ziemssen's Cyclopædia of Medicine, vol. viii., page 328.

† Bull. de la Soc. Anat. de Paris, 1875, page 726.

spot that has been especially the seat of pain and tenderness.

During the progress of any case of tubercular peritonitis, genuine intestinal obstruction may occur from matting together of the coils of intestine, or from bending or kinking of such loops as are adherent.

Diseases that have been mistaken for obstruction of the bowels.—Under this heading I propose merely to enumerate a few of the maladies that have been mistaken for cases of intestinal obstruction; but not to discuss the differential diagnosis in each instance, since many of these examples of mistaken diagnosis have been already referred to, and the symptoms of each variety of occlusion have been, on the other hand, fully discussed.

Cholera.—This disease has been imitated by the most acute forms of intestinal obstruction. In these cases the patient has fallen rapidly into a condition of cholera-like collapse; the extremities have become cool, the surface cyanosed, the pulse thready and almost imperceptible, the voice has sunk to a whisper, and the countenance has presented all the features observed in cholera. At the same time there has been a violent vomiting, cramps in all the limbs, suppression of urine, and extreme prostration. The cases that have most closely resembled cholera have been cases of very acute strangulation of a considerable portion of the small intestine especially of the upper parts of that bowel. The strangulation may have been preceded by profuse diarrhœa, or the gut below the obstruction may have been emptied by diarrhœa after the strangulation had occurred.* In many instances the cases had been met with during an epidemic of cholera.

Another form of obstruction that may resemble

* Fournier and Ollivier; *Gaz. Méd. de Paris*, 1868. The motions were not arrested until two days before death.

cholera is ultra-acute intussusception associated probably with much purging.*

Dr. Barlow mentions an instance where the patient was thrown into a choleraic condition from obstruction due to masses of undigested food.† A like case of a more severe character is quoted in Dr. Servier's treatise. In this instance the patient, a soldier, lived only sixteen hours after the commencement of the attack.‡

An excellent discussion of the chief features in the diagnosis of these cases has been afforded by M. Félix Réfrégé.§ He deals with fourteen cases of error in diagnosis, and refers to other but less defined examples.

In only four of the fourteen cases were cramps in the limbs noticed, and in all, save in two examples, there was absolute constipation.

There can be little real difficulty in the diagnosis if too hurried an opinion be not arrived at. The obstruction attacks are associated with intense pain at the commencement attended by constipation. In cholera there is an absence of pain and profuse diarrhœa. The abdomen becomes soon retracted in cholera, but meteoristic in acute strangulation. In cholera vomiting does not set in quite so early as in cases of acute obstruction. In many cases it is entirely absent, and when present is non-feculent, and has the peculiar whey-like appearance so often described.

Error is most likely to occur when an example of ultra-acute occlusion is met with during an epidemic of cholera.

* Dr. Todd; *Med. Times and Gazette*, vol. ii., 1865, page 195. M. Fernet; Bull. de la Soc. Anat., 1863, page 296.

† *Med. Times*, vol. i., 1866, page 443.

‡ L'Union Méd., 1867, page 100.

§ Le Diagnostic de l'Étranglement intestinal à Symptomes cholériformes. Thèse de Paris, 1867. *See also* art. by M. Berger, Bull. et Mém. de la Soc. de Chir. de Paris, vol. ii., 1876, page 698; and Vassor, Thèse de Paris, 1862; and Savopoulo, Thèse de Paris, 1854.

Lead colic.—A case is reported by Dr. Fagge* of a man, aged twenty-nine, who had a blue line on the gums, but whose intestinal symptoms were due not to lead-poisoning, as at first supposed, but to partial obstruction from shrinking of the mesentery.

Poisoning by arsenic.—In several instances cases of acute strangulation have excited suspicions of poisoning by arsenic, and the doubt has only been cleared up at the autopsy. Leichtenstern alludes to several examples.

Hepatic or renal colic may be imitated by acute obstruction in the upper portion of the small intestine associated with profuse non-feculent vomiting, intense paroxysmal pain, collapse, and a retracted condition of the abdomen.

Meningitis.—Dr. Fagge alludes to a case of acute obstruction of the jejunum where meningitis was suspected on account of the delirium, the vomiting, and the retracted abdomen.

Cirrhosis of the liver.—Dr. Lusseau reports a case where cirrhosis of the liver was taken for an example of obstruction of the commencement of the colon by a neoplasm. The autopsy, however, revealed, in addition to the cirrhosis, some old adhesions about the cæcum and sigmoid flexure, as well as a compression of the third part of the duodenum by an old cicatricial band.†

Cancer of the omentum has simulated true obstruction.‡

A cyst of the mesentery has been mistaken for an intussusception tumour,§ and an intussusception tumour for a new growth or a mass of fæcal matter.

Tumours formed by fæcal masses have been mistaken for a number of affections (*see* page 354), and

* Guy's Hospital Reports, vol. xiv., page 272.
† Progrès Médical, 1879, page 545.
‡ De l'Occlusion Intestinale. Thèse de Paris, 1879, No. 363.
§ Bull. de l'Acad. de Méd., page 831. Paris, 1880.

notice has already been taken of the numerous diseases which have been confused with chronic intussusception. (*See* page 237.)

The confusion between acute or subacute intussusception and *dysentery* or *enteritis* has been of frequent occurrence.

CHAPTER XXIV.

THE TREATMENT.

THE subject of the treatment of cases of intestinal obstruction, with its extensive bearings and its many vexed questions, may be most conveniently considered under two general headings:

1. The methods of treatment available for intestinal obstruction.
2. The special treatment of individual forms of obstruction.

THE METHODS OF TREATMENT AVAILABLE FOR INTESTINAL OBSTRUCTION.

Non-operative measures: the feeding of the patient.—This is matter which demands a little more attention than it has at present received. In many examples of acute obstruction the progress of the case is so rapid, and death appears so early, that the question of supporting the patient by food does not require to be entertained. In less rapid cases, however, this question becomes a prominent one, and in subacute cases it obtains a very considerable degree of importance. Certainly in not a few instances one of the factors in the exhaustion that leads to death depends upon the patient's inability to take or to retain food. When the case has lasted four or five or

six days the patient's prospect of recovery is compromised by the debility induced by want of nourishment, and this debility may seriously modify the result of any operation. In not a few instances, more especially in cases of intussusception, a process of spontaneous relief is found to be nearly complete at the time of death and to have been arrested by a fatal exhaustion, to the production of which an inability to take food has no doubt contributed. The position of acute and subacute cases of obstruction with reference to the question of feeding is as follows: The patient is very sick, he not only vomits everything that he takes, but will vomit at other times than after the ingestion of food. In many subacute cases, where the sickness is not so marked, the taking of nourishment excites the act of vomiting after the symptom has abated, and the patient may for awhile only be sick after he has taken food.

It is obvious that it is worse than useless to attempt to feed these patients by the mouth. There is usually an entire lack of appetite, and a disgust of food quite apart from the circumstance that every mouthful swallowed is apt to aggravate one of the most distressing of the symptoms. Moreover, even if it be supposed that the food can be retained, it is scarcely possible to imagine that it can be digested and absorbed. The stomach is not improbably occupied by matters regurgitated from the bowel. The small intestine above the obstruction is more or less congested, is distended, is occupied by putrifying contents and much flatus, and is certainly not in a condition to further elaborate or even to absorb any food matters that may reach it from the stomach. These is still one other aspect of the question. In some cases of subacute intussusception food may occasionally be swallowed without causing sickness. That such food is digested and absorbed is not very

probable. Whether it is or not is a little apart from the question, since clinical experience shows that the matters, if not rejected, will excite increased peristaltic action in the intestines, and will decidedly aggravate the condition of the invagination. It is obvious, therefore, that if food is to be administered in these cases, it must be administered by enemata and never by the mouth. By means of nutritive enemata the patient may be greatly relieved and his strength to no small extent supported. The distressing thirst that is often so conspicuous in cases of acute obstruction is much abated by copious injections of fluid into the rectum, and when more substantial nourishment needs to be administered, it can be introduced by means of small and repeated enemata of peptonised foods. In the majority of the cases of acute obstruction, the small intestine is the part involved, and the colon, therefore, is free and capable of receiving injections. Even in cases of acute obstruction involving the colon (as in volvulus of the sigmoid flexure), enemata may be retained by the rectum, although in many of these cases there is so much tenesmus that feeding by this method is impossible. On the other hand, it must be remembered that the vomiting in cases where the colon is involved is usually much less severe than it is when the obstruction implicates the lesser bowel.

There are many circumstances, however, besides the one already mentioned, under which the administration of food by enemata is not possible. In many examples of intussusception it is not possible. The invagination has reached the lower colon, there is tenesmus, the contents of the bowel are being frequently rejected by a species of diarrhœa, and enemata merely aggravate the peristaltic movements of the tube. In these cases, however, that are associated with diarrhœa, there is often comparatively little

vomiting, and the patient is not infrequently able to take a little nourishment by the mouth without inconvenience being caused.

There are other cases of obstruction apart from intussusception, where the administration of enemata has been undesirable on account of the disturbance produced, the mere injection having caused in such instances an increase in the vomiting, and in the pain depending upon peristaltic movements.

In acute and subacute cases of obstruction, the question of feeding the patient resolves itself to this: the patient may have ice to suck to relieve the sense of distressing thirst, but apart from this all food should be administered, if possible, by the rectum, and in any case this method of taking nourishment should be persevered with so long as it can be carried out.

In chronic intestinal obstruction, and especially in cases where the small intestine is the part involved, the feeding of the patient becomes a matter of extreme importance, and one demanding considerable attention.

In this form the lumen of the intestine is only partially occluded. Matters can pass readily through it so long as they are fluid, or at least of quite soft consistence; but any large solid particles passing along the bowel will certainly, if of sufficient magnitude, plug the stenosed part and produce severe symptoms. This circumstance is repeatedly illustrated in the clinical history of stricture of the intestine. Indeed, the earlier symptoms of stenosis of the small intestine depend upon an occasional entire occlusion of the tube, and this occlusion is, in the majority of cases, due, directly or indirectly, to the presence of masses of undigested food. The earlier treatment of stricture of the small intestine resolves itself almost solely into a question of diet. So long as the patient exercises extreme care in the selection of his food, so long will

he remain free from severe trouble until such time as the condition of the stricture will not permit the free passage of even well-digested matters. In examples of stenosis of the colon the same importance attaches to diet, although it may be not quite so manifest. In these cases there may be no aggravation of symptoms shortly after food, the connection between the taking of certain foods and the appearance of certain symptoms may be not so direct as in cases of stricture of the lesser bowel, but the relationship still exists. The more solid the contents of the colon become, the more trouble does the stricture produce, and it is needless to point out the connection between the state of the colic contents, and the nourishment that has been ingested. In the long period that usually elapses between the commencement of symptoms and the time when operative interference has to be considered, a very great deal may be done by a careful dieting of the patient. Indeed, during this period the treatment of the case is in the main a pure question of dieting.

These observations apply of course to feeding by the mouth, and refer to cases of stricture as well as to others allied to that condition. In the later stages of these forms of obstruction, when vomiting becomes a more frequent and prominent symptom, the question of administering some or (for a while) all of the food by enemata again arises.

In no case, however, do I think that operative measures should be delayed on account of the circumstance that the patient's general strength can be fairly supported by nutrient enemata. When operation is desirable on account of the condition of the bowel it should be carried out, and the more favourable the patient's general state at the time of the operation, the greater degree of success may be expected to attend the procedure.

In not a few examples of chronic intussusception the patient dies of marasmus and exhaustion. This termination is in great part brought about by the enfeebling effect of persistent vomiting and frequent pain, but it depends also in a large degree upon the malnutrition, consequent upon the inability to take or to retain food, or to absorb nutritive matters from the disordered bowel above the invagination. In many of these cases the general strength may be supported by peptonised enemata, and the patient's life greatly prolonged in instances where operative interference is not considered as necessary. In cases where an operation may be performed, the success of the procedure is likely to be rendered more certain by the improved state of nutrition consequent upon feeding by the rectum. There are, of course, cases of chronic intussusception in which the repeated use of even small injections would not be tolerated.

Opium.—There is certainly no one drug of more use and value in cases of intestinal obstruction than opium. The precise action of opium upon the intestinal movements may be still a matter of some scientific speculation, although its gross effects in cases of intestinal disorder are, from a clinical point of view, obvious enough. The latest experimental investigations upon this subject are those conducted by Nothnagel. The following abstract from an article in the *Lancet** gives the general result of these experiments in a very brief and complete manner. Nothnagel "discovered in his earliest experiments that a sodic salt placed in contact with the outer surface of the intestine of a rabbit causes a local contraction which passes upwards. This effect was found to be prevented by a preceding subcutaneous injection of a small quantity of morphia, one to four centigrammes. Even bicarbonate of soda, which under normal circumstances causes a very

* Leading article, *Lancet*, Oct. 21st, 1882, page 672.

energetic contraction, no longer produces the effect. Nothnagel ascribes the effect to the stimulation of a nervous mechanism antagonistic to that which is excited by the sodic salt. If, however, a much larger quantity of morphia was injected (ten centigrammes, for instance), not only does the sodic salt produce its customary effect, but the contraction is much more energetic than under ordinary circumstances. This anomalous effect seems to indicate, that while small doses of morphia stimulate, larger doses paralyse the inhibitory nervous mechanism. Morphia appears thus to exert on the intestinal apparatus an action comparable to that which digitalis exercises on the innervation of the heart, which consists in a stimulation or paralysis of the inhibitory fibres of the vagus, according to the dose employed. Other experiments seem to show that the action of morphia on the intestine is exerted through the splanchnic nerves. The constipation produced by morphia is assumed to be the result of a stimulation of the inhibitory fibres contained in the nervous trunk, aided by a diminution in the intestinal secretion."

As to how far these experiments are confirmed or refuted by clinical experience in the human subject it is needless here to enquire. The general effect of opium in cases of intestinal obstruction is very marked, and very fairly constant when the conditions under which its action is observed are equal. It allays pain. It can dull or remove the severe agony that often marks the earliest stages of acute strangulation. It can quiet the constant sense of distress that attends upon a case of chronic obstruction.

Pain, moreover, may often be taken as a measure of shock, especially in examples of collapse depending upon intestinal lesions, and with the subsidence of pain the more striking manifestations of shock commonly disappear. Thus in acute cases the

effect of opium in moderating and even removing the more conspicuous symptoms of shock is often very pronounced. It not only affects the pain, but it influences the pulse and temperature. One of the cases reported by Leichtenstern in his monograph may be taken in illustration of this. "A few days ago I saw," he writes, "an unusually severe case of obstruction by gall stones; the patient was covered with cold sweat, had cool extremities, muffled voice, choleraic countenance, vomited freely, and presented a board-like tension of the abdomen. The temperature in the rectum was 95½°; a thermometer placed at the same time in the axilla, and compared with the one in the rectum, marked only 92°; the pulse was small, its frequency 48 in the minute. After an injection of morphia, the tension of the abdomen diminished, the skin filled with blood, the pulse rose gradually to 76, the temperature in the rectum, after the patient had passed an hour of comparative comfort, was 99·6°."* Besides all this, in such cases the expression of the face returns more to its normal condition. The pinched appearance is gradually lost, the eyes appear less sunken, and the lips less blue. The dry tongue becomes moist, the sweat ceases to pour from the face, the intellectual faculties revive, and the patient passes from a state of intense terror and anxiety to a condition of comparative repose. I have no doubt that in many severe cases a death early in the case from shock has been averted by the timely injection of morphia. Upon the quantity of the urinary secretion the effects of opium are often very marked, as many reported cases testify. Before the administration of the drug, and during the presence of the collapse symptoms, there may be oliguria or apparent suppression of urine, but after the administration of the narcotic a copious secretion of

* Ziemssen's Cyclopædia of Medicine, vol. vii., page 499.

urine is one of the commonest evidences of its beneficial effects.

Some of the symptoms of intestinal obstruction, such as violent and disordered peristaltic movements and vomiting, depend in a great degree upon reflex nerve action. Opium has large powers as an inhibitor of reflex movements. Thus it happens that under the influence of the drug the vomiting, especially in acute cases, often exhibits a singular improvement, and the movements of the bowels become almost stilled. In chronic cases, where the intestinal movements can be observed through the parietes, the influence of the narcotic upon those movements is very conspicuously displayed. If one considers the serious part that peristalsis takes in the development of intestinal obstruction it will be understood that any moderation in this movement is likely to be attended by great improvement. This circumstance is strikingly illustrated by the following case placed upon record by M. Le Fort: A young man received a kick upon the belly from a horse. Some days after he developed symptoms of internal strangulation. Opium was at once administered every one or two hours. The symptoms passed away. The patient's appetite returned; his bowels were freely opened; he got up. Before long, however, gurgling would begin in the abdomen associated with energetic movements of the intestine and subsequently with much meteorism. These symptoms were soon followed by vomiting, pain, and the other evidences of intestinal obstruction. Under the influence of opium all these symptoms subsided and the patient was soon well again. Within two months the patient had three attacks of internal strangulation which yielded to opium. The fourth attack was associated with peritonitis, of which he died. The autopsy revealed two herniæ of the small intestine through two rents in the

great omentum, which rents were no doubt produced at the time of the accident. Here it would seem that while the intestines were still, and their contents quietly propelled, the narrowing of the gut was not sufficient to cause obstruction. But when the peristaltic movements became active and the contents were hurried along, the involved coils became obstructed and symptoms were immediately produced.*

The value of opium in the treatment of intussusception can scarcely be over-estimated. In this condition the very origin of the invagination as well as its progress depend upon disordered peristaltic movements. Some of the most distressing symptoms of the affection are due to those movements. Opium arrests them. When the patient is fully under the influence of the drug the intestines would appear to be still, an increase of the intussusception is scarcely possible, and the troubled parts have all the advantages of physiological rest. When once the irregular peristaltic movements are brought into abeyance a most favourable opportunity is offered to the part to return to its normal condition. I have not the least doubt that many cases of acute intussusception have yielded to the early administration of opium, and it is not improbable that many of the examples of the "cure" of acute strangulation by opium belong really to this pathological division.

Not a few instances, however, are reported of cases of obstruction that have spontaneously yielded under the effects of opium, in which there is no reason to suppose that the cause of the obstruction was an invagination. As examples of this may be cited the following: Mr. Brewer records the case of a man, aged forty-nine, who presented the symptoms of acute obstruction. The condition was ascribed to a too hearty meal of steak-pudding. Aperients were at first

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 635.

administered, but only with the effect of increasing the trouble. The subsequent treatment consisted of opium, the use of enemata, and poultices. The enemata had no effect, and, indeed, provoked vomiting. The action of the poultices may be considered as nil, and the treatment therefore is reduced to rest and opium. The man had all the symptoms of internal strangulation, the vomiting was severe and became stercoraceous. There was absolute constipation for eleven days. At the end of that time a motion was passed spontaneously and the patient made a rapid recovery.*

In another case, less fully reported, a female, aged thirty-nine, after long-continued pain in the epigastrium began to vomit and to suffer from complete constipation. The vomiting was severe and was for seventeen days stercoraceous. Indeed, one note during the progress of the case states that the patient vomited four to five pints of feculent matter every twenty-four hours. No aperients were given. The only treatment adopted consisted in the use of opium and the administration of enemata. The latter produced no effect. At last the bowels, after having been absolutely obstructed for nineteen days, were opened spontaneously and the patient made a good recovery.†

The immense quantity of morphia that can be tolerated in some chronic cases is surprising. Dr. Blake reports the case of a man whose bowels were absolutely confined for no less a time than eighteen weeks. He began early in the case to take morphia, and before its conclusion was taking twelve grains of the alkaloid every day. The bowels were spontaneously relieved before death, which occurred seven days after this relief of the obstruction.

While opium is of great value in relieving the more

* *Lancet*, vol. ii., 1874, page 726.

† Ibid., vol. i., 1868, page 284; case by Mr. Moses.

urgent and distressing of the symptoms, it must also be observed that its use may seriously obscure the diagnosis in an obscure case of acute strangulation. It may so modify the symptoms and so affect the general aspect of the case that the more characteristic manifestations of the malady are put entirely in abeyance. If the pain be modified or relieved, if the symptoms of collapse be but dimly marked, if the vomiting be slight and of little moment, and if the patient appear to be in a state of comparative ease, some of the chief factors in a proper differential diagnosis will be wanting. This is well illustrated in cases of strangulated hernia, especially in old persons. The symptoms may in these cases be at first typical enough, but when opium is administered they become not only obscured but misleading. The evidences of pain and prostration become indistinct, the dry tongue becomes moist, the pulse improves, the excretion of urine is normal, the abdomen is the seat of no severe pain, the hernia is not especially tender, the vomiting has ceased or has become very much diminished. In short, the patient's symptoms have apparently improved, while the state of the herniated bowel has become worse and worse. I have twice had under my care in the London Hospital, elderly patients with strangulated herniæ, who had been freely drugged with opium before admission, and who had lost most of the more conspicuous evidences of strangulation. In both there was great prostration, in both there was an absence of pain, in both the vomiting had become much less marked than it had been, and in both the hernial tumour was becoming soft through gangrene.

In like manner, in cases of internal strangulation, the symptoms may be so improved and so modified by the free administration of opium that the clinical outline of the case may become greatly blurred and serious errors in the diagnosis result in consequence.

I think that in acute cases the use of opium should be conducted with the greatest possible caution before a definite diagnosis has been made, or before a definite plan of treatment has been decided upon. When once the drug has been given the clinical aspect of the case may become greatly altered without any corresponding beneficial change taking place in the involved portion of intestine. No better rules can be adopted in this matter than those that guide the surgeon in the use of opium in strangulated hernia.

Aperients.—There are comparatively few cases of intestinal obstruction, in the sense in which the term is used in the present volume, that are not greatly aggravated by the use of aperient medicines. In all cases of acute and of subacute strangulation their use is to be absolutely condemned without reservation. They merely excite increased peristaltic action in such cases, and aggravate all the symptoms, increasing the pain, rendering the vomiting more severe, and producing without doubt a more grave condition of strangulation.

Fortunately, in most of the acute cases the aperient is at once vomited when taken; but when it is retained, or when croton oil is used, or when the aperient drug is administered by an enema, it can only be said that it does unmixed harm. In a great many instances the symptoms have not become severe until after the administration of a purge. Vomiting that had been moderate and merely bilious has become profuse and feculent after the use of an aperient. Profound collapse, from intense pain, has also followed this treatment, and it has in many instances, I think, brought about a threatening perforation of the bowel. Aperient medicines in these maladies have rendered subacute cases acute, and have caused chronic forms of obstruction to take on an acute development. Indeed, among the indirect causes of death in stoppage

of the bowels purges would occupy a very prominent position, if all the cases where they have been used could be brought to light. The evil effect of aperients in cases allied to those now under notice is well shown in an instance of injury to the abdomen reported by Mr. Simon.* A man, aged sixty, was ridden over, and, as an autopsy showed, his jejunum was partially ruptured. No extravasation, however, appears to have taken place at or immediately after the accident. For seventy hours the patient remained free from any symptom of abdominal trouble. He had then several doses of aperient medicine. Symptoms of perforative peritonitis very rapidly developed, and the patient died. In this case the death of the individual may be fairly ascribed to the effect of the treatment.

In acute and subacute forms of intussusception, also, aperients can do little but harm. They simply excite increased peristaltic movement and greatly aggravate the local condition. In not a few instances that have been reported the use of an aperient has evidently determined the strangulation of an intussusception, and has very seriously compromised the future prospects of the case.

In volvulus of the sigmoid flexure and of other parts it is needless to say that aperients do infinite harm, and tend to increase rather than to diminish the distortion of the bowel.

In obstruction, however, due to fæcal accumulation, aperients are of especial value, particularly when combined with enemata and administered with proper caution. In cases also of chronic obstruction depending upon partial mechanical occlusion of the bowel, laxatives cautiously administered are often of the greatest service. They render the intestinal contents fluid and prevent accumulations above the obstruction. Violent aperients are, however, often almost as

* Path. Soc. Trans., vol. iv., 1853, page 151.

obnoxious in these cases as they are in examples of acute strangulation. They hurry along the contents and rapidly plug the stenosed segment, at the same time that they roughly disturb the disordered bowel above the obstruction. It must be noted that the intestine above the obstruction is often hyperæmic and in a condition far from healthy, and that a violent irritation applied to such a segment of bowel may lead to serious changes within its walls. Indeed, in the following case I think it may not be unjust to ascribe the patient's death to the aperients that she took. A woman, suffering from long-continued constipation, depending upon a non-malignant stricture of the sigmoid flexure, took castor-oil and other powerful drastic purgatives. This treatment led to no improvement, but induced a profuse diarrhœa attended by great prostration and soon followed by death. The autopsy revealed the circumstance that the greater part of the anterior wall of the ascending colon had sloughed, fæcal extravasation being only prevented by the adhesion of the omentum over the necrosed part.*

In many cases of chronic intussusception the occasional and cautious use of gentle laxatives is of much service as a palliative measure. The aperient in these cases can render fluid the intestinal contents and can clear the bowel more or less efficiently without leading to an amount of peristalsis that may do harm to the invaginated part. Dr. Wilks has recorded a case which he reports as an example of intussusception cured by purging. The patient was a girl, aged thirteen, who suffered for some forty days with intestinal symptoms associated with the presence of a tumour in the right hypochondrium. Purges were administered, the bowels were evacuated, the tumour gradually disappeared, and the patient

* Case by Dr. Moxon ; Path. Soc. Trans., vol. xx., 1869, page 181.

recovered.* With every respect for the authority of so eminent a physician, I would submit that the symptoms in this case do not very clearly point to chronic intussusception. Indeed, the whole circumstances of the case could be more readily associated with the notion of a fæcal accumulation, a diagnosis that Dr. Wilks especially repudiates. The conception of an invagination that could be actually cured by purgatives involving a great increase in the peristaltic movements is not consistent with the usually accepted ideas as to the pathogenesis of the disease.

Metallic mercury.—The use of metallic mercury in large doses is of very ancient date, and the metal was at one time regarded as a most important and certain remedy. In those days little was known of the pathology of intestinal obstruction; most of the acute cases were put down to "volvulus," and the mercury was supposed by its mere weight to undo some twist of the bowel that was causing obstruction, or to force open a passage that had been temporarily closed. Many cases are reported where patients suffering apparently from severe ileus were immediately relieved by a large dose of quicksilver. It is needless to say that this mode of treatment has gone more or less out of use, and the subject would hardly have merited a notice were it not for a very able monograph recently published by M. Matignon, wherein this mode of treatment is once more advocated.† Under any circumstances M. Matignon's paper cannot fail to be read with considerable interest, and it is from this production that the remarks that follow are in the main adduced.

The cases for which this mode of treatment are best adopted are cases of obstruction due to stercoral tumours and some examples of obstruction depending

* *Lancet*, vol. i., 1870, page 731.

† Du Traitement de l'Occlusion intest. par le Mercure métallique à Haute Dose. Thèse de Paris, No. 340, 1879.

upon the accumulation of fæcal matters above a stricture or stenosed part. In all cases of acute and subacute strangulation, in all cases of intussusception, and in all cases of complete mechanical occlusion of the bowel, it is, as may be supposed, absolutely useless. In cases, however, of ileus following fæcal accumulation its effects have often been very remarkable and very decided, an evacuation having been at once produced in severe cases after repeated enemata and aperients have failed. The modus operandi is as follows: The mercury does not act by its weight, but in its passage along the intestine it becomes very finely divided, and on reaching the stercoral tumour appears to insinuate itself among the parts of the fæcal mass and between the mass and the bowel wall, and so to loosen the obstructing matter as to restore the normal passage. This mechanical action is aided, no doubt, by some peristaltic action that the foreign substance may excite in the intestinal wall as it passes along. In any case the metal appears to have been passed in a state of extremely fine division and not in a coherent mass as when swallowed. In cases of acute and of complete mechanical obstruction the quicksilver has been found after death to have collected into a single mass above the obstruction, the separated particles having in such instances cohered again. In no instance was any evidence of mercurial poisoning produced. In several of the cases where this treatment was adopted the vomiting and pain were immediately subdued after the mercury had been swallowed, and this result is supposed to be due to the interference with the movements of the stomach that the metal may effect by its mere weight.

The dose of the metal administered varies from 50 to 300 grammes, and in most cases the dose, whether large or small, has been many times repeated.

M. Matignon reports several cases of relief by this

treatment in obstruction due to fæcal accumulation. In these examples purges and enemata had failed, the symptoms had become very grave, and in some the vomiting had become feculent. Metallic mercury was administered, with the result, that the vomiting and pain were immediately relieved, and the bowels were caused to act after a few hours. In each of the cases quicksilver was passed in a finely-divided state for some three or four days after the first evacuation, and in one instance, where nearly 1,000 grammes of mercury had been given in several doses, the metal was noticed in the motions for seventeen days after the administration of the last dose.

M. Matignon's cases appear so clear that in any case of fæcal accumulation that has resisted the action of aperients, enemata, massage, electricity, etc., the use of metallic mercury in large doses would appear to be worth trying, especially as the mode of treatment appears to be attended by no especial risk.

Ice.—In any case, and especially in those that are of an acute character, the patient often derives much comfort from sucking ice. It allays the thirst, it moistens the parched mouth, and it certainly in many cases moderates the sickness a little. In what is known as Grissolle's method the use of cold is more extensively adopted, and the method professes to be not merely palliative but also curative. In this procedure the patient is encouraged to take as much ice by the mouth as possible; ice is at the same time freely applied to the surface of the abdomen and enemata of iced water are administered at frequent intervals. The precise *modus operandi* of Grissolle's method in cases of internal strangulation is not quite evident, and I can find no definite account of any instance where cure can be said to have followed this plan of treatment.

Enemata of iced water are apt to excite consider-

able peristaltic movement, and may therefore in many cases do more harm than good. The treatment is probably more adapted for the relief of obstruction due to paresis of the bowel than to that due to mechanical causes.

Electricity has been extensively used in the treatment of intestinal obstruction, and has been in recent times strongly advised by eminent authorities. Many remarkable cases of cure have been ascribed to this method. Some of these cases are so scantily reported that they are of little or no value, since they furnish no data upon which to base any independent criticism of the diagnosis.

So far as I can ascertain, the cases of cure by electricity have been wholly, or for the most part, examples of ileus depending upon fæcal accumulation. In these cases, in which a paresis of the gut takes so conspicuous a part, the mode of treatment is intelligible, and may be expected, *à priori*, to be of benefit.

Electricity may also be of use in some cases of obstruction due to foreign substances of various kinds. It may also prove of service in some instances of stricture or of stenosis where an accumulation has taken place above the narrowed part, which the unaided contractions of the bowel are unable to relieve.

It is very difficult, however, to understand how electricity can have the least curative effect in acute strangulations as by bands or through slits and apertures. If it acts by increasing peristaltic movements, then its use in cases of this kind would appear to be peculiarly undesirable. The same observations apply to acute or subacute intussusception and to volvulus. In these affections a moderation of intestinal movements is a condition to be desired, and if the main effect of electricity is to stimulate those movements, then the measure is calculated to do harm rather than good. I have met with accounts of a large number of

cases of intestinal obstruction treated by electricity, and in all such of these cases as were not due to fæcal accumulation or to temporary obstruction in cases of incomplete stenosis, the treatment appears to have been of no avail. Some examples of supposed cure are, I think, a little fanciful. The following may serve as an instance: "Dr. Clemens, of Frankfort, states that he has successfully treated invagination by first administering one or two tablespoonfuls of metallic mercury, which settled down to the seat of the invagination. The negative electrode was applied over the supposed seat of the disease and the positive in the rectum. Voltaic alternatives were used."* In connection with this case I might point out that post mortem examinations do not support the belief that metallic mercury, when taken by the mouth, will arrange itself above an invagination, as here described.

In many cases of fæcal accumulation causing obstruction symptoms electricity has given relief, and has caused a motion to be passed after aperients and enemata had entirely failed. Of its power in affording relief in cases of stricture, the following case may be taken as an example: A man, aged 56, had had occasional slight attacks of intestinal obstruction from time to time during the twelve months that immediately preceded his death. The last attack had lasted already seventeen days when the patient was admitted into hospital. He vomited everything, and the abdomen was greatly distended. Aperients and enemata, including enemata of seltzer water, had no effect. On the twenty-second day galvanism was applied, and had the immediate result of causing the patient to pass a copious motion. He was much relieved. The symptoms, however, returned, inguinal colotomy was performed on the right side, and the patient died on the

* Medical and Surgical Electricity, by Beard and Rockwell, page 484. New York, 1871.

following day. The obstruction was due to an epitheliomatous stricture of the sigmoid flexure.*

There have been a few cases reported of internal strangulation where electricity gave some slight temporary relief without, however, affecting the actual obstruction. Thus, M. Terrier records the case of a woman, aged twenty-one, who was suffering from strangulation of a portion of the intestine beneath a band connected with the broad ligament. On the third day electricity was used, and is said to have relieved the pain and to have moderated the vomiting. The symptoms, however, persisted and laparotomy was performed on the fourth day with success.†

There are several methods of applying electricity in these cases of abdominal obstruction. 1. Both electrodes are placed upon the abdomen = abdominal method. 2. One pole (the negative) is placed upon the abdomen, the other just within the anus = ano-abdominal. 3. One electrode (the negative) is placed over the dorsal spine while the other is introduced some distance up the rectum = recto-spinal. 4. The negative pole touches the abdomen while the positive is applied within the rectum = recto-abdominal. In the two last-mentioned methods the electrode is made of a copper ball mounted on an isolating handle, so that the current may pass to the gut direct without involving the anus and lower part of the rectum. In all cases and in all forms the faradic current is advised. The method most particularly advocated by those who have written upon the subject is the recto-abdominal. The effects that have been demanded for this form of electric application are the following: The abdominal muscles contract; the intestines contract and propel forwards their contents; flatus disappears from the intestine without being either expelled from the mouth

* Archives Gén. de Méd., 1879, vol. ii., page 207; M. Duplay.
† Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 564.

or the anus ; and the symptoms of collapse are relieved if they exist. *

Massage.—Massage of the abdomen has been somewhat extensively tried in many forms of intestinal obstruction, especially in France. Its action is very vague and its general effects uncertain and unsatisfactory. It has often been used with much success in constipation and in obstruction due to fæcal masses, to gall stones, and to foreign substances. In these cases the manipulation of the abdomen probably not only excites peristaltic movement but also directly dislodges the obstructing matter. As an illustration may be cited a case reported by Martin. The patient, a woman aged seventy-eight, was suffering from symptoms of severe obstruction due to the impaction, probably in the terminal part of the ileum, of a large gall-stone. Aperients had had no effect and the vomiting had become stercoraceous. A tumour could be detected in the right iliac fossa. On the sixth day massage was employed ; relief followed, and on the next day a large gall-stone with ten smaller stones were evacuated. †

Massage has been frequently used in cases of intussusception. I can, however, find no case where cure can be said to have followed this treatment alone. In the cases of reputed cure the massage was usually subsequent to, or coincident with, the administration of copious enemata, ‡ and the morbid anatomy of invagination would lead us to suppose that the injection would have more effect than the manipulation. I imagine that massage in these cases would tend to excite an undesirable amount of peristaltic action, although it is quite reasonable to suppose that it might prove of

* *See* L'Occlusion Intestinale, by A. Bulteau. Thèse de Paris, 1878, No. 427.

† Bull. de la Soc. Anat. de Paris, 1875, page 195.

‡ *See* case by Dr. Gillette, *New York Med. Journ.*, 1882, page 261.

service if applied when the patient was under the influence of an anæsthetic or a narcotic.

In other cases of acute obstruction I imagine that this mode of treatment would probably do more harm than good. It could never be applied with any scientific precision.

In several of the reputed examples of cure by massage other modes of treatment had been adopted to which some share in the cure may possibly be ascribed. This is well illustrated in a remarkable case reported by M. Bitterlin. The patient, a man aged fifty-six, was seized with symptoms of acute intestinal obstruction. The obstruction lasted ten days and the symptoms were very severe. During these ten days the following therapeutic measures were adopted for the relief of the unfortunate patient. Morphia was administered, followed by large doses of castor-oil, and subsequently by large doses of croton-oil. Enemata of water, of senna, of sulphate of magnesia, and of tobacco were injected at different times. Poultices were first of all applied to the abdomen, and these were in time followed by frictions with belladonna. Electricity was used. All these means were without effect. At last massage was tried, an almost immediate relief followed, and the patient recovered in spite of treatment.*

The various mechanical methods adopted for the relief of constipation in what is usually known as the "Swedish movement cure," seem to have met with a very encouraging degree of success. The machines employed are of different descriptions. In one the patient lies upon the abdomen over an opening, and in this opening rollers move which exercise a kneading action over the whole of the belly. In another machine two rollers are caused to rotate along the course of the large intestine.

* L'Union Médicale, 1882, page 433.

In other machines, passive rotation of the lower part of the trunk and passive oscillation of the pelvis are brought about, with the effect, it is said, of stimulating peristaltic movements in the intestine. In still other machines the patient sits upon a saddle, and is subjected to movements which imitate more or less the movements incident to horse exercise.*

Enemata.—Copious enemata of water are of considerable service in cases of intestinal obstruction. Beyond the fact that an enema may excite peristaltic action in a large segment of the small intestine they are of use only when the obstruction involves, in whole or in part, the large intestine. In the cadaver, water forcibly injected at the anus can occasionally be made to pass through the ileo-cæcal valve. There is often no difficulty in this. In the living subject, however, there is every reason to believe that the valve does not yield, and that the direct action of the enema ceases abruptly at the ileo-cæcal junction.

There are morbid circumstances in the living subject, however, under which it may be possible for the valve to become insufficient. Thus there are good reasons for believing that when the patient is under the influence of an anæsthetic water may sometimes be made to pass beyond the colon into the ileum. In cases, too, of obstruction associated with paralysis of the ileo-cæcal segment of the bowel the valve may prove to be insufficient, especially when the activity of reflex action has been moderated by opium. Mere distension of the colon would appear to increase rather than to diminish the competency of this internal anus.

There are different methods of administering enemata. In the great majority of cases the ordinary

* Diagrams of most of these machines are given in Mechanical Exercise a Means of Cure, the work being a description of the Zander Institute in London, 1883.

enema-pump or syringe is all that is required. A somewhat better instrument than this, even for ordinary purposes, is the syphon apparatus. This consists essentially of a large funnel, to which is attached a long indiarubber pipe ending in a more solid tube for introduction into the rectum. Between the two tubes is a tap. In the administration of enemata by this means the patient should be placed in such a position as to reduce the abdominal pressure as much as possible. The knee-and-head, knee-and-elbow, and lateral abdominal positions are the best. The water enters by gravitation, and the pressure of the entering column can be increased or diminished by raising or lowering the funnel containing the injection material. This method has great advantages over the ordinary syringe. The fluid is introduced in a constant and easily regulated stream, and not in intermittent gushes. The bowel being more tolerant of the former method, it follows that much larger quantities of fluid can be introduced by this means than by the common syringe. The pressure, moreover, that is exercised upon the walls of the bowel is uniform and can be slowly and regularly increased.

Enemata as administered by one or other of these methods are of infinite service in many cases of obstruction. By their means the large intestine may be cleared. In cases of obstruction due to fæcal accumulation enemata constitute the principal active treatment. By the use of frequent and copious injections a distended colon may be gradually emptied of its contents from the rectum to the cæcum. When used for the purpose of evacuating the colon different fluids have been recommended. In most cases warm water is all that is required. When a more stimulating injection is needed a little turpentine is added. In some instances an alkali is mixed with the water, under the impression that by such admixture the

impacted fæces are more readily acted upon. The alkali usually is introduced by mixing soap with the water. With a like object in view enemata of oil or of mixtures containing oil have been made use of.

In other instances some aperient has been used as the enema-material, and solutions of senna or of sulphate of magnesia have been thrown up the bowel. Here the ordinary action of the injection is supplemented by the absorption of purgative drugs.

Enemata are also of considerable use in relieving obstructions due to accumulation above a stricture or stenosis in the colon. In many cases it has been found that water can be made to enter the narrowed gut from below, while the part remains impervious to water introduced from above. A stricture of the colon may long be prevented from causing a complete and final obstruction by the frequent and patient use of enemata. Injections have also been of much service in relieving accumulations that have taken place above chronic invaginations occupying the large intestine.

In cases of volvulus of the colon enemata would appear to be of no use as curative measures, and the same observation applies in a still more marked degree to examples of acute intestinal strangulation.

Enemata, however, can be used in obstruction cases for other purposes than the simple evacuation of the colon. They have proved of considerable service in reducting intussusceptions that occupy the large intestine, *i.e.* such as are colic, ileo-colic, or ileo-cæcal. To effect this reduction large quantities of fluid, and in such cases only warm water is used, are injected with considerable force ("forcible enemata," "monster clysters"). The ordinary syringe or pump may be used for this purpose, the return of the water being prevented by an assistant who presses the sides

of the buttocks and the margins of the anus as close as possible against the tube. This apparatus, however, is objectionable. The fluid is introduced spasmodically, and it is difficult to estimate what amount of force is being used.

A far better method is by the syphon apparatus. If the tube of this enema be made very long, and the funnel be placed at a considerable height, the fluid can be caused to enter the rectum, not only with great force, but also with a uniform and easily regulated pressure. In both forms of enema there is much difficulty in retaining the injected fluid. This difficulty can, however, be well met by adapting to the rectal tube of the syphon-apparatus the very ingenious elastic ring and handle devised by Mr. Lund for his air-inflation instrument (Fig. 57).

In many cases the injection has been administered while the patient was partly inverted. This position has, however, I think, no peculiar advantage. If it facilitates the passage of fluid along the descending colon it must at the same time hinder its passage along the ascending colon. The best positions for the purpose are those already referred to, viz. the head-and-knee, knee-and-elbow, and lateral abdominal positions. I think it extremely important that the injected fluid should be forcibly retained for a *considerable time*. Its reducing action upon the invaginated bowel must be slow and gradual, and the bowel should therefore be kept distended for at least fifteen minutes. Dr. Eastes has recorded an interesting case where an intussusception was quietly reduced by means of a forcible enema, which was not allowed to escape for a quarter of an hour.* Many examples may be given of the ready reduction of an invagination by means of enemata only, both with and without the assistance of chloroform. This

* *Lancet*, vol. ii., 1869, page 669.

subject will be further considered in dealing with the treatment of invagination.

Enemata of a mixture of tobacco-juice and water, and even insufflations of tobacco-smoke, were at one time in great repute among the therapeutic measures available for intestinal obstruction. It was supposed that the tobacco subdued spasm and relaxed the muscular contraction of the bowel. The measure was used at a time when spasmodic stricture of the intestine was considered to be a fairly common affection. Experience has shown this treatment to be not only useless but also to be obnoxious in many ways. If an anti-spasmodic be required it can be administered in a more satisfactory manner than by introducing tobacco-juice into the rectum.

Insufflation.—The forcible injection of air into the colon has been used to excite peristaltic movements in cases of chronic constipation and obstruction by stercoral masses. It is, however, not so efficacious as an injection of fluid, and has no advantages over that method of treatment. Insufflation has, however, been extensively used in cases of intussusception for the purpose of reducing the invagination. Air-inflation acts in precisely the same way as the forcible enema, and it might be said at once that, as a means of reducing an intussusception, it is inferior to the injection. Before it can be used the bowel must be emptied by enemata, and there are no cogent reasons why in the further treatment these enemata should be replaced by insufflation. Indeed, instances can be given where insufflation has failed but where injections have been successful in reducing an invagination.* There are at the same time not a few examples of the cure of intussusception by air-inflation only.

The procedure is usually carried out by means of a

* *See* case by Mr. Waren Tay; *Lancet*, vol. i., 1876, page 13.

common bellows, to which an indiarubber pipe and a rectal tube have been attached.*

By far the best instrument, however, for the purpose is that designed by Mr. Lund of Manchester (Fig. 57). It consists of an air-syringe and a rectum-tube. "The merit of the invention," writes Mr. Lund, "consists in a particular mode of securing an air-tight contact around the margin of the anus, by the use of a hollow elastic ring E placed over the tube, which is compressed and flattened against the

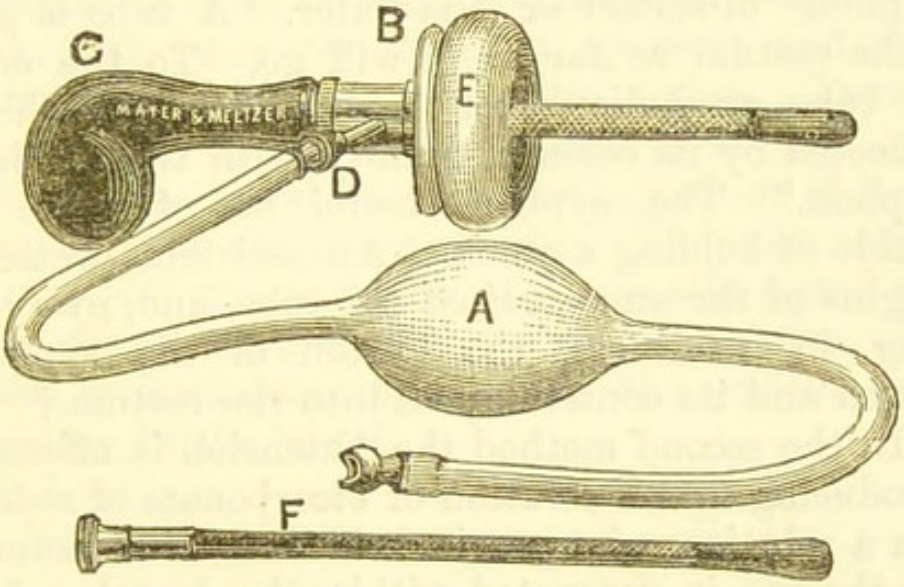


Fig. 57.—Lund's Inflator.

A, air syringe; B, shoulder on end of handle C; D, point where air enters the rectum tube; E, hollow elastic ring; F, a long narrow rectum tube for cases of rectal stricture, etc.

shoulder B on the handle C, when firmly pressed against the part by an assistant. This method of preventing the return of the air as it is pumped into the bowel is more effective than anything of the nature of a plug or tampon introduced within the rectum, even if it be carefully adjusted to the size of that cavity, for the air so injected is sure to escape by the side of the plug, the anus and rectum being immensely expansible. . . . With the apparatus, when the hollow ring is compressed, the central hole

* *See* art. by Dr. Trastour; Bull. gén de Thérap., 1874, page 107.

in it is diminished in size, the skin around the anus, to which the indiarubber clings with great tenacity, is drawn inwards towards this centre, and the tightness of the air-joint thus formed can be well sustained."*

Mr. Lund's instrument was more especially devised for distending the colon in lumbar colotomy.

Enemata of carbonic acid.—Distension of the colon by carbonic acid may be effected in two ways. In the first method the gas is derived from an ordinary "syphon" of seltzer or soda-water. A tube is passed up the rectum as far as it will go. To the end of this tube an indiarubber pipe is attached which is connected by its other extremity with the nozzle of a "syphon." The syphon should be of large size, capable of holding a quart. An assistant presses the margins of the anus against the tube, and, everything being in readiness, the button of the syphon is pressed and its contents pass into the rectum.†

In the second method the distension is effected by introducing first a solution of bicarbonate of soda and then a solution of tartaric acid into the rectum, so that the gas is generated within the bowel. A long rectal tube is used, which is connected by an indiarubber pipe with a glass funnel. The two drugs are introduced in solution, one being poured in after the other has had full time to find its way into the intestine. When the two solutions have been introduced a certain quantity of water is rapidly poured in. The escape of the gas is prevented by forcibly pressing the buttocks together about the tube, escape also being prevented along the tube itself. Ziemssen, who has written in high praise of this mode of distending the bowel, says that for complete dilatation of the colon in an adult twenty

* *Lancet*, vol. i., 1883, page 588.

† *See* Bull. gén. de Thérap., 1877, page 223; Dr. Garnier.

grammes of bicarbonate of soda are required and fifteen grammes of tartaric acid. He recommends that the solutions should be introduced gradually, or at least in three parts. He points out that the ileo-cæcal valve remains firm even against strong pressure, but states that under the influence of the carbonic acid it may yield a little so as to allow gas to reach the small intestine.*

Ziemssen asserts that this form of enema is of great value in reducing intussusceptions, and that it is superior to the ordinary injection of water. He regards it also as a very efficient aperient, and states that it induces intense peristaltic action. Previous authors have stated that carbonic acid acts as a sedative to the intestine, and that injections of it may be used to allay the pains of colic. Ziemssen believes this form of enema to be of diagnostic value as a means of ascertaining the dilatability of the colon, and also as demonstrating possibly the position of an obstruction in the bowel.

CHAPTER XXV.

THE TREATMENT—OPERATIVE MEASURES.

Puncture of the bowel with a fine trochar.—In this procedure an aspirator needle or a fine trochar is thrust into the abdomen over some prominent coil of intestine, and relief is sought to be afforded by the escape of matters, fluid and gaseous, from the distended bowel.

It cannot be said that this is a very scientific operation, nor one that can be adopted with any precision or carried out with any very definite purpose.

* Archiv für Klin. Med., bd. 33, 3 and 4.

It must be regarded as a palliative rather than as a curative measure.

In many forms of obstruction great distress is occasioned by the distension of the abdomen, much dyspnœa may be produced, the pain increased, and the vomiting rendered more troublesome. Indeed, in some cases of rapid and extreme distension, such as may be met with in volvulus of the sigmoid flexure, the meteoristic bowels may so press upon the diaphragm and the thoracic viscera as to cause more or less sudden death. In cases of distension puncture usually affords very considerable relief. The punctures may be repeated many times or made in many parts of the abdomen at once, and the amount of flatus and occasionally of fluid matter that may be in this way removed is often considerable. The procedure, moreover, has been advocated as a valuable measure in diagnosis. By its means distended coils may be emptied and a tumour or other condition be revealed that had been hitherto hidden from view.

It has been recommended also as a preliminary to laparotomy by surgeons who, in performing this operation, have been troubled by the premature escape of the distended coils.

With regard to puncture as a curative measure one must note that several cases of obstruction have been recorded which have been apparently cured by this procedure and by it alone. In illustration, I might take an example of an acute case and then an example of a chronic one.

M. Le Fort mentions the case of a man with symptoms of acute internal strangulation upon whom he was about to perform laparotomy. Before, however, proceeding to this measure he punctured the abdomen with a capillary trochar once in the right hypochondrium and twice in the site of the transverse colon. Some flatus and fluid fæces escaped. The

next day the man passed a copious motion, and a rapid and complete recovery followed.*

Mr. Worthington details a case of chronic constipation ending in an acute attack in the person of a man aged twenty-eight. The symptoms were severe, there was great meteorism and stercoraceous vomiting. On the seventh day a fine trochar was introduced and retained thirty minutes. Much fluid and flatus escaped. Next day a stool was passed, and the patient made a good recovery.†

Without discussing the probable nature of these or of like cases we may proceed to consider what form or forms of obstruction are likely to be benefited by this mode of treatment.

Puncture of the involved coil has been suggested as a means of cure in volvulus of the colon. It is true that at autopsies it has often been found impossible to reduce a volvulus until it had been emptied by a trochar, but I am not aware that the emptying alone has been sufficient in any case to effect reduction. Indeed, I can refer to cases both of volvulus of the sigmoid flexure‡ and of the cæcum § where capillary puncture was resorted to during life without any enduring benefit.

Evacuation of the contents of the upper segment of the bowel may completely relieve obstruction due to kinking, or to acute bending of the intestine. It may also allow of the spontaneous reduction of a coil that is lightly held under a band or is involved, without severe strangulation, in some abnormal aperture. It may afford marked and long-continued relief in cases of temporary complete obstruction depending upon stricture, upon any form of stenosis, upon fæcal

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 641.

† *Brit. Med. Journ.*, vol. ii., 1882, page 167.

‡ Contrib. à l'Étude de l'Occlus. intes., by J. M. Le Moyne. Thèse de Paris, 1878.

§ Dr. Hilton Fagge; Guy's Hosp. Reports, vol. xiv., page 272.

accumulation, or upon the impaction of a foreign substance. It may give decided relief in cases of chronic "stoppage" where symptoms of acute obstruction have developed suddenly as a result of changes following upon great distension of the bowel.

But even should a correct diagnosis be made in such cases as the above, it must still remain an open question whether relief should be sought by this means. It is true that in most instances the little operation is associated with no evil results, even if it does not give relief, but its application is attended by great uncertainty. The proper coil of intestine may be hit, or it may not be. In any case it is probable that the trochar would enter a distended loop, but it may be one so far away from the seat of obstruction that the evacuation of its contents is attended by no real benefit. In the great majority of cases, therefore, the puncture must be made purely at hazard and blindly, and its chances of hitting the exact spot are about those of the arrow from the bow "drawn at a venture." In not a few cases the trochar has entered the bowel below the obstruction. Thus, in one example of stricture involving the terminal part of the ileum a trochar was thrust into the transverse colon and retained there during the night. About forty ounces of fluid fæces escaped, but no relief was afforded.*

Even when the trochar strikes the proper segment of the intestine an amount of distress may be occasioned by the instrument which is not counterbalanced by any relief following the evacuation of intestinal contents. Thus, in a case of chronic obstruction due to a lesion involving the lower ileum a fine trochar was introduced. It was proposed to retain it for some time. The instrument was, however, carried round and round by the peristaltic action of the bowel, and

* *Lancet*, vol. i., 1883, page 42; by Dr. Wm. Platt.

so much pain was occasioned that it had to be removed at the end of two hours.*

Before concluding this subject it must be pointed out that puncture of the intestine is not quite so entirely harmless a procedure as is sometimes supposed. The punctured gut is much distended and often in a state of temporary paralysis; so that after the trochar is withdrawn the little hole is not efficiently closed, and fæcal extravasation may follow. The more minute the trochar the smaller the hole to be closed, but at the same time the amount of matter evacuated by very slight instruments is so trifling that the operation has no raison d'être. Then, again, the puncture may involve a friable piece of gut on the point of gangrene, and fæcal extravasation may again ensue. Mr. Hulke, in performing a laparotomy, punctured the distended intestine. The gut so treated was in a precarious condition. The hole did not close, attempts to close it made it larger, until at last it had to be converted into an artificial anus.†

One other point may be noticed. I have met with several instances where perforation of the bowel that had been previously threatening took place immediately after the relief of a distended coil. In one of these cases I had performed left lumbar colotomy for the relief of a stricture of the sigmoid flexure. Little fæces escaped at the time of the operation. During the night there was a copious evacuation through the wound. Shortly afterwards the patient developed evidences of perforative peritonitis, of which she died. The autopsy showed extensive ulceration of the cæcum and a perforation at the base of one of these ulcers. Dr. Bristowe describes a case of stricture of the sigmoid

* Dr. Hilton Fagge, loc. cit.

† *Medical Times and Gazette*, vol. ii., 1872, page 482. *See also* Paper by Prof. G. Macleod; *Glasgow Med. Journ.*, March, 1884, page 167.

flexure associated with great distension of the abdomen, to relieve which he used a trochar. In thirty minutes acute peritonitis set in, of which the patient died next day. The autopsy revealed the trochar punctures perfectly closed. Fæcal extravasation had taken place through a perforation in the lower ileum, the aperture being at the base of an extensive ulcer.* In these cases, and I could allude to others, it would appear that some disturbance in the amount of pressure brought to bear upon various segments of the bowel follows from the sudden relief of distension, and a potential perforation is thereby rendered an actual one.

In favour of the harmlessness of puncture of the abdomen the case reported by Dr. Blake may be again alluded to. In this case, during a constipation that was absolute for eighteen weeks, the abdomen was punctured no less than 150 times, about half a pint of intestinal contents, in addition to some flatus, being drawn off each time.

Enterocentesis.—This operation was devised by Dr. Larguier des Bancels.† It merely consists in puncturing the intestine with a large trochar, the instrument to be retained as long as necessary.

Dr. Larguier uses a trochar with a diameter of five to six mm., and leaves it in the intestine at least two or three days. In one case the procedure led to a fæcal fistula, which, however, closed in time. Dr. Larguier gives an account of five cases in which this puncture was adopted. Three recovered, one was relieved, and one died. The cases were of a chronic character, and in one instance of obstruction due to fæcal accumulation the relief was certainly marked and immediate. The operation can, however, in

* Path. Soc. Trans., vol. xxiii., page 119.

† Sur le Diag. et le Trait. chirurg. des Etrang. internes. Thèse de Paris, No. 142, 1870.

no way be advised. It must be done blindly. Its chances of failure are not equalled by its chances of success. In many cases it must leave the real cause of the obstruction untouched. It must expose the patient to a great risk of fæcal extravasation when the trochar is withdrawn. The operation is in itself dangerous, and at the most resolves itself, if successful, into an enterotomy performed in the dark.

Laparotomy.—This is one of the most important operations concerned in the treatment of intestinal obstruction, and is a procedure that is likely in the future to occupy a still more conspicuous position than it does at present.

It consists essentially in making an opening into the cavity of the abdomen. It has been adopted in cases of obstruction with many different purposes. Laparotomy may be performed merely as an exploratory operation and as a means of diagnosis. As a measure in treatment it has been applied to cases of acute strangulation of all kinds. It has been used as a means of dividing constricting bands and ligaments, of reducing portions of intestine that have become strangulated through holes and apertures of various kinds, of treating every species of internal hernia, of reduction *en masse* after external hernia, of strangulation by the diverticulum, and by an adherent appendix vermiformis and the like. It has been applied for the relief of cases of volvulus and for the reduction of all forms of intussusception. By its means relief has been afforded in examples of obstruction by impacted foreign bodies, and in occlusion of the bowel by tumours situated without the intestine.

It has been made a preliminary to other operations such as enterotomy, enterectomy, colectomy, and the like.

The principal details of the operation will be discussed when dealing with the forms of obstruction to

which it may be considered to be applicable. In this place it will be convenient to consider the general features of the procedure.

The first question that arises is as to the position of the incision. Is it to be made in the middle line or over the seat of the supposed obstruction? In answer to this question it may be said that in all cases it is better for the incision to be made in the middle line, and this applies as well to exploratory as to curative procedures. The incision made in the linea alba is a simple one; no important structures are cut through; no vessels of any magnitude are divided; the abdominal cavity is readily reached; the wound is not a deep one, and after the operation its edges can be easily approximated. If the incision be made over the supposed seat of obstruction it is probable that the abdominal muscles will have to be cut through; important planes of connective tissue will thus have to be opened up; vessels that may cause troublesome bleeding are apt to be divided; by the time the abdomen is opened the wound will be a deep one and will have to be relatively larger than the median wound in order to obtain an equally extensive display of the interior of the belly. Moreover, wounds through muscular layers are not so easy to adjust, and in the case of the abdomen are more likely to lead to hernia than is a median wound through a dense fibrous structure. Moreover, the incision over the supposed seat of obstruction involves a very accurate diagnosis, and failing this accuracy many serious errors have been made. Thus tumours have been cut down upon which have proved to be in no way connected with the obstruction. An incision has been made in the left iliac region when the intestinal stoppage has been in the right iliac district.

In one case of laparotomy for intussusception the operation had to be practically abandoned because the

incision had been made in a lateral segment of the abdomen, and the surgeon's manipulations were in consequence seriously restricted. The operator in this instance (Mr. George Brown) expressed a resolve in his report of the case to operate for the future by a median incision.*

Even in cases where the obstruction is supposed to depend upon some morbid condition in the loop of gut reduced from an external hernia it is better as a rule to make the cut in the middle line than over the seat of the hernia. A cut into the abdomen through the region of the inguinal canal is apt to seriously weaken a part already weak and render very probable a subsequent ventral hernia. It moreover greatly limits the surgeon's sphere of action and may render the operation useless should an error have been made in the diagnosis.

Thus in cases supposed to depend upon an external hernia an incision has been made over the sac; nothing has been found of note; the wound has been closed, and a second cut made in the linea alba.†

Through a median incision made between the umbilicus and the pubes all parts of the abdomen can be reached and all parts of the intestine explored. If the obstruction is not in the situation in which it was expected to be found, it may be searched for elsewhere. Any part of the small intestine may be resected through a median wound. I have shown that a part of the colon can be excised through a like incision.‡

The most varied forms of intussusception have been reduced through a cut in the linea alba, and enterotomy has been performed at the same situation. It has been shown, moreover, that a primary median

* *Lancet*, vol. ii., 1882, page 1036.
† *See* case by Mr. Bradley; *Lancet*, vol. i., 1878, page 493.
‡ Med.-Chir. Trans., vol. lxvi., 1883.

incision does not compromise the success of a subsequent lumbar colotomy.* Lastly, in cases where a laparotomy has been performed when no such proceeding should have been undertaken (and of this there are not a few examples), it must be owned that the median incision inflicts the less serious lesion upon the patient.

Some surgeons have suggested that the abdomen, when distended, should be punctured before the operation. The evacuation of distended intestines certainly greatly simplifies the procedure, and in cases of extreme meteorism this preliminary tapping should be adopted. In less severe cases of distension and in cases where there is reason to expect a much damaged state of the gut the puncturing may very well be left until the intestines have been themselves exposed. After such exposure the puncture may be made with more precision, even if over a somewhat more limited area. On two occasions I have introduced my hand into the belly as soon as the incision was large enough, and have punctured through the skin distended coils that I could feel but that were out of easy reach through the incision.

The length of the wound must depend upon the merits of the individual case. In most instances it should be at least large enough to allow of the introduction of the hand.

The bladder should be emptied before the operation, and in some cases of pelvic adhesions it is well to make out its precise position with a sound.

In one reported case, in a male patient, the bladder was cut into during the preliminary incision and urine escaped into the peritoneal cavity. The patient died.†

* *See*, for example, case by Mr. Pitts; St. Thomas's Hosp. Reports, vol. xi., 1882, page 75.

† Case by Dr. Atherton; *Boston Med. and Surg. Journ.*, 1883, page 531.

When the abdomen has been opened great care must be taken to prevent the protrusion of the distended viscera. I am convinced that such protrusion very seriously compromises the success of the operation, and I think that this fact is demonstrated by the recorded cases.

The practice of allowing the bowels to escape for the purpose of more readily finding the obstruction is absolutely bad. The protrusion should be prevented by an assistant provided with one or more large flat sponges that have been soaked in warm carbolic water. When these sponges become cool they should be changed. Some surgeons appear to have used flannels wrung out in hot water for this purpose. A more unsuitable material could hardly be imagined, since the hairy particles of the flannel adhere to the intestine with the greatest readiness and are only to be got rid of with difficulty.

The hand should be introduced into the abdomen, and before such introduction greatly distended coils may be evacuated by a fine capillary trochar if deemed advisable. I would strongly urge that the examination should now be conducted on the following systematic principles, even in cases where the diagnosis is considered to be fairly certain. The hand should first be passed to the cæcum. If this part of the intestine be found to be greatly distended the obstruction may be taken to be in the colon; but if it be found to be empty, or only moderately filled, then it may be concluded that the stoppage is in the lesser bowel. Thus with very little disturbance of parts a considerable step may be made towards a correct diagnosis.

The cæcum may not be found, either because it is the subject of congenital malposition, or because it has become involved in an intussusception or a volvulus.

If from the condition of the cæcum it is surmised that the obstruction is in the colon, then the

hand must be passed along the whole length of that intestine, from its commencement to the beginning of the rectum. The rectum itself will, of course, have been explored previous to the operation.

If the condition of the cæcum points rather to an obstruction in the lesser bowel, then a somewhat more difficult examination has to be undertaken. Some operators have avoided the difficulty by allowing the intestine to protrude and by then searching in the abdomen for the obstruction. Such a procedure is very strongly to be condemned. Another plan is to expose in the depth of the wound the length of the small intestine inch by inch until the part occluded is reached. The serious difficulty in this case is usually a lack of knowledge of the precise portion of bowel first exposed. Without this knowledge the surgeon may proceed with his examination in the wrong direction and find himself at the end of a tedious inspection at the duodenum. Quite recently Mr. Rand of Liverpool has advised an examination of the root of the mesentery as a means of recognising any given portion of intestine exposed.* It is well known that the attached edge of the mesentery is only about six inches in length, and that it extends along the spine from the left side of the second lumbar vertebra to the right sacro-iliac synchondrosis. Mr. Rand advises that the mesentery of the exposed piece of gut be examined, and claims that by this examination it would be possible to find which was the upper and which the lower end of the coil, and also to form some idea as to whether it belonged to the higher or to the terminal parts of the lesser bowel. This plan may succeed in a few instances, but in many it would be of little avail, as in cases where many adhesions exist, or where there is much shrinking of the mesentery, or where a volvulus has occurred. By far the readier way out of the

* *British Med. Journ.*, Dec. 22nd, 1883, page 1235.

difficulty is to commence the examination, not with the distended coils that present in the wound, but with the empty and collapsed coils below the obstruction. When the obstruction is complete there should be no difficulty in recognising such coils. In cases of strangulation involving the lower ileum these empty loops of intestine should be sought for in the cæcal region. When the obstruction is higher up in the bowel the collapsed loops are extremely apt to hang down into the pelvis. It is well, therefore, that a search for the obstruction in the small intestine should commence with a search for non-distended coils in the region of the cæcum, or about the brim of the pelvis, or within that cavity. This method of investigation was first proposed, so far as I can ascertain, by Mr. Hulke in 1872. In describing a case of laparotomy he says, "I passed in my hand and felt for an empty piece of small intestine, by tracing which I hoped to be led to the obstruction." *

In another case of Mr. Hulke's, reported by Dr. J. K. Fowler, this procedure was carried out, and Dr. Fowler makes a point of strongly advocating the method.† As he observes, the collapsed gut can be examined with ease and rapidity, the distended and engorged bowel above the obstruction is not exposed to an extensive handling, and the risk of rupturing these dilated coils, a risk by no means slight, is thus avoided. Certainly by this means the danger of peritonitis is reduced to a minimum. A third case of laparotomy by Mr. Hulke serves to illustrate indirectly the value of this method. In this case pains were taken not to allow the bowels to protrude. The small intestine was drawn to the wound and examined inch by inch, and the loop so inspected reduced after its exposure. Unfortunately the examination was in the wrong

* *Med. Times and Gazette*, vol. ii., 1872, page 482.
† *Lancet*, vol. i., 1883, page 1119.

direction, and after a time the duodenum was reached, and before the obstruction was found the whole process of examination had to be reversed.*

In any case where hernia is suspected the various hernial orifices should be examined from within. They can all be readily reached by the hand introduced through the median incision.

The special treatment to be adopted when the obstruction has been found will be considered subsequently, when dealing with the treatment of the varieties of obstruction.

After the operation the peritoneal cavity should be well sponged out. The wound should be united in the same manner as the wound after ovariotomy. The best suture material is "Chinese twist." For convenience of introduction each suture should be threaded at either end to a long straight needle. Deep sutures, to include the peritoneum, should be placed at intervals of about half an inch. The intermediate parts of the wound may be adjusted by superficial sutures. With regard to the draining of the peritoneal cavity after the operation, the matter remains in the same position somewhat as the question of drainage after ovariotomy. Some advise, others condemn.

I think that in cases where peritoneal inflammation is to be expected a drain should certainly be introduced.

In the above observations I have presumed that the operation is performed under the strictest antiseptic precautions. It would certainly appear that laparotomy has been attended with greater success since the introduction of Listerism. At the same time it must be remembered that with every year our knowledge of the diagnosis of these cases has become more accurate.

There are many possible fallacies in the operation.

* Path. Soc. Trans., vol. xxxiii., page 146.

In several instances there has been no real obstruction, but the symptoms have been all due to acute peritonitis.* In one case, at least, no cause of obstruction was found, the patient had no peritonitis. The wound was closed and the patient recovered.† In other instances there has been an obstruction but it has been overlooked and the patient has died unrelieved.‡ In many examples of the operation the obstruction was found but was of a nature not to be relieved and the case was practically abandoned. Some of these were cases of volvulus of the colon, others were examples of extensive cancer, and others of stricture. §

In many instances also the obstruction was of such a nature that it could be only relieved by some further operation such as enterotomy or colotomy.

When two forms of obstruction exist in the same case one is very apt to be treated and the other to be overlooked. In several examples where two bands have obstructed the intestine at the same time, only one band, and that causing the less amount of trouble, has been divided and the patient has died unrelieved.

The pathology of intestinal obstruction also reveals cases where obstruction due to stricture has been associated with a less important obstruction due to slight entanglement of a loop beneath a band. ‖ Had these cases been treated by laparotomy it is more than probable that the false ligament would have been divided and the stenosis overlooked.

With regard to the general mortality of the operation, I have here collected 155 examples of the

* For cases *see* Duplay's monograph; Archives Gén. de Méd., vol. xxviii., 1876, page 513.

† *Lancet*, vol. i., 1871, page 776.

‡ *Brit. Med. Journ.*, 1882, page 166.

§ For cases *see* Billroth; Archiv f. klin. Chirug. Langenbeck, b. i., s. 485; Lawson, *Med. Times*, vol. i., 1861, page 675; Spencer, ibid., 1879; Maunder, *Med. Press*, 1867.

‖ For examples of such cases *see* Path. Soc. Trans., vol. iv., page 156; and Le Progrès Médical, 1882, page 12.

operation. M. Peyrot had collected in 1880 125 cases.* In my list I have omitted, for various reasons, several of M. Peyrot's cases, and have added forty-five new ones.

Laparotomy for Intestinal Obstruction exclusive of Intussusception.

Internal hernia	3 Recoveries. 6 Deaths.	9
Strangulation after the reduction of hernia	7 Recoveries. 6 Deaths.	13
Strangulation by bands of all kinds	15 Recoveries. 31 Deaths.	46
Volvulus	2 Recoveries. 15 Deaths.	17
Strangulation through slits or apertures	1 Recovery. 3 Deaths.	4
Stricture, etc.	6 Recoveries. 5 Deaths.	11
Tumour compressing the bowel	2 Recoveries. 0 Death.	2
Strangulation by diverticula	3 Recoveries. 8 Deaths.	11
Obstruction by foreign bodies	4 Recoveries. 1 Death.	5
Obstruction due to unknown causes	2 Recoveries. 2 Deaths.	4

Total number of laparotomies 122
Total number of recoveries 45
Total number of deaths 77

Mortality, 63·1 per cent.

Ages of the Patients.

2 years and under.		3 to 10 years.		11 to 15 years.		16 to 20 years.	
Recoveries	0	Recoveries	0	Recoveries	2	Recoveries	4
Deaths	0	Deaths	2	Deaths	7	Deaths	9
Total	0	Total	2	Total	9	Total	13

21 to 40 years.		41 to 60 years.		Over 60 years.		Age not stated.	
Recoveries	20	Recoveries	8	Recoveries	5	Recoveries	6
Deaths	23	Deaths	18	Deaths	5	Deaths	13
Total	43	Total	26	Total	10	Total	19

* De l'Intervention chirurgicale dans l'Obstruction intestinale. Paris, 1880.

LAPAROTOMY FOR INTUSSUSCEPTION.

Total number of cases 33
Total number of recoveries 9
Total number of deaths 24

Mortality, 72·7 per cent.

Two years old and under . . .	18 cases .	4 recoveries. 14 deaths.
Three to fifteen years old . . .	4 cases .	0 recoveries. 4 deaths.
Over fifteen years old	11 cases .	5 recoveries. 6 deaths.

Reduction easy.

Total cases 10
Recoveries 7
Deaths 3

Mortality, 30 per cent.

Age of patients. — *Recoveries.*	*Deaths.*
6 months.	Infant.
7 ,,	9 months.
9 ,,	17 ,,
2 years.	
33 ,,	
34 ,,	
50 ,,	

Reduction difficult or impossible.

Total cases 23
Recoveries 2
Deaths 21

Mortality, 91·3 per cent.

Age of patients. — *Recoveries.*	*Deaths.*
20 years.	12 weeks.
28 years.	14 ,,
	4 months.
	5 ,, (2 cases.)
	6 ,, (3 cases.)
	9 ,,
	1 year.
	16 months.
	5½ years.
	8 ,,
	12 ,,
	14 ,,
	16 ,, (2 cases.)
	36 ,,
	43 ,,
	50 ,,
	"A young man."

Duration of disease at the time laparotomy was performed in the cases that were reduced easily.	
18 hours.	14 days.
2 days.	18 days.
"A few days."	One month.
4 days.	Not stated (2 cases).
5 days.	

10 cases.

Duration of disease at the time laparotomy was performed in the cases that were irreducible or difficult of reduction.	
48 hours.	10 days (2 cases).
3 days (2 cases).	11 days.
4 days (2 cases).	17 days.
5 days (3 cases).	30 days.
"Under 7 days."	One month.
7 days.	4 months.
"Some days" (3 cases).	Not stated (3 cases).

23 cases.

Since the preparation of this table Dr. Schramm * has published statistics of 193 laparotomies for intestinal obstruction, including twenty-seven for intussusception.

* Langenbeck's Archiv., band xxx., heft. 4.

The mortality of this series is 64·2 per cent. The mortality of the operation in the various forms of obstruction is practically the same as in the above table.

Out of my one hundred and fifty-five cases there were fifty-four recoveries and one hundred and one deaths. I believe that these statistics are quite useless as a means of ascertaining the real mortality after this operation. Probably the recorded cases bear to those that are unpublished the proportion of one to ten, and it may be surmised that the great bulk of these unpublished cases ended in death. It is scarcely possible to find any hospital surgeon of experience who cannot allude to two or three unsuccessful laparotomies for obstruction in his practice. On looking through the published cases one is struck with the fact that they have been published for the most part with one of two objects, either because they were successful or because they presented some interesting pathological feature. Cases that end fatally and have no pathological interest in the eyes of the operator are not reported.

I have no doubt, therefore, but that the mortality after laparotomy is a very great deal higher than that shown in the above statement.

The high mortality need be no matter for wonder. In the majority of the cases the operation was performed at a period antecedent to the introduction of antiseptic measures in surgery, and previous to the great advances that have been of late years made in abdominal operations.

Thus Dr. Schramm has shown that the cases of laparotomy reported prior to the year 1873 show a mortality of 73 per cent., while those reported since that date present a mortality of only 58 per cent.

A large number of the recorded cases were totally unfit for operation. Some of the patients were almost moribund at the time the laparotomy

was performed, others were in a condition of profound exhaustion. In some there was general acute peritonitis, in others fæcal extravasation had already occurred before the abdomen was opened. Laparotomy has been done in cases where treatment had been so long delayed that the gut was gangrenous and became ruptured when handled. Laparotomy has indeed been looked upon as a last resource instead of as a primary measure, and in the face of the above facts it can hardly be wondered that the mortality after the operation has been high.

Dr. Schramm has given a table in the monograph above referred to, to show the influence that the time of performing the operation has upon the result. This table shows in a graphic manner how serious is the delay, even of twenty-four hours, when laparotomy is concerned.

An examination of the recorded cases shows very clearly that in proper instances, and especially in those where the operation is undertaken early enough, laparotomy is by no means so very fatal a procedure. The one great fact that affects the issue of the operation is not so much the age of the patient, nor the seat of the obstruction, nor the period in the disease when the procedure was carried out, but the state of the gut; and since pathology can give us precise teaching upon this latter point, there is no reason why laparotomy should not be rescued from the somewhat ignominious position it now occupies in surgery.

There is no reason why in the future, with a fuller knowledge of the technical details essential to the operation, with a surer acquaintance with the clinical aspects of obstruction, and with the exercise of a sounder judgment in the selection of cases, the procedure of laparotomy should not have a mortality but little higher than that of the operation for the relief of strangulated hernia.

Laparotomy during peritonitis.—The general question may now be considered as to how far peritonitis is a bar to operation in cases of obstruction of the intestines.

It may be at once said that when peritonitis occurs in connection with intestinal obstruction its appearance usually coincides with so serious a condition of the gut that the case is unfit for any kind of operation. The intestine under such circumstances may be intensely inflamed or gangrenous, or, as is frequently the case, perforated. Thus it happens that laparotomy performed during peritonitis has been in nearly every case fatal, and the same applies to other operations for the relief of obstruction, such as enterotomy.

Duplay has collected several cases of laparotomy performed for a peritonitis, the symptoms of which were mistaken for those of acute strangulation. These were all instances of perforative peritonitis, and all led to a fatal result. I have been able to add several other cases to Duplay's list, and they collectively serve to show that (at the present time at least) abdominal incision does not delay the fatal issue in cases of perforative peritonitis, and that all operations performed during that condition are entirely hopeless.

The occurrence, however, of local peritonitis, and even of acute general peritonitis, when not due to perforation, is not an absolute bar to the performance of laparotomy for the relief of obstruction, as some recent cases show.

I have found two recorded instances of laparotomy performed during acute general peritonitis, in both of which the obstruction was relieved, and the patients made an excellent recovery. It is significant that in both these cases the operation was carried out under strict antiseptic precautions. The first case was recorded by M. Terrier. It concerned a female, aged twenty-one, who was operated upon, upon the third

day of the symptoms, for the relief of a strangulation by a band. Much sero-sanguinolent fluid escaped from the peritoneal cavity, the serous membrane was red, and the intestines extensively adherent by soft recent adhesions. The band was found and divided without difficulty.* The second case was by M. Julliard. The patient, a woman aged forty-eight, had an ovarian tumour, and developed symptoms of obstruction. Laparotomy was performed on the second day. The ovarian growth was removed and the obstruction, which was due to oldish adhesions, was relieved. The peritoneum was in about the same condition as in the previous case.†

Apropos of this subject it may be observed that the practice is gaining ground of treating many cases of peritonitis by free incision and drainage. This treatment has been applied to inflammatory effusions into another large serous cavity, that of the pleura, and why not to the peritoneum? The cases that appear to be best suited for such treatment are cases of chronic peritonitis and especially of local peritonitis. So far as I can ascertain, the first serious proposal that abdominal section should be performed for peritonitis was brought forward by the late Mr. Hancock in a paper read before the Medical Society in 1848. Mr. Hancock opened the abdomen in a case of chronic local peritonitis depending upon some disease in the appendix, and the patient recovered. In his comments upon the case Mr. Hancock remarks: "I trust the time will come when this plan will be successfully employed in other cases of peritonitis." Mr. Lawson Tait has performed abdominal section in several cases of chronic peritonitis, with a good result in each instance.‡ Dr. Savage reports eight cases of pelvic

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, page 564.
† Ibid., page 665.
‡ *Brit. Med. Journ.*, Feb. 17th, 1883, page 300.

peritonitis treated by laparotomy, and all followed by a successful issue.* In a case of chronic puerperal peritonitis Dr. Playfair made an abdominal incision and freely drained the serous cavity under antiseptic precautions, with a perfectly successful result.†

One of the most interesting cases, however, that can be mentioned in the present category is placed on record by Dr. Buchanan of Glasgow. A woman of 29 years of age was suddenly seized with severe abdominal pain, soon followed by vomiting. The attack came on on Feb. 18th, at 2 a.m., after eating a hearty supper. The pain and vomiting became more severe, and at 4 a.m. on Feb. 20th the ejected matters were stercoraceous. There was absolute constipation, and enemata gave no relief. On Feb. 21st the patient was greatly prostrated, the eyes were sunken, the voice husky, the limbs cold. The case was considered to be one of obstruction. Median laparotomy was performed (non-antiseptic). One pint of turbid serum containing curd-like flocculi escaped. There were extensive recent adhesions involving all the intestines. No obstruction was found. The pelvis was sponged out and the wound closed. The patient made an excellent recovery.‡

Enterotomy.—This operation was first proposed and carried out by Nelaton, by whose name it is also very usually called. The procedure is as follows: The seat of the operation is the iliac or inguinal region, preference being given to the right side. An incision is made through the abdominal parietes parallel to and a little above Poupart's ligament, and to the outer side of the epigastric artery. The skin incision is advised to be about 7 cm. in length. The deep

* *Brit. Med. Journ.*, March 4th, 1884.

† Ibid., March 10th, 1883. *See also* account of Dr. Molodenkoff's fatal case in an annotation in the same journal, Feb. 10th, 1883.

‡ *Lancet*, vol. i., 1871, page 776.

incision whereby the peritoneum is opened being about 4 cm. in length. The first *distended* coil of bowel that presents itself is gently seized and drawn into the wound. If the operation be performed upon the right side it is found that the segment of intestine opened is nearly always the terminal part of the ileum. The gut is then fixed to the wound by a double line of sutures which transfix the intestinal walls. An opening is finally made into the bowel between the two lines of suture and the operation is completed.

In chronic cases, where time may be no great object, the operation can be divided into two stages. In the first stage the gut is fixed to the sides of the incision by a series of sutures that do *not* traverse the entire thickness of the intestinal wall. Three or four days are allowed to elapse in order that adhesions may form between the bowel and the parietal peritoneum, and then by a second slight operation the gut is opened and secured, if necessary, by more substantial ligatures. The first stage in the procedure may be conducted under antiseptic precautions.

Enterotomy is an operation that can be very readily performed and that is fairly certain of success so far as making an opening in the gut above an obstruction is concerned. It involves no more exposure of the peritoneum than pertains to the operation of kelotomy when the sac is opened.

The procedure has been carried out in nearly every form of intestinal obstruction, and has certainly been more popular upon the continent than in this country.

It has been done for internal strangulation, for volvulus, for intussusception, both acute and chronic, for the many forms of obstruction due to adhesions, for fæcal accumulation, for stricture, and for obstruction by foreign bodies. It has also been performed, owing to an error in diagnosis, in a case of tubercular peritonitis. In some instances the operation has been

secondary to another procedure. For example, a laparotomy has been performed to relieve a supposed strangulation. The case has proved to be incapable of relief by the means intended, and an enterotomy has then been performed. Messrs. Morris and Coupland, in their monograph upon stricture of the intestine, advise that when a lumbar colotomy has been performed, and it is found that the colon has been opened *below* the obstruction, the peritoneum should be incised, and a coil of small intestine pulled into the lumbar wound and opened.

I cannot avoid the conclusion that a primary enterotomy is not to be advised. The operation is at the best but a palliative measure; it is not founded upon sound surgical principles; it is a procedure that is carried out more or less independently of diagnosis; it is an operation done in the dark, and it leaves the cause of the disorder untouched. It is true that it does not show so high a mortality as does laparotomy, but the disadvantages of the procedure are many. In the first place, as already stated, it leaves the real malady itself untouched. To this statement there are a few exceptions. There are some forms of obstruction that are in great measure produced and maintained by distension of the bowel; among such are certain forms of volvulus (which are very rare), some cases of occlusion by kinking, by adhesions, and by changes in the visceral peritoneum or mesentery. Such cases *may* be cured by enterotomy, and a closure of the artificial anus may follow the operation. Some cases also of fæcal accumulation and of obstruction by a foreign substance may be so far relieved by enterotomy that the artificial anus may close in time, or be closed by some plastic measure. But how stands the matter in other cases? The obstruction remains. If it be an example of acute strangualtion, or of volvulus, or of intussusception, then the gut may become in time gangrenous, and the

patient die practically of the direct effects of an unrelieved, or imperfectly relieved, obstruction of the bowel. If the obstruction be due to cancer, the cancer is left untouched, and the operation merely gives some temporary relief. Suppose, however, that after the enterotomy no further changes of a destructive or malignant character take place about the seat of obstruction; what is the condition of the patient? There is a permanent fæcal fistula in the groin. This leads into the small intestine, and may be the cause of wasting, and, if higher up in the bowel than usual, of death from marasmus. There may be, moreover, a considerable portion of intestine between the artificial anus and the obstruction, and the accumulation of fæcal matter in this part of the bowel may lead to the greatest distress. The ileum has actually been opened to relieve a case, not diagnosed at the time, of simple stricture in the upper part of the rectum, and in other examples of enterotomy the seat of the obstruction has been in the descending colon and the sigmoid flexure.

An operation that would present examples such as these cannot be said to be based upon proper surgical principles.

Against secondary enterotomies there is nothing to be said. If in performing a lumbar colotomy it is found that the colon has been exposed at a point below the obstruction, then it is clearly better to open the small intestine at the seat of the colotomy, if the case be urgent, rather than to make a second attempt upon the colon in another place. These remarks refer in the main to lumbar colotomy of the ascending colon, in cases where the stricture is in the cæcum or in the terminal part of the ileum.

Moreover, when a laparotomy has been performed, there are many cases in which nothing can be done to give relief save by enterotomy or enterectomy, and by some secondary enterotomies it is certain that life has

been spared and the patient's existence has been greatly prolonged.

The following statistics deal with the mortality after enterotomy. The cases are divided into two sets, those in which the operation was done for cancer, and those in which it was done for obstruction due to non-malignant disease. The total number of cases is 109. Of these, 86 are taken from Peyrot's tables, the remaining 23 I have collected myself, mainly from reports subsequent to the date of Peyrot's monograph. They serve to show the great mortality of enterotomy in cancer, and also demonstrate the fact that in the fatal cases death does not follow so soon after the operation as it does in fatal cases of laparotomy, where the great majority of the deaths fall within the first twenty-four hours.

Enterotomy for Non-malignant Forms of Obstruction.

Sixty-one operations . . . . { 20 are described as cured. 41 died.

Of the fatal cases . { 24 died within 2 days of the operation. 7 ,, ,, 2 to 5 ,, ,, 6 ,, ,, 6 to 10 ,, ,,

Four patients survived the operation respectively 11 days, 15 days, 22 days, and 2 months.

Enterotomy in Cases of Malignant Stricture.

Forty-eight operations . . . . { 6 are described as cured. 42 died.

Of the fatal cases . { 28 died within 2 days of the operation. 6 ,, ,, 2 to 5 ,, ,, 1 ,, ,, 6 to 10 ,, ,,

Seven patients survived the operation respectively 12 days, 28 days, 2 months, 4 months, 6 months (two cases), and 7 months.

Of the cases of "cure" . { 3 are described simply as "cured." 1 as temporarily cured. 1 as "cured of the operation." 1 lived for 4 years after the enterotomy.

Colotomy.—This procedure is applicable only to obstructions in the colon, and consists in establishing an artificial anus in the gut above the point of occlusion. There are two forms of colotomy: lumbar colotomy, commonly known as Amussat's

operation, and inguinal colotomy, usually referred to as Littre's operation. In the former, the ascending or descending colon, as the case might be, is reached through an incision made in the loin. An opening is made in the gut behind the peritoneum, and the serous cavity is not opened. In the latter, the colon is reached by an incision in the iliac region placed a little above Poupart's ligament and external to the epigastric artery. The cavity of the peritoneum is opened and an incision is made into the gut through its peritoneal covering. The two modes of operating, therefore, differ considerably. From Erckelen's * very extensive statistics of colotomy, an abstract of which is appended, it will be seen that Amussat's operation is the safer of the two, there being a difference of nearly ten per cent. between the mortality after the two procedures.

LUMBAR COLOTOMY (ERCKELEN'S STATISTICS).

Total operations, 262 = Amussat's method, 165; Littre's, 84; Method unknown, 13.

INDICATIONS.—Cancer, 100 cases; fistulæ, 16 cases; atresia, 44 cases; stricture, 49 cases; obstruction, 43 cases.

AGE.

Ages.	*Cases.*	*Recoveries.*	*Deaths.*	
1 to 10 years.	47	21	25	1 result unknown.
10 to 20 ,,	5	4	1	
20 to 30 ,,	30	21	9	
30 to 40 ,,	27	12	15	
40 to 50 ,,	40	26	14	
50 to 60 ,,	38	23	15	
60 to 70 ,,	27	20	7	
70 to 80 ,,	4	1	3	
Unrecorded.	44	23	20	1 result unknown

Sex.—Male, 128; Female, 96; Unknown, 38.

Death took place:

In first week in 70 cases, including 43 on first or second day.
In second week in 15 cases.
In third week in 8 cases.
Time not recorded, 15 cases.

* Archiv f. Klin. Chir. Langenbeck, 1879, page 41.

In the total of 262 the operation ended:
Favourably in 152 (58·4 per cent.), *i.e.* the patient survived 21 days.
Unfavourably in 108 (54·2 per cent.), *i.e.* the patient did not survive 21 days.
Result unknown in 2.

Of the 165 by Amussat's method:
101 recovered . . . . . 63·0 per cent.
63 died . . . . . 38·4 ,,
1 result unrecorded.

Of the 84 by Littre's method:
44 recovered . . . . . 52·4 per cent.
39 died . . . . . 46·4 ,,
1 result unrecorded.

Of the 13 cases by unrecorded methods, 7 recovered and 6 died.

Carcinoma.

110 cases . . 68 ended favourably 42 unfavourably.
83 by Amussat's . 52 (63·9 per cent.) ended favourably 31 ,,
23 by Littre's . 14 (61·0 ,,) ,, ,, 9 ,,
4 by unknown methods . . . 1 died, 3 recovered.

Fistulæ.

16 cases . . 13 (81·0 per cent.) ended favourably 3 unfavourably.

Atresia.

44 cases . . 20 (45·2 per cent.) ended favourably 24 unfavourably.

Stricture.

49 cases . . 29 (59·2 per cent.) ended favourably 20 unfavourably.
38 by Amussat's . 25 ,, ,, 13 ,,
9 by Littre's . 3 ,, ,, 6 ,,
2 result unrecorded.

Obstruction.

43 cases . . 22 ended favourably 21 unfavourably.
20 by Amussat's . 10 ,, ,, 10 ,,
18 by Littre's . 10 ,, ,, 8 ,,
5 result unrecorded.

In the lumbar operation the gut may be more readily and more safely reached upon the right than upon the left side. The descending colon is less movable than the ascending, and has also a more extensive non-peritoneal surface. A meso-colon is more often found upon the right than upon the left side, and the presence of this condition would involve an opening into the sac of the peritoneum. Moreover, in malformations of the colon the abnormal condition is more frequently found upon the right than upon the left side. It may be possible to attempt a right

lumbar colotomy and find no colon at all in the usual position. Indeed, the ascending colon may be entirely absent. The question of a right *versus* a left lumbar colotomy will be discussed further when dealing with the treatment of obstructions in the colon.

In Littre's procedure the incision may be made either upon the left or the right side. In the former case the sigmoid flexure is the part opened; in the latter case the cæcum becomes the seat of the artificial anus. The left operation is limited to cases of stricture of the rectum or terminal part of the sigmoid flexure. The right operation is the one concerned in the present subject.

There are many excellent reasons for selecting the cæcum in these cases. It is usually much distended and very prominent. In long-standing cases it is a part much in need of early relief, since the great strain of the accumulation falls upon its walls, and its mucous membrane not infrequently becomes ulcerated. Perforation by one of these ulcers is a common cause of death in stenoses of the colon. I could refer to several instances where this perforation has taken place after a colotomy performed on another part of the colon, and where it may be said that the cæcum has been relieved too late. It must be remembered, however, that the cæcum is liable to many abnormalities due to congenital defect, and that the right iliac region may be opened up and no trace of the cæcum found. In both forms of colotomy much distress is often occasioned by the accumulation of fæces that usually exists between the artificial anus and the occluded part. The greater the distance between these two points the more serious is the trouble likely to be.* As soon after the operation as the condition of the wound will permit,

* *See* illustrative case by Mr. Bryant; *Lancet*, vol. i., 1878, page 743.

steps should be taken to relieve the gut of this obstruction.

In both Amussat's and Littre's operation, the procedure may be divided into two parts, when the demands of the case are not urgent, and the first and more important part of the operation may be performed under antiseptic precautions. In this first step the gut is exposed and stitched to the edges of the wound by sutures that do not pass entirely through the thickness of the intestinal wall. A few days are allowed for the bowel to contract firm adhesions to the margins of the incision. When all the parts are firmly sealed with lymph the operation is completed by opening the intestine. In Littre's procedure this plan makes the opening of the peritoneum a comparatively harmless proceeding, and renders the chance of escape of fæcal matter into the serous cavity practically impossible. In the lumbar operation the plan is equally valuable. It minimises the evils that may follow from an accidental wound of the peritoneum, and tends, moreover, to prevent suppuration in the loose subserous tissue that is opened up when the gut is exposed. I have seen a case of left lumbar colotomy where this suppuration had extended down along the colon to the rectum and had ultimately caused death.

After a lumbar colotomy has been performed a great deal of inconvenience is often experienced by the patient owing to the accumulation of fæcal matter between the artificial anus and the seat of obstruction. Madelung has recently proposed * a modification of the operation which should prevent this complication. Madelung does not content himself with merely opening the colon, but he cuts the bowel entirely across. He stitches the upper end of the divided intestine to

* Deutschen Gesellshaft für Chirurgie, April, 1884; Central. f. Chir., No. 23, 1884.

the edges of the abdominal wound, and so establishes an artificial anus. He then empties the lower segment of the bowel of its contents, and having entirely closed its divided end reduces it into the abdominal cavity (behind the peritoneum), and closes the skin incision over it. This procedure is only proposed for cancer of the rectum or of the sigmoid flexure. It could be applied, however, to any form of obstruction involving these parts which may be considered to be quite beyond relief by further treatment. The measure would prevent the evils arising from the irritation of the cancerous surface by fæcal matter, and should greatly minimise the tendency to prolapse of the gut at the seat of the operation.

Colotomy has been performed for all varieties of obstruction of the colon, but especially for such as are of a chronic character. The selection of the place of operation depends, of course, upon the correctness of the diagnosis; and in many cases where the diagnosis has been in error a useless operation has been performed. Thus, in a case of volvulus of the ascending colon and cæcum, left lumbar colotomy was performed. By chance the extreme point of the greatly distended and displaced ascending colon was opened, but without relief to the patient.*

In many cases the artificial anus has been made below the seat of the obstruction in the colon; † and the descending colon has even been opened for an occlusion that involved the small intestine.‡

Mr. Lockwood § has given an account of two cases of attempted lumbar colotomy, in neither of which was the colon found, owing to a congenital deformity of the large intestine.

* Path. Soc. Trans., vol. ii., page 222.

† For instances *see* Dr. Fagge's Monograph.

‡ Path. Soc. Trans., vol. xii., page 111.

§ St. Bart.'s Hosp. Reports, vol. xix. *See also* A Manual of Surgical Anatomy, by the author, page 314.

Resection of intestine.—In this operation a diseased portion of intestine is entirely cut away and removed from the body. The term *enterectomy* is applied to the procedure when it involves the small intestine, the term *colectomy* when it concerns the colon.

Enterectomy may be performed for the following conditions: 1. Strictures of the small intestine both simple and epitheliomatous. 2. Occlusion of the bowel by adhesion, and matting of the coils of such a character that the deviation of the gut cannot be corrected. 3. Obstruction by neoplasms other than epitheliomata. 4. Gangrene of the bowel due to any of the manifold forms of strangulation. 5. Irreducible intussusceptions. 6. For the closure of fæcal fistulæ situated in the small intestine.

The great bulk of the operations of enterectomy have, up to the present time, been performed for the removal of gangrenous bowel following strangulated hernia, and for the closure of fæcal fistulæ.

It will be convenient to consider, in the first place, the data upon which the value of the procedure is based in the various conditions above named. 1. In cases of stricture of the small intestine, the patient may be relieved, and may be saved from immediate death from obstruction, by an operation other than the one under notice; but by the present procedure alone can the patient be *cured*. Enterotomy may give relief, but enterectomy is the only means of cure. Enterotomy leaves the patient with the obstruction still untreated, and it renders, moreover, an artificial anus an absolute necessity. If this fistula be in the lower ileum, the patient's life may be indefinitely prolonged; but if it be situated in the upper parts of the lesser bowel, then a more or less rapid death from marasmus is inevitable. In addition to this, and as a matter of less moment, the artificial anus involves a grave and

abiding source of inconvenience, and leaves the patient exposed to the troubles that occasionally arise from the presence of retained fæcal matter in the bowel below the seat of the obstruction. By means of enterectomy the cause of the trouble may be removed, and the integrity of the intestinal canal restored.

If the stricture be carcinomatous, the condition is still more serious. Enterotomy may relieve the patient of obstruction symptoms, but it leaves untouched within his body a growth that will assuredly increase, and will at no distant time inevitably lead to death. It happens that the form of cancer that is usual in the intestine is a form that is peculiarly well adapted for treatment by excision, and by enterectomy not only may death from obstruction be averted, but the patient may be relieved of a fatal malady.

2 and 3. To the conditions that fall under these headings the same remarks apply as have been used in speaking of enterectomy in simple stricture. In cases of obstruction by the matting together of many coils, the propriety of the operation must be influenced by the length of intestine involved. In the light, however, of Koeberlé's very successful case, where over two yards of the lesser bowel were removed,* it is evident that liberal views may be entertained upon this point.

4. The value of resection in instances of gangrene is obvious. To liberate a piece of bowel that is strangulated by a band and gangrenous in consequence, and then to leave that loop in the abdomen, is to undertake an operation that had better have been left alone. It would appear obvious also that it would be better to resect the damaged loop than to simply draw it out of the abdominal wound, and allow it to slough off, if for no other reason than that during the process of separation the intestinal obstruction would be maintained.

* Bull. et Mém. de la Soc. de Chir. de Paris, 1881, page 99.

5. If, in a case of intussusception, non-operative treatment has failed, and the abdomen has been opened and the invagination found to be irreducible, the operation of enterotomy affords the only means of relief if resection be not performed. Enterotomy, however, performed under these circumstances, offers even less prospects of success than it does in cases of simple stricture. Not only does the obstruction remain unrelieved, but a portion of gut is left in the abdominal cavity that may cause fatal mischief. The unreduced intussusception may, in spite of the artificial anus above it, become gangrenous; or its walls may ulcerate; or the imflammation existing in its tissues may lead to a fatal peritonitis. It is only by an excision of the involved segment that these evils can be obviated.

6. Resection for fæcal fistula has little direct concern with the present subject. Enterectomy performed for the cure of artificial anus is of the nature of a plastic operation. The piece of gut the seat of the fistula is excised, and the two divided ends having been united by suture, the bowel, whose integrity has thus been restored, is reduced into the abdomen, and the wound in the parietes is closed. A large number of resections have been performed under these circumstances, and the results obtained are of considerable moment in estimating the value of certain details in resection procedures which are more fully dealt with below.

Colectomy has been so far limited to cases of stricture chiefly of an epitheliomatous character, and to artificial anus. The operation could, however, be adopted for other conditions of disease in the large intestine that are of like character with those just named in connection with the lesser bowel. Colectomy cannot be considered to present the same claims that may be advanced on behalf of the operation as applied to

the small intestine. An artificial anus in the colon is by no means so inconvenient nor so detrimental to health as is a fæcal fistula in the lesser bowel, and colotomy as a means of relief in colic stenoses must be regarded as a very successful operation. Colotomy of course leaves the cause of the obstruction untouched, and renders a permanent artificial anus necessary, whereas colectomy removes the disease entirely, and allows the normal lumen of the bowel to be restored. In cases of simple stricture, colotomy, as compared with resection, concerns mainly the convenience of the patient, and not a question of life and death. Such being the case, the mortality of the two operations should be as nearly as possible upon a par, and it must be owned that at present this position cannot be claimed for the resection operation. In instances of epithelioma of the colon, however, the claims of colectomy can be advanced with much greater point. In such cases, the establishment of an artificial anus but relieves the patient for awhile, and leaves untouched a malignant growth that by means of colectomy may be entirely and freely removed.

Speaking generally of the operation of resection of intestine, it should be noted that the procedure involves no new surgical principle, and embodies no revolution in treatment. It merely implies the tardy application to abdominal disorders of modes of cure that have for centuries been applied to other parts of the body. In principle it simply involves the removal of diseased parts that cannot be treated by other means, the excision of malignant growths that cannot be got rid of by milder measures, the separating of gangrenous tissues from contact with the living body that cannot be so separated by natural means.

The modus operandi.—There are two different methods of resecting the intestine. In the one, the diseased segment is excised; the divided ends of the

bowel are then carefully united by many points of suture; the parts so adjusted are reduced into the abdominal cavity, and the wound in the parietes is closed. In the other, after the necessary portion has been removed, the divided ends are stitched to the edges of the skin incision, and an artificial anus is established. After a varying interval of time, a second resection operation is performed upon the portion of intestine involved in the fæcal fistula, the lumen of the tube is restored by suturing the two ends, and the parietal wound is closed. The details of these two procedures may now be described, so far as they refer in the first instance to the small intestine.

1. A laparotomy is performed, and preferably by an incision in the middle line. The advantages of a median incision have been referred to in speaking of laparotomy. Through such a cut, any part of the small intestine may be reached, and the surgeon is rendered independent of a precise knowledge of the locality of the obstruction. If any certain evidence exists to point to the precise seat of the lesion, then the incision may be made over that spot, or over the semi-lunar line that is nearest to it. The segment of bowel to be excised is then drawn out of the abdominal wound. Before proceeding further, steps should be taken to prevent any blood or fæcal matter set free by the operation from entering the peritoneal cavity. This occurrence can be prevented either by closing the abdominal wound by sutures as far as the protruding loop of bowel will allow, or by plugging that wound carefully with warm carbolised sponges. The next step is to occlude the bowel, both above and below the part that is to be excised. For this purpose, some surgeons content themselves with the pressure that can be exercised by the fingers of an assistant, while others secure the bowel by elastic or silk ligatures. Both of these methods are open to objection. In

adopting the first plan, it will be found that the hands of the assistant will probably become tired out before the operation (which must always be of long duration) is completed. Moreover, if the assistant has to relax his hold at any time to accommodate himself to the manœuvres of the surgeon, the intestinal contents may escape, and in any case two additional hands in the precincts of the wound greatly narrow the area of the operation. Ligatures of all kinds are objectionable on account of the damage they must

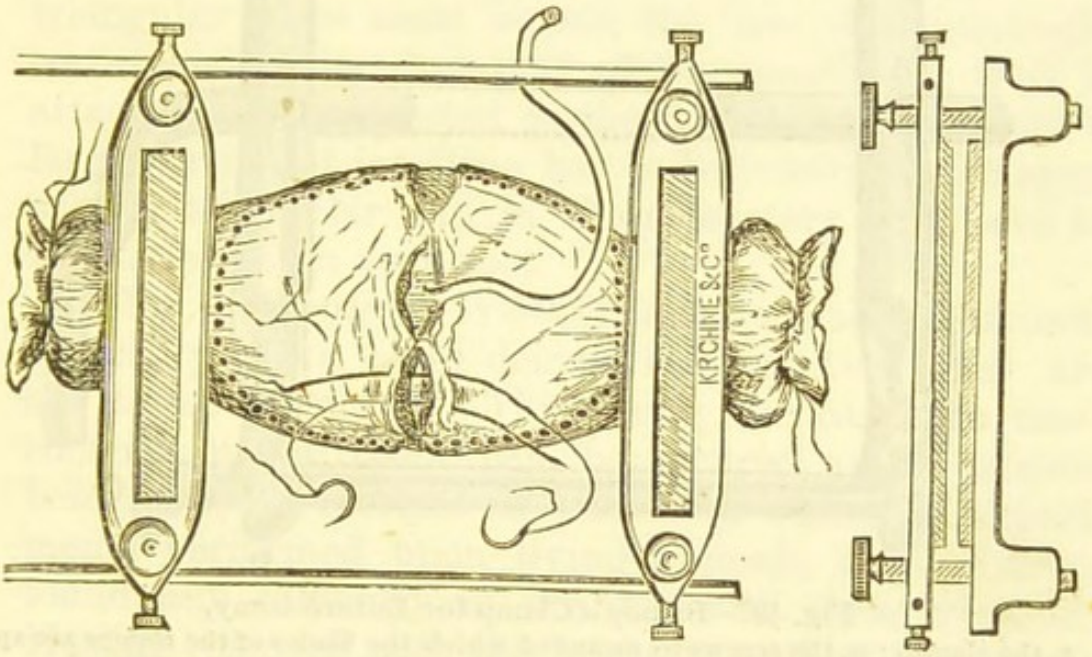


Fig. 58.—Treves' Clamp for Enterectomy or Colectomy.

almost of necessity inflict upon the delicate walls of the intestine. It is evident that assistance must be sought from some species of clamp. A clamp that I have devised for this purpose, and the use of which I have fully described elsewhere,* seems to meet, I venture to believe, some of the chief requirements demanded of such an instrument (Fig. 58). This clamp is made in two parts, one for the upper and one for the lower end of the intestine. These two portions are quite separate, are readily applied, and

* Med.-Chir. Trans., vol. lxvi., page 55.

occupy very little room. The compressing surfaces are covered with indiarubber, and are brought together by means of screws. When the gut has been resected, and the two divided ends require to be carefully approximated in order that the sutures may be introduced, the two portions of the clamp are fixed by means of connecting rods, so that a rigid framework is formed, the length of which can be regulated by a slight and easy adjustment of these little rods.

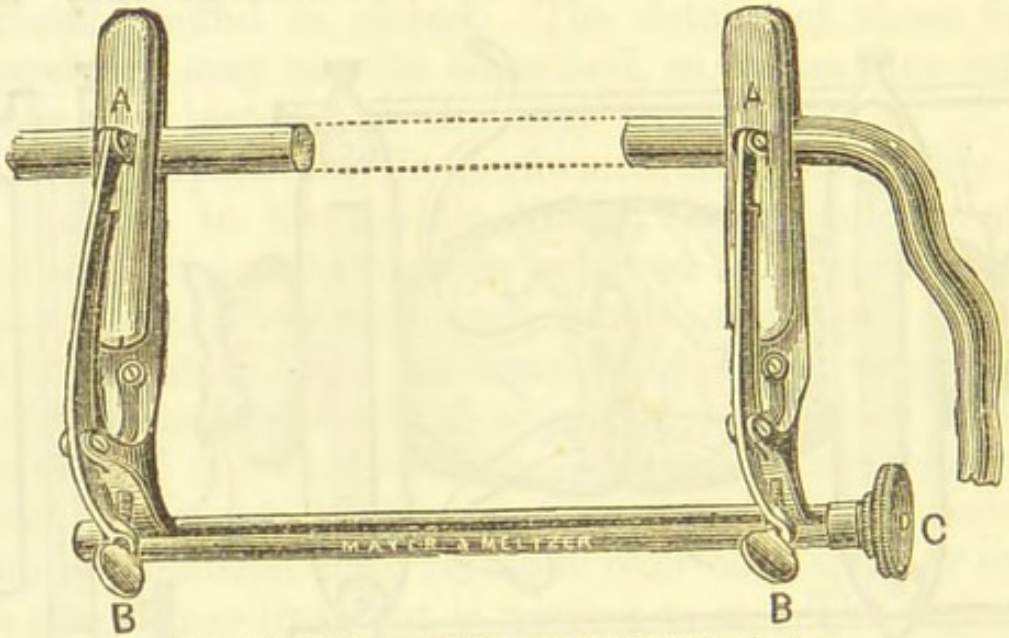


Fig. 59.—Bishop's Clamp for Enterectomy.

A, the clamps; B, the screws by means of which the blades of the clamps are approximated; C, the screw by means of which the clamps are adjusted.

A clamp of a more ingenious construction has been introduced by Mr. Bishop, of Manchester.* In this instrument the two portions of the clamp are connected by means of a screw, by one movement of which they can be approximated, and by another moved apart (Fig. 59). One slight disadvantage in Mr. Bishop's instrument is its size and weight, and the inconvenient dimensions and position of the connecting screw. It is, however, much more readily applied than is the clamp to which I have just referred.

The clamps having been applied, the diseased

* *Brit. Med. Journ.*, Nov. 3, 1883.

segment of gut between them is excised with scissors, a certain portion of sound intestine being allowed to intervene between the proposed line of sutures in each case and the line of compression by the clamps. The bowel should be divided upon a sponge, so that nothing may escape into the peritoneal cavity; and if the diseased segment has been well emptied of its contents before the clamps are applied, the amount of matter that could escape should be slight. Attention must now be turned to the mesentery, from which a triangular piece must be cut, the base of the triangle corresponding to that part of the membrane that is attached to the resected segment of bowel. When a large portion of intestine has to be removed, the apex of this triangular gap in the mesentery may have to be carried to its very root.

The mesenteric vessels are usually distinct, especially as in cases demanding resection they are apt to be engorged. This being the case, the most conspicuous of them can be secured and ligatured before the membrane is cut. In resection experiments performed upon living animals, I have never found any difficulty in dealing with these vessels.* Having removed both the intestine and its mesentery, the two cut edges of the latter should be carefully approximated by sutures. I hold that the resection of a triangular piece of the mesentery and the subsequent closure of the gap so made by sutures is of vital importance. If the membrane be not so treated, the gut, when united and reduced, is almost certain to become occluded by kinking at the suture line, a catastrophe that has occurred in some of the recorded cases in the human subject. The mesentery should, if possible, not be divided quite up to the line of division in the bowel, in order that the nutrition of

* It is necessary to state that none of the vivisection experiments alluded to in this work were performed in this country.

the cut edge of the intestine be not interfered with more than is possible. It is obvious that the sound and rapid healing of the intestinal wound will depend upon the nutritive activity of the divided ends, and it is fortunate that the anatomical arrangements of the vessels, both in the mesentery and in the walls of the bowel, prevent this activity from being greatly interfered with in the resection operations.

In cases of epithelioma of the gut, the excision of a large triangular piece of the mesentery will usually permit, at the same time, of the removal of any enlarged glands in the immediate vicinity of the disease.

The two divided ends of intestine are now to be brought into close contact with one another, and if either of the two clamps described above are used, this object can be readily effected. The sutures have next to be introduced. They should be introduced in a double row, the first series bringing the edges of the mucous membrane together; the second or external series uniting the serous surfaces of the bowel. When the intestine is divided, the muscular coat retracts, carrying with it the serous coat. By this contraction the mucous layer is freely exposed, and the introduction of the inner row of sutures is a matter of no difficulty (Fig. 60, A).

With regard to the outer line of sutures, the most convenient stitch is that known as Lembert's. It is readily applied, and brings the serous surfaces into close contact. It is well known that the union of the divided ends of the intestine will be first effected and chiefly maintained by the fusion of the serous surfaces. This union is, however, slight in character, and not sufficiently substantial to withstand much strain. The use, therefore, of the inner row of sutures is most important: they serve to strengthen the union, while they help greatly to protect the healing wound on

the serous surface from contact with the septic matters within the lumen of the bowel.

By means of Gussenbauer's stitch the mucous and serous layers of the bowel may be brought together by one suture. This mode of using the needle is, however, not to be advised. It is complicated, and does not save any time in the operation (Fig. 60, B).

The needle used in the process of suturing should be very small, should be so curved as to represent

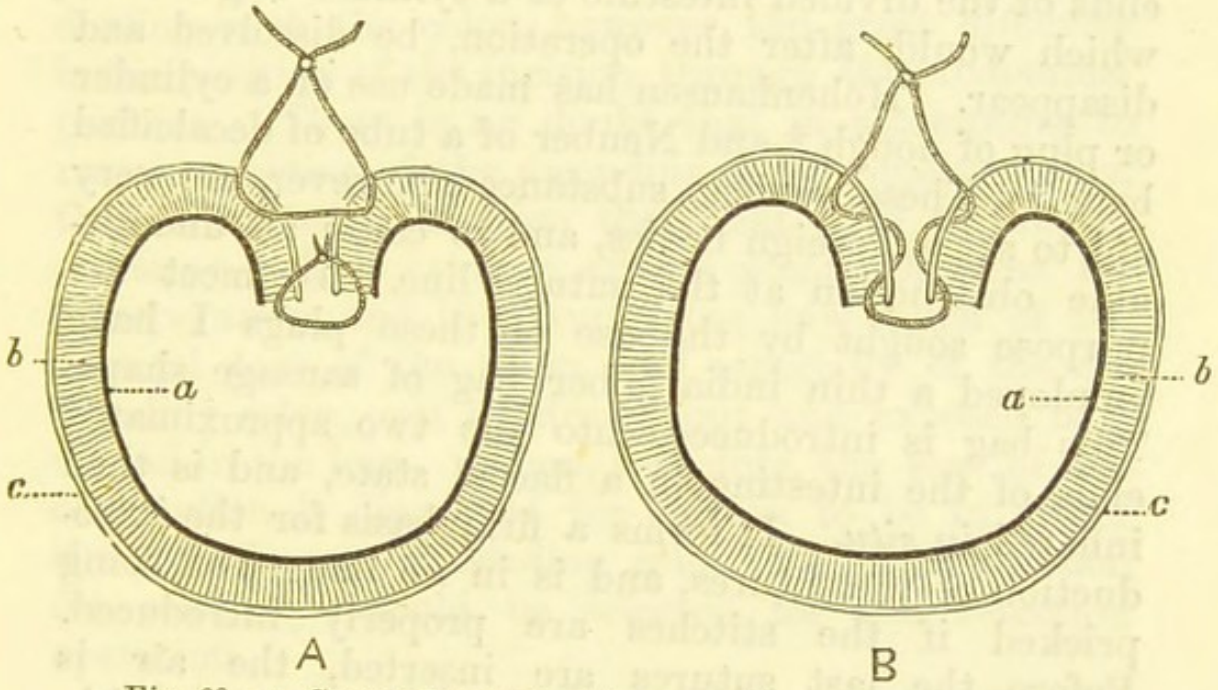


Fig. 60.—A, Czerny-Lembert suture. B, Gussenbauer's suture. *a*, mucous coat; *b*, muscular coat; *c*, serous coat.

half a circle, should be perfectly round on section, and of the same thickness from the "eye" to within a short distance of the point. The best material for the stitches is the finest Chinese twist. It is much more easy to manipulate than catgut or horsehair or silk-worm gut, or even than fine silk.

In all, some forty points of suture are required, fifteen for the inner row, and twenty-five for the outer. The most difficult sutures to introduce are those applied at the line of the attachment of the mesentery; and it is significant that in cases of yielding of

the sutures the occurrence has been most often noted at this spot.

The two divided ends of intestine that have to be united are, of course, limp and non-resistant, and render the introduction of the sutures a matter of some difficulty. The need is felt of some firm substance upon which the bowel may rest while the stitches are being introduced. To fulfil this object some surgeons have proposed the introduction into the ends of the divided intestine of a cylinder of gelatine, which would, after the operation, be dissolved and disappear. Hohenhausen has made use of a cylinder or plug of dough,* and Neuber of a tube of decalcified bone.† These various substances, however, are very apt to act as foreign bodies, and to cause an undesirable obstruction at the suture line. To meet the purpose sought by the use of these plugs I have employed a thin indiarubber bag of sausage shape. This bag is introduced into the two approximated ends of the intestine in a flaccid state, and is then inflated *in situ*. It forms a firm basis for the introduction of the sutures, and is in no danger of being pricked if the stitches are properly introduced. Before the last sutures are inserted, the air is allowed to escape from the bag, which is then withdrawn. When empty, the bag is so thin that it can be drawn through a hole that would not admit the tip of the little finger. I have used this bag in vivisection experiments and on the human subject,‡ but have now discarded it as unnecessary.

After the divided ends of the bowel have been united, the clamps are removed, and the loop having been replaced into the abdominal cavity, the wound in the parietes is closed.

* Deutsche med. Wochens, Sept. 5, 1883.
† Central. für Chirurg., No. 23, 1884.
‡ Med.-Chir. Trans., vol. lxvi., page 55.

Schede* has suggested that the sutured segment should not be at once reduced, but should be fixed outside the peritoneum. This modification has for its object the prevention of extravasation at the suture line. The method, however, has little to commend it, and is open to all the objections that have been urged against the extra-peritoneal treatment of the pedicle in ovariotomy.

In the operation upon the colon, the proceeding is practically identical with that just described. In dealing with the colon, however, the great difficulty is the position of the incision through the abdominal parietes. There is no doubt that in attempting to resect a portion of the ascending or descending colon, there is no better incision than that used in lumbar colotomy. This incision affords plenty of room for the operation, and it is surprising how much of the vertical part of the colon, and especially of the descending colon, can be drawn out and exposed in a wound in the loin. When, therefore, the seat of the obstruction is diagnosed for certain to be in either the ascending or descending colon, the usual incision for colotomy should be selected for the resection operation.

If there should be distinct evidence to localise the disease in the transverse colon or sigmoid flexure, then the preliminary incision should be made through the parietes, directly over the involved part of the intestine. When, however, any doubt exists as to the situation of the obstruction, it is safer to open the abdomen in the middle line. This incision may be made for diagnostic purposes, and a second incision then made over the seat of the disease as soon as it has been ascertained. It is far better, however, to perform the resection through the median wound when possible. When impossible, as it has been

* Quoted by Reichel.

shown to be in several cases, the median incision should be closed, and a second cut made over the seat of the obstruction. In some cases where a median incision has been made, and the disease found to be in one or other loin, the original wound has been continued into the loin by means of a transverse cut.* This procedure is certainly to be condemned. Indeed, so far as the reports of cases at present go, this complicated wound appears to have been always attended by unfortunate results.

In more than one instance the parts resected were so extensive, and the involved gut so fixed, that it was found impossible to unite the two ends of the divided bowel, and a permanent fæcal fistula was therefore inevitable.†

The most extensive statistics of this operation are those collected by Reichel.‡ He has brought together 121 reported cases of gut resection, with subsequent suturing of the divided ends. Out of this number 58 died, 58 are described as cured, and 5 recovered with a permanent fæcal fistula.

37 cases for the relief of artificial anus . .	=	21 recovered. 2 recovered with permanent fistulæ. 14 died.
56 cases for gangrene after hernia . . .	=	24 recovered. 3 recovered with permanent fistulæ. 29 died.
8 cases for occlusion of the bowel . . .	=	2 recovered. 6 died.
10 cases for cancer of the bowel . . .	=	5 recovered. 5 died.
10 cases for injury to the bowel . . .	=	6 recovered. 4 died.

* Gussenbauer, Archiv für Klin. Chir., 1878, page 233. Baum, Centralbl. für Chir., 1879., page 169.

† Schede, Berlin. Klin. Woch., 1878, page 326. Martini, Zeitsch. f. Heilkunde, 1880, page 208; and others.

‡ Deutsche Zeitsch. für Chir., 1883, page 230.

The causes of death in the 58 instances are as follows:

Collapse	6
Marasmus after fæcal fistula	1
Diseases not connected with the original malady	3
Vomited matters entered trachea during operation	1
Intestinal obstruction following the suture	3
Peritonitis	34
Causes not known	9

The three cases of fatal obstruction included two instances of contraction at the suture line, and one case of kinking, due to improper application of the suture.

It will be seen that the chief cause of death in these operations is peritonitis, and it must be owned that this peritonitis usually depended upon some flaw in the details of the operation. In some instances fæcal matter escaped into the peritoneal cavity during the operation. In other cases the sutures were insufficient and allowed the escape of contents after the parietal wound had been closed. In another set of examples the gut sloughed at the suture line, or union did not take place, or what union had occurred broke down after a time.

It is not, therefore, too much to expect that the mortality of the operation may be very greatly diminished by improvement in the details of the operation.

2. In the second method of performing resection a temporary artificial anus is established.

The *modus operandi* in this procedure is practically identical with that first described, short of suturing the intestine and closing the abdominal wound.

The abdomen having been opened, and the diseased loop exposed, the clamps are applied, and the portion

of intestine excised in the manner already described. A triangular piece of the mesentery should also be removed in the operation when it concerns the small intestine. The gap thus formed in the membrane should be closed by a few points of suture. This mode of treating the mesentery renders the subsequent closure of the artificial anus a much more easy matter to effect. The clamp having been removed from the lower and usually collapsed end of the bowel, the margins of the divided intestine are carefully secured to the edges of the abdominal wound. Since the bowel above the obstruction is usually greatly distended, much caution should be exercised before the upper clamp is removed, lest any fæcal matter enter the peritoneal cavity. Before the removal of this clamp the abdominal wound should be closed as far as possible. The wound in the vicinity of the upper segment of the bowel should be well plugged, and before the clamp is actually taken off, this end of intestine should be drawn well forward out of the wound. After the contents of the bowel have escaped, the margins of the intestinal wound and of the parietal wound should be joined, as in colotomy.

After a while, the duration of which must depend upon the circumstances of each case, the artificial anus thus formed is closed by a further resection operation, associated with suturing of the bowel.

Of these two methods of performing resection there is no doubt that the last described is by far the better and the safer.

It may be that the operation of suturing the intestine immediately after the resection may be improved as surgery advances, but, as the matter at present stands, everything points in favour of the operation that demands the establishment of a temporary artificial anus.

The comparative value of these two procedures

has been fully discussed by Reichel in the monograph above alluded to, and this surgeon has shown clearly that the chief element of success in resection operations depends upon the formation of a temporary fæcal fistula.

It must be borne in mind that the patients who are the subjects of resection operations are suffering from obstruction, and often from acute obstruction. Their lives are threatened by reason of this obstruction, and any operation performed should give immediate and entire relief to the distended bowel above the site of the occlusion. In the second of the two methods above described this relief is afforded. The engorged intestine can empty itself at its leisure. If, however, the divided ends of the bowel be at once united after the excision of the diseased segment, the distension, to a great extent, remains, the obstruction is but imperfectly relieved, the gut at the suture line is paralysed, peristaltic movements must be interrupted at this point, and free circulation of the intestinal contents is thus rendered practically impossible. The fact must not be lost sight of, that in resection operations the relief of an obstructed intestine is of more immediate moment as regards the patient's life than the removal of an epithelioma or neoplasm from the walls of the bowel.

Then, again, the operation requiring immediate suturing of the intestine is long and tedious, and the state of the patient upon whom these operations are performed is usually such as to render a prolonged narcosis most undesirable and most dangerous. The procedure that postpones the suturing of the bowel to a future period is readily performed, and, indeed, is almost as simple as an ordinary enterotomy or colotomy.

In all resection proceedings there is a great risk of death from fæcal extravasation, and it is needless to

point out that this risk is infinitely reduced by a perfect evacuation of the bowel above the obstruction.

In many examples of resection, especially when undertaken for gangrene, the bowel is not in a condition to ensure sound and perfect healing. For the success of the primary suture operation this ready healing is essential, and it will be obvious that in excising the bowel, with this fact before him, the surgeon would be apt to remove too much.

Owing to the disturbance of the mesentery the margins of the divided intestine are apt to slough a little. In the latter of the two procedures now under notice this would prove a matter of no moment; in the former it would probably lead to fæcal extravasation and death.

It may be said, therefore, that in resecting the intestine a temporary artificial anus should always be established, and the suturing of the bowel left to a future period.

To this rule one exception may be made In cases of resection of small intestine high up in the jejunum, the divided ends should be at once brought together with sutures whenever the state of the intestine will permit. The mortality attending fæcal fistulæ in the upper part of the jejunum is well known.

The literature of resection operations.—Among the more important contributions the following may be noted: Reichel, loc. cit.; Bouilly and Assaky, Revue de Chir., 1881 and 1883; Petit. Bull. Gén. de Thérap., Méd. et Chir., Dec. 1882; Köberle, loc. cit.; John Marshall, *Lancet*, vol. i., 1882; Karl Jaffé, Volkmann's Sammlung, 1881, No. 201; Madelung, Verh. d. d. Ges. f. Chir., 1881; Czerny, Berl. Klin. Wochenschr, 1880, No. 45; Kocher, Centralb. f. Chir., 1880, No. 29; Gussenbauer, Prager Zeitschr. f. Heilk, i. bd., 1880; Bryant, Med.-Chir. Trans.,

1882; Rydygier, Berlin. Klin. Wochen., 1881, Nos. 41, 42, 43; Schede, Verh. der deutsch Ges. f. Chir., 1879.

CHAPTER XXVI.

THE SPECIAL TREATMENT OF INDIVIDUAL FORMS OF OBSTRUCTION.*

It only remains to mention in the briefest possible manner the particular treatment suited for each of the various forms of intestinal obstruction.

In discussing this subject the classification that is the most convenient is that based upon clinical evidences, and that has been adopted in the chapter upon *diagnosis.* This classification consisted essentially in dividing the various forms of obstruction into two great classes, the acute and the chronic, and then in making certain subdivisions in each of these two great classes.

1. ACUTE OBSTRUCTION.

Let it be supposed that a given case has been diagnosed to be one of acute obstruction. By a further step in the diagnosis let it be supposed that it has been classed under one of the four following headings:

A. Strangulation by bands, or through apertures.
B. Volvulus.
C. Acute intussusception.
D. Obstruction by foreign bodies, etc. (certain cases).

A. **Strangulation by bands, or through apertures, etc.**—Under this heading may be included the following pathological conditions: (1) Strangulation by peritoneal bands; (2) by omental

* This chapter must be regarded as little more than an index to the matter contained in the chapters on the forms of treatment.

cords; (3) by the diverticulum; (4) by an adherent appendix, or Fallopian tube, etc.; (5) strangulation through slits and apertures. As rarer conditions it would also include (6) strangulation over a band; (7) acute kinking of the small intestine; (8) some cases of volvulus of the small intestine; and (9) of occlusion by pressure of a tumour outside the gut.

In the treatment of the case the patient should in the first place, of course, be kept absolutely at rest. The lower bowel should be emptied by an enema. The patient should be allowed ice to suck, but no food should be given by the mouth. The strength should be supported, if thought fit, by nutrient enemata, although it must be remembered that such enemata may cause distress and may have to be discontinued. Opium should be given when the pain is very severe, and the vomiting marked, and especially in cases associated with collapse. It should be administered in the form of a hypodermic injection of morphia. Great care should be used in the giving of morphia in these cases. It must be remembered that while opium may give considerable relief, it is apt, on the other hand, to mask the symptoms, to alter the clinical aspect of the case, and to give the surgeon an erroneous notion of its gravity. At the best the drug can only be regarded as a palliative, and not as a curative measure. Indeed, it should be given in these cases with the same caution that it is administered in cases of strangulated hernia. Should the patient become fully narcotised the main symptoms may become so modified that the surgeon may imagine the malady to be undergoing cure, while the involved gut is becoming hourly more and more hopelessly disorganised. It should be borne in mind that the main use of the drug in these cases is to combat collapse.

With regard to the curative treatment in the present forms of obstruction, the only measure is

laparotomy. It has been shown that in the first five at least of the above-mentioned conditions spontaneous cure, while not absolutely impossible, is yet so exceedingly improbable that it cannot be considered when discussing the treatment of the case. In the remaining four conditions spontaneous relief of the obstruction is certainly not so improbable, but it must be remembered that these conditions cannot be diagnosed from the rest, unless in the last-mentioned form a distinct tumour exist, and that even if diagnosed they can be better treated by laparotomy than by any other known means. When once, therefore, the general nature of the case has been diagnosed, laparotomy should be performed without delay. It is worse than useless to temporise with aimless enemata, with electricity, with massage, with applications of ice, and the like. The condition of the gut is identical with the condition in strangulated hernia. In a case of strangulated hernia no surgeon, after the taxis had failed, would think of delaying kelotomy until he had tried galvanism, enemata of tobacco, metallic mercury, and other measures of like character. Kelotomy is in itself an operation of small magnitude. It is only serious when delayed, and its success depends not so much upon the technical details of the procedure as upon the condition of the gut at the time of operation. The present series of cases are even more urgent than are any cases of strangulated rupture, for no taxis can be applied, and relief can only be expected from operation. Laparotomy, therefore, should be performed at once. It must be remembered that the average duration of life in these cases is only six days. Laparotomy at present appears to be a very serious measure, but when one comes to examine the fatal cases the seriousness is soon explained. Other things being equal, the success of the measure depends little upon the precise species of obstruction, and still less upon

the *modus operandi*, the age of the patient, and the site of the operation. It depends upon the condition of the gut; and, with very few exceptions, in the cases of death the operation had been delayed until the condition of the parts was such as to render any interference hopeless.

It has been shown clearly enough that a simple incision into the abdomen is, with certain precautions, a comparatively trifling measure; but that incision appears as one of the very gravest and most dangerous when in cases of obstruction its application is delayed. If any treatment is to be adopted at all, let it be adopted at once. I would urge that laparotomy should be performed as soon as the diagnosis is fairly clear, and if possible within the first twenty-four hours after the appearance of the symptoms. The operation is usually regarded as a last resource. It should be the first resource, especially as it certainly is the only resource. Moreover, in cases of doubt, all recent experience in abdominal surgery would speak in favour of an exploratory incision. A simple cut into the peritoneal cavity, made with proper caution, cannot be so calamitous a circumstance as an unreduced strangulation, or even as a case of intestinal obstruction treated absolutely in the dark.

I could allude to several instances where an exploratory laparotomy has been performed, where the obstruction has been found to be in the colon, and where after closure of the median wound a lumbar colotomy has been performed with success.* In any case, therefore, of acute obstruction diagnosed (surely or even incorrectly) to be of the character with which we are now dealing, an early laparotomy is, I venture to think, without doubt the most appropriate, as it is indeed the only, treatment.

* *See Lancet*, vol. i., 1875, page 369, case by Mr. Teale; and St. Thomas's Hosp. Reports, 1882, page 75; case by Mr. Pitts.

The details of the operation have been already described. It only remains to say a few words as to the treatment of the obstruction when found. Slender "bands" may be torn through with the finger; while larger ones should be secured by a double ligature, and divided between the two threads. It is well subsequently to cut off these bands close to their attachments, as they may give further trouble if left free in the abdomen. Large omental cords may be clamped, then cut, and the individual vessels secured with the finest catgut. This treatment especially applies to the larger omental bands, which are often supplied with many blood-vessels. Indeed, such "bands" may consist of the whole or one-half of the omentum rolled up into a large cord.

In cases of strangulation by Meckel's diverticulum, the process when large, and especially when disposed to become gangrenous, had better be excised near its point of origin from the intestine, and the wound carefully closed by Lembert's suture, or any other suture that will bring the peritoneal surfaces in contact. It is unwise to leave a diverticulum still attached to the bowel, since it is very likely to become again a source of trouble. The narrower diverticula may be divided after having been secured by a ligature. In some cases the cut end has been clamped and fixed in the wound after the manner of treating the pedicle in a form of ovariotomy.

If the trouble be due to the appendix, the adhesions holding down that process may be divided, or the end of the appendix itself may be cut off, and the wound closed carefully with several points of suture.

In cases of strangulation through slits and apertures, it is well (whenever possible) to close the abnormal aperture with a few points of suture after the gut has been reduced.

After an obstructing band has been relieved, care

should be taken to ascertain that there is no other occluding cord. I might refer to two instances where there were two bands causing obstruction in one case. In each instance laparotomy was performed, one band was divided, and in each instance it was the wrong band, or the one causing the least serious obstruction. Both patients of course died.*

The amount of gut involved in the forms of acute occlusion now under notice is on an average fifteen inches. It is very commonly much less, and often a mere knuckle.

If the strangulated gut be gangrenous, the damaged part should be resected, and the divided ends of the bowel attached to the edges of the abdominal wound. The artificial anus so established may be closed by a subsequent operation, as already pointed out.

If a volvulus be found it may be reduced, but if irreducible by the usual means, the question of resection or of enterotomy must be considered.

Cases of obstruction due to the pressure of a tumour must be treated according to the indications in each especial case.

B. **Volvulus.**—The morbid condition concerned in this form of obstruction is for the most part that known as volvulus of the sigmoid flexure. To this variety of volvulus the following observations are in the main directed. Under the same clinical heading, however, are classed volvulus of other parts of the colon, and occlusion of the colon by acute bending.

In the matter of treatment the patient may be brought early under the influence of opium, and the rectum may be emptied by an enema. There is no evidence to show that a complete and well-defined volvulus of the sigmoid flexure can ever spontaneously

* *Lancet*, vol. i., 1876, page 773; and ibid., vol. i., 1873, page 773.

untwist itself. Indeed, the longer the case lasts the more tight does the twist become. If unrelieved, no other than a fatal issue is to be anticipated. Attempts at relief by enemata or by rectal tubes are useless, if not actually harmful.

The treatment of these cases is most unsatisfactory. As the symptoms produced by the volvulus are acute, the operative measure adopted for its relief has as a rule been laparotomy, the cases having been probably mistaken for acute strangulation of the lesser bowel. Laparotomy, however, is not likely to prove other than useless. The huge coil formed by the distended sigmoid flexure cannot be dealt with through the small incision permitted by an ordinary laparotomy. If the gut be punctured it may be reduced, but the volvulus would probably reappear as soon as the abdominal wound was closed.* At the same time some treatment must be promptly adopted, since the progress of the case is rapid and peritonitis is apt to develop very early. In the first place, the distended coil may be tapped through the parietes, and failing relief from that measure a left lumbar colotomy should be at once performed. In these cases the colon is usually much distended with fæces above the seat of the volvulus, and the lumbar colotomy would give very efficient relief if performed early enough. If postponed for too long a time the distorted sigmoid flexure may have become gangrenous, or peritonitis may have developed to a grave extent. Left inguinal colotomy would probably be impracticable. The incision would merely expose the distended and obstructed coil, and would not permit the surgeon to reach the gut above the occlusion.

In cases of occlusion of the colon by kinking,

* In one case of laparotomy that I performed for volvulus, I could not reduce the twist through the wound, nor could I reduce it at the autopsy, until after much disturbance of the parts.

permanent relief may be given by puncturing the colon and by keeping the bowel for the future clear by the judicious use of aperients and by dieting. Should puncture fail, colotomy would be the best method of treatment, provided that the seat of the obstruction had been diagnosed.

Volvulus of the right part of the colon (a rare condition) may be relieved very possibly by laparotomy, and failing that an enterotomy should be done at the laparotomy wound.

One surgeon, who is perhaps a little in advance of the times, has suggested that an irreducible volvulus should be removed by resection; but at present there would appear to be but slender bases for the support of this plan of treatment.

C. **Acute intussusception.**—The administration of opium is absolutely essential in these cases. By its means peristaltic movements are stilled, and any increase in the invagination is probably prevented. At the same time, it must be remembered that the drug may mask the symptoms and may thus arouse in the surgeon's mind a false impression as to the improvement effected in the case. As has been already pointed out, there are substantial reasons for believing that under the influence of opium, administered early, an invagination may undergo cure by spontaneous reduction. I think, therefore, that in all cases, both in the young as well as in adults, the administration of this drug should be adopted as early in the case as possible. Presuming, as is very probable, that no marked improvement follows upon its use, the next measure in the treatment consists in an attempt to reduce the invagination by means of enemata or by insufflation. These modes of treatment have been already fully described. They have met with very encouraging success in a large and varied series of cases, and are worthy of a patient trial.

It will be obvious that enemata or insufflation will be quite useless when once adhesions have formed, or when the invagination has become for other reasons irreducible. Moreover, should the intussusceptum have become gangrenous a forcible enema may cause rapid death by separating the sloughing gut and permitting the intestinal contents to escape into the peritoneal cavity.

Should these measures fail or be considered inadmissible, there are substantial reasons for recommending an immediate laparotomy, especially in the young. Against this operation many objections have been urged. In the first place, it is pointed out that an acute attack may become a chronic one, and the patient may live if left alone for many months. This may be; but examples of the occurrence are comparatively few, since the great majority of the patients die long before they can enter upon the chronic disease. Moreover, chronic intussusception is itself fatal in time, as has already been fully shown. Indeed, out of fifty-nine recorded examples of chronic invagination there are no less than fifty-one deaths.

As a further objection, it is said that spontaneous cure may take place by elimination of the gangrenous intussusceptum. But how does this matter really stand? Elimination of the gut by gangrene occurs in about 42 per cent. of all cases, but when it has occurred it by no means follows that the patient recovers. In fact, no less than 40 per cent. of the subjects of spontaneous elimination die of the immediate results of the process of separation. Moreover, during the first year of life spontaneous elimination occurs in only 2 per cent. of the cases, and between the ages of two and five in only 6 per cent.; and when it is remembered that more than 50 per cent. of the total number of examples of intussusception occur in children under ten, it will be seen that elimination

by gangrene offers no very extensive prospects of spontaneous relief. It is true that the older the patient the more chance has he of a recovery by this means; but it unfortunately happens that the older the patient the higher is the mortality after the occurrence of the elimination, so that the chance of cure becomes remarkably slight.

In favour of laparotomy in intussusception it must be remembered that the general mortality of the disease is 70 per cent., and that 80 per cent. of the patients die before the seventh day. In quite young children the mortality is terribly high; death occurs at an early period, the cases usually following an acute course. In the young, therefore, laparotomy, if done at all, should be performed within the first forty-eight hours, and, if possible, within the first twenty-four hours; and Dr. Sands' well-known case of laparotomy for invagination fully supports this advice.* In adults the question of operation may be left a more open one, since the chance of spontaneous cure is certainly increased; but that chance is too slender to depend upon, and is more slender than that incurred by a laparotomy performed in good time and under properly selected circumstances.

In performing laparotomy in these cases the invagination should be reduced if possible, and, failing this, the mass should be resected by either of the two methods that have been above described, but preferably by that that establishes a temporary artificial anus.

D. **Obstruction by foreign bodies, gall stones, etc.**—In cases of subacute or acute obstruction due to foreign substances in the intestine the condition may in some instances be met by free doses of opium followed in a while by a gentle aperient. In more grave cases laparotomy should be performed and the foreign body extracted. The wound made in

* *New York Med. Journ.*, June, 1877.

the intestine may be closed and the gut returned, or an artificial anus may be, for a while, established. The selection of one or other of these methods will depend obviously upon the state of the bowel at the seat of the obstruction. Its condition will probably be such as to forbid union of the wound and a return of the gut into the abdomen.

2. Chronic Obstruction.

A. **Stenosis of the small intestine.**—Under this heading are included a great many pathological conditions which are all marked by a partial mechanical occlusion of the lumen of the bowel associated with the symptoms of chronic obstruction.

The conditions are the following: 1. Stricture. 2. Bending of adherent intestine. 3. Adhesion of a coil in the form of a loop. 4. Matting of adjacent coils by many adhesions. 5. Direct compression of the gut by contracting adhesions. 6. Occlusion from shrinking of the mesentery. 7. Stenosis from traction. 8. Some forms of volvulus. 9. Obstruction by neoplasms. 10. Some cases of obstruction by gall stones and foreign substances. 11. Pressure of a tumour outside the gut.

In all these forms of obstruction the dieting of the patient is a matter of the very greatest importance. The food taken should be moderate in amount, should be composed of only the most digestible substances, and should be taken in small quantities at a time. By observing a careful dietary, and by keeping the bowels clear by enemata and gentle laxatives, the patient's condition may be rendered endurable for a considerable period of time. When these means cease to be of use, and when the malady becomes more grave in consequence of repeated attacks of obstruction and the mal-nutrition that follows upon them, some operative measure must be adopted. In

cases of stricture temporary relief may be afforded by enterotomy, but more lasting and efficient relief can only be obtained by resection of the diseased segment of the intestine. In cases where the stricture is epitheliomatous, where the disease is still not extensive, and where the glands are not seriously involved, the operation of excision is very strongly to be advised. Enterotomy or resection, and especially the latter, is the proper measure to adopt in cases of stenosis as a result of traction, and in cases of obstruction by neoplasms within the gut. Occlusions due to adhesions may be relieved by laparotomy and division of the adventitious bands, and in cases where the adhesions are too extensive to be so treated enterotomy may be performed to save life. In any such case the involved coils may be removed by resection, provided that too extensive a removal of intestine be not required, and that the operation is upon other grounds possible and desirable. In cases of obstruction by foreign substances time should be allowed. In the great majority of instances the mass will be evacuated in time. Slight aperients may be of some use, and massage and electricity have also been credited with effecting a cure. Failing these or other methods, the obstructing body may be cut down upon and removed.

B. **Stenosis of the large intestine.** — The conditions in the colon that as regards treatment may be included under this title are: 1. Stricture; 2. Bending of the adherent colon; 3. Compression by adhesions; 4. Volvulus of the cæcum; 5. Obstruction by neoplasms; 6. Compression by a tumour outside the gut; 7. Some enteroliths.

In all these forms of obstruction the patient's condition can be rendered more comfortable by careful attention to diet and by ensuring as complete an evacuation of the bowels as possible by means of laxatives, and especially by means of enemata. In

the cases of obstruction due to pressure of a tumour outside the gut some special treatment directed against the tumour itself will probably be indicated. When the obstruction is due to an enterolith (a comparatively rare condition) relief may be afforded by repeated copious enemata, combined by cautiously administered aperients. Some surgeons would be disposed to rely, to some extent, upon electricity and massage in these cases.

In the other forms of obstruction, as well as in those just mentioned, when a distinct diagnosis is not made, the usual means of affording relief is by colotomy.

In cases of stricture the site of the colotomy must obviously depend upon the site of the obstruction, and this latter matter is by no means easy to determine. Statistics dealing with the position of strictures of the colon show very clearly that in any case of doubt it is better to open the colon in the right loin, or do inguinal colotomy in the right iliac region. If, after attempting right lumbar colotomy, the ascending colon be found empty, it has been advised that an enterotomy should be done through the lumbar wound. I have already alluded to instances where the diagnosis has been made by means of a median laparotomy, and where an opening into the colon in the loin has been subsequently effected with success. In several cases colotomy has failed, owing to the presence of a double obstruction, one being above the artificial anus. Thus in one case the rectum was found to be partially occluded, left lumbar colotomy was performed, but proved to be useless, since an obstruction existed also in the small intestine.* It must be observed also that colic strictures are often multiple. Thus, in one case there existed a stricture of the rectum, which had been diagnosed; there also

* Path. Soc. Trans., vol. iii., page 108.

existed two strictures of the transverse colon which had not been suspected. Had left lumbar colotomy been performed in this case it would have proved abortive.*

The relative merits of inguinal and lumbar colotomy have been already discussed.

In cases of stricture where a more radical mode of treatment is considered necessary, colectomy may be performed. This procedure seems to be rather prominently indicated in cases of epitheliomatous stricture, where by an early performance of the operation the malignant growth may possibly be entirely eradicated. The details of the measure have been considered.

In cases of obstruction by neoplasms also colectomy may be performed should the general conditions of the case permit that procedure.

C. **Fæcal accumulation.**—In the treatment of these cases is involved the varied and extensive methods adopted for the relief of constipation. Into the consideration of these it is unnecessary to enter in this place.

The only question that need be entertained is the treatment of the case when actual and serious obstruction has occurred. In such condition aperients are calculated to do harm rather than good. The main reliance should be placed in copious and repeated enemata. Many continental surgeons strongly advise carbonic acid enemata in these cases. Much good has also been effected by massage, by electricity, and even by the somewhat questionable mode of treatment by metallic mercury in large doses. All these measures and their application have been already considered. In not a few cases that have resisted all other treatment colotomy has been performed. I think, however, that in the majority of these examples

* Bull. de la Soc. Anat., 1877, page 519.

a correct diagnosis was not made. The cases wherein this operation is actually demanded are very few, and the measure should not be entertained until every other mode of treatment has had a patient and repeated trial. Lumbar colotomy for fæcal accumulation must be regarded rather as a surgical misfortune than as a recognised means of treatment.

D. **Chronic intussusception.**—The great fatality that attends this form of obstruction demands that it should be very carefully treated. Much relief can in all cases be afforded by a careful attention to diet, and in the most chronic examples benefit of a temporary character has attended the use of laxatives. In the less chronic cases, and in those associated with occasional and slight acute attacks, the use of opium is now and then indicated.

Attempts may be made to reduce the invagination by means of enemata and insufflation, since it has been shown that even in intussusceptions that have existed for more than a month, reduction, and fairly easy reduction, is not impossible. This measure, however, can only be successful in extremely rare cases. The only means of relief, in the event of failure of non-operative measures, is by laparotomy, followed by resection of the diseased mass in cases where reduction is found to be impossible. This question has already been discussed in the preceding chapter.

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