Intestinal obstruction : its varieties with their pathology, diagnosis, and treatment.

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INTESTINAL OBSTRUCTION

ITS VARIETIES

WITH THEIR

PATHOLOGY, DIAGNOSIS, AND TREATMENT

BY

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WITH 118 ILLUSTRATIONS

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PREFACE.

THE first edition of this work was published in 1884. It was in substance the essay to which the Jacksonian Prize had been awarded by the Royal College of Surgeons of England.

During the fifteen years which have elapsed since the book came into existence, extensive additions to our knowledge of the pathology and clinical manifestations of intestinal obstruction have been made, and a great and far-reaching change has affected the modes of treatment of that disorder. To embody these additions and to do justice to this change, it has been necessary to re-write the book almost entirely, and to introduce many emendations into such parts of the original essay as have survived the vicissitudes of fifteen years, and have been retained.

The entire arrangement of the work has been altered.

It has been found more convenient to divide the subject into three distinct parts, and to consider first the pathology of intestinal obstruction, then its clinical manifestations, and finally its treatment.

In the account of the treatment of the trouble I have refrained from introducing the actual details of the various operations named, since such matters are very fully discussed in the text-books on Operative Surgery.

A large number of new illustrations has been added, for which I am indebted to Mr. Berjeau.

FREDERICK TREVES.

6, WIMPOLE STREET, W.
June, 1899.

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INTESTINAL OBSTRUCTION.

INTRODUCTION.

UNDER the title of "intestinal obstruction" are included a great variety of conditions, which, although unlike in character, have yet the common property of bringing about, mechanically, an obstruction to the passage of matter along the intestine. The obstructing agent may, on the one hand, be a peritoneal adhesion, by means of which a loop of bowel is snared and actually strangulated; on the other hand, it may be represented by a ring-like growth of epithelioma in the wall of the gut which very gradually narrows and perhaps closes its lumen. The bowel may be obstructed at one time by the torsion of a loop of gut around an axis at right angles to the line of its own course, as seen in volvulus of the sigmoid flexure; or at another by the invagination of a certain portion of the bowel into the segment below it as illustrated by intussusception. The intestinal canal may be blocked by a gall-stone within its walls or be occluded by the pressure of a tumour entirely without its confines.

The symptoms produced by the various mechanical causes may be exceedingly acute on the one hand or exceedingly chronic on the other.

The case may run its entire course from its commencement to the patient's death in the short space of forty-eight hours, or the phenomena of obstruction may persist for years, and may not at the end be the direct cause of death.

When the clinical phenomena come to reviewed, it is at once evident that too much prominence must not be given to the mere circumstance that the bowel is obstructed. Obstruction of the bowel is the prominent symptom, but it is not the sole basis upon which the great issues of the malady depend. Indeed, in certain acute cases it is neither the most prominent nor the most serious of the manifestations.

In acute intussusception the disease may run its course and end in death without there having been produced a definite obstruction in the lumen of the bowel.

The duration of the obstruction to the passage of the fæces is also not an inevitable criterion of the gravity of the case. A loop of gut may be strangulated within the abdomen and death may follow within a week, no material passing through the alimentary canal in the meanwhile. On the other hand, the colon may be actually plugged with a hardened mass of fæcal matter, and while no trace of a motion may be passed for four or more weeks, the patient may yet make a good recovery. In the acute cases, as will be immediately shown, the actual fact that the bowel is obstructed is comparatively unimportant. The obstruction, *quâ* obstruction, does not produce the more urgent symptoms, nor does it act as the direct, nor, indeed, as the prominent cause of death. As an abstract proposition, it may be stated that obstruction of the lumen of the bowel for a period of a week, or even more, is not in itself—all other circumstances being disregarded—a condition which need cause death or even distressing inconvenience.

If the clinical phases of quite acute and quite chronic forms of intestinal obstruction be studied comparatively, the following general features become evident:—

In the very acute cases, as illustrated by strangulation by a band, the grave initial symptoms obviously do in no way depend upon the undoubted fact that the bowel is obstructed.

Time must elapse before the mere obstruction can produce phenomena of discomfort.

When a loop of gut is snared by a band, the initial symptoms are due solely to a sudden and severe injury to the peritoneum and to the numerous important nerves of the implicated part.

These symptoms, which are mainly those of intense abdominal pain, with collapse and usually with vomiting, are by no means peculiar to intestinal obstruction, but are common rather to nearly all acute lesions within the abdomen. They have been described collectively under the title of "peritonism." Such symptoms may attend the passing of a gall-stone and the twisting of the pedicle of an ovarian tumour, and, in fact, both these conditions have during the initial stages been mistaken for acute intestinal obstruction. The symptoms which depend upon the injury to the bowel, in distinction to the mere obstruction of its lumen, remain prominent for some little time, and, other things being equal, depend in their degree of severity upon the amount of

intestine involved, the tightness of the strangulation, and the nearness of the loop to the stomach.

Certain phenomena which follow are due undoubtedly to the actual obstruction, and prominent among them must be placed the constipation, the incessant vomiting and the distension of the belly. This latter symptom, however, is not solely dependent upon mere accumulation of matter in the gut above the narrowed part, as will be explained subsequently (page 13). The final symptoms of acute intestinal obstruction—the symptoms which precede death—are again not so much those due directly to occlusion of the lumen of the bowel as those depending upon septic infection of the whole body from the disordered intestine.

The subjects of acute intestinal obstruction die for the most part with the phenomena of septic poisoning, and if a certain stage has been passed the mere relieving of the obstruction does not save life.

In chronic intestinal obstruction, as illustrated by the closure of the colon by a ring of malignant growth, the phenomena are much more distinctly the direct outcome of actual obstruction. The bowel becomes filled up, but so long as the obstruction is not complete and a little matter can escape from time to time, the distress occasioned may be quite slight. Two results follow. The irritation, septic and mechanical, of the long-retained fæces leads to catarrh, and the expression of that takes the form of a spurious diarrhœa. At the same time the bowel becomes hypertrophied in its persistent attempts to empty itself of its contents, and enlarged coils are usually seen and felt in movement through the walls of the abdomen. A certain degree of septic intoxication is not uncommon even in the early stages of the disease, and the ending is often by acute obstruction, or by the septic poisoning which follows upon peritonitis.

The infection in those forms of peritonitis which depend upon intestinal obstruction comes from the bowel, and a conspicuous element in the surgical treatment of obstruction is not only to relieve the actual mechanical cause of the trouble (as by dividing a band), but to relieve also the engorged bowel by emptying it of its putrid contents.

CLASSIFICATION

The circumstances which bring about an obstruction of the bowel are—as has just been stated—numerous and varied

and no one scheme of classification will meet all the conditions upon which a consideration of the subject may be based.

Two principal methods of classification at once suggest themselves; first, that based upon the *mechanical conditions* which cause the obstruction; and, second, that founded upon the *clinical manifestations* which that obstruction may produce. The first plan of classification will be followed in dealing with the *morbid anatomy and pathology* of intestinal obstruction; and the second in discussing the *symptoms* with which the trouble is attended.

1. The Classification of Intestinal Obstruction according to the Mechanical Conditions producing it.

1. Strangulation.	The Bowel is snared.	*Examples*: Strangulation by bands or through apertures. Herniæ.
2. Torsion.	The Bowel is twisted.	*Examples*: Volvulus. Obstruction by kinking.
3. Invagination.	The Bowel is invaginated.	*Example*: Intussusception.
4. Obturation.	The Bowel is blocked.	*Examples*: Obstruction due to foreign bodies, gall-stones, etc. Fæcal accumulation.
5. Stenosis.	The Bowel is narrowed.	*Examples*: (*a*) Strictures. (*b*) Compression from without.

In the first four of the above classified varieties it is to be noted that there is no primary or essential change in the intestine itself, so far at least as its actual wall is concerned.

In the first variety a normal loop of bowel is snared and strangulated, as seen in the common circumstance of a strangulated hernia. The strangulating agent may be a peritoneal band or adhesion, or an adherent Meckel's diverticulum, or the margins of the foramen of Winslow, or of a slit in the mesentery.

In the second variety a loop of bowel, together with its mesentery or mesocolon, is twisted upon itself, the condition being most commonly illustrated by volvulus of the sigmoid flexure. This subdivision will also include the occlusion of the bowel by kinking or the bending of the

gut acutely upon itself, just as a thin tube of indiarubber may be kinked.

In the third form a certain part of the intestine is invaginated into the part immediately continuous with it. It is true that in this variety changes rapidly occur in the wall of the invaginated portion of the bowel, and that these changes play a very important part in the production of obstructive symptoms. Such changes are, however, secondary and, in a limited sense, accidental.

In the fourth variety the lumen of the bowel is simply blocked, the obstructing agent having no structural connection with the intestinal wall. The fifth variety of intestinal obstruction—that known as stenosis—calls for more detailed consideration. In this mechanical form the lumen of the bowel is narrowed, but such narrowing may be due to two perfectly distinct causes. In the first of these two kinds the stenosis is due to changes in the bowel wall itself. In that wall there is a growth or a cicatrix whereby the lumen is narrowed and obstruction symptoms are produced. This sub-variety is illustrated by the many forms of stricture which may be due to a malignant growth of the gut on the one hand or to the contracting cicatrix of a non-malignant ulcer of the bowel on the other. In the second of the two forms of stenosis the lumen of the bowel is narrowed by changes which are outside and beyond the actual intestinal wall. This kind is illustrated by cases in which the bowel is compressed by a tumour—such as a cancerous uterus—outside the canal or by contracting peritoneal adhesions, or by a diffuse growth which has arisen beyond the bowel but has grown around it and compressed it.

As a further amplification of the table above given, a classification may be based upon the *degree of the obstruction*, for it is evident that cases of intestinal blocking may be divided into those in which the lumen of the tube is completely occluded and those in which the closure is incomplete, and the passage is only imperfectly obstructed.

Such a classification arranges itself as follows:—

1. *Occlusion.* Closure of lumen of gut complete. Passage of contents impossible. Illustrated by (1) strangulation and (2) torsion.
2. *Obstruction.* Closure of lumen of gut incomplete. Passage of contents difficult. Illustrated by (3) invagination, (4) obturation, and (5) stenosis.

It is unnecessary to state that considerable differences both as regards symptoms and prognosis, exist between the

cases in which the lumen of the bowel is absolutely occluded and those in which the passage is merely obstructed, such obstruction being incomplete.

Finally it will be found convenient when dealing with the *morbid anatomy of intestinal obstruction* to arrange the anatomical varieties of the affection in the following order:—

1. Strangulation by bands and through apertures, including "internal herniæ."
2. Volvulus.
3. Intussusception.
4. Obstruction due to foreign bodies, gall-stones, and enteroliths.
5. Stricture.
6. Obstruction due to tumours growing from the bowel wall.
7. Obstruction due to the pressure of tumours, etc., external to the bowel.
8. Fæcal accumulation.

This method of classification will be observed in the sections which follow on the pathology and morbid anatomy of intestinal obstruction.

2. The Classification of Intestinal Obstruction according to the Clinical Manifestations produced.

1. Acute obstruction.
2. Chronic obstruction.
3. Cases in which symptoms of acute obstruction supervene on those indicative of chronic obstruction.

The acute cases are of so severe a type that the majority die, if unrelieved, in some six or seven days. Examples of this form of obstruction are provided by cases of strangulation by bands, by volvulus, by acute intussusception, and by abrupt blocking of the bowel by gall-stones or foreign bodies.

Chronic obstruction, on the other hand, may pursue a course extending over months or even years. It is illustrated by the various form of stenosis of the bowel, by chronic intussusception, and by fæcal accumulation.

The cases which come under the third category are those in which the symptoms of chronic obstruction are suddenly interrupted by the phenomena of acute occlusion of the bowel. This variety is illustrated, in case of stricture of the intestine in which the narrowed part of the gut becomes suddenly occluded, by bending or kinking of the bowel, or by the blocking of its lumen by

a foreign body which has been swallowed, or by a mass of undigested food.

RELATIVE FREQUENCY OF THE VARIOUS FORMS.

Precise information upon this point is not very easy to obtain. Statistics based upon *post-mortem* records must obviously be incomplete, as only a proportion of the examples of intestinal obstruction are fatal.

Hospital records deal for the most part with the severer forms of the trouble, although it must be acknowledged that such examples of intestinal obstruction as are not serious or severe are few in number. Tables based upon the published records of individual cases are the least suited of all for the present purpose. Such records are largely concerned with instances of successful treatment on the one hand, and with pathological surprises and anatomical curiosities on the other.

An examination of the records of the London Hospital shows that the cases ascribed to fæcal accumulation are the most numerous; then come cases of stricture of the large intestine, then intussusception, and next in order of frequency strangulation by bands. Obstruction due to tumours external to the bowel ranks next; then follows the blocking of the gut by gall-stones or foreign bodies; while the remaining forms of intestinal obstruction may be spoken of as rare.

THE PORTION OF BOWEL INVOLVED.

Strangulation by bands most commonly involves the small intestine. The small intestine also is most often concerned in *internal herniæ*. *Volvulus* is most frequent in the sigmoid flexure, and is, indeed, rare elsewhere. *Intussusception* has its most usual seat in the ileo-cæcal segment of the bowel. *Strictures* of all kinds are more common in the colon than in the lesser intestine. They are more common in the lower segments of the colon than in the upper. *Obstruction due to pressure* from without may be met with in any part of the canal, but more usually concerns the large intestine as being the less movable, and especially the rectum and sigmoid flexure from their position with reference to the pelvis. *Foreign bodies* often lodge in the lower ileum and in the cæcum, and gall-stones are apt to become impacted in the jejunum or upper ileum. *Fæcal accumulation* of necessity is met with only in the colon, and often in the cæcum and sigmoid flexure, or in the hepatic or splenic flexures.

THE QUESTION OF SEX AND AGE.

Strangulation by bands and through apertures is a little more common in males than in females, is met with mostly in young adults, and is rare after forty. It is still rarer before ten. *Internal herniæ* have been shown to be more common in males, and the greater number of the recorded cases have fallen between the ages of twenty-five and forty-five. *Volvulus of the sigmoid flexure* is about four times more common in men than in women. It is most usual between forty and sixty, and is, indeed, rare before forty. *Acute intussusception* is a little more often met with in the male sex. It mostly attacks the young. Fifty per cent. of the cases are under the age of ten years. *Strictures* are equally common in the two sexes. The non-malignant occur about early middle life. The cancerous stricture is rare before forty. Certain strictures of the intestine are congenital. *Obstruction due to tumours external to the bowel* is obviously more common in women, and in adults of that sex. *Obstruction due to impacted gall-stones* is more usual in females than in males, and the average age falls between fifty and sixty-five. *Fæcal accumulation* occurs with greater frequency in women than in men. It is most common in adults and the aged, and is, as may be imagined, not infrequent in the insane and hysterical.

PART I.

PATHOLOGY AND MORBID ANATOMY.

CHAPTER I.

GENERAL PATHOLOGY OF INTESTINAL OBSTRUCTION.

In this section of the work the subject will be dealt with in the following order:

The General Pathology of Occlusion of the Bowel.
The General Pathology of Obstruction of the Bowel.
The Morbid Anatomy of Particular Forms of Intestinal Obstruction.

The General Pathology of Occlusion of the Bowel.—In the variety of intestinal obstruction now to be considered the closure of the lumen of the gut is complete, the passage of intestinal contents is impossible, and, in fact, the obstruction is absolute. This variety is illustrated by the many forms of strangulation of the bowel and by volvulus. The bowel concerned is, at the time of the accident which occludes it, normal; the occlusion is sudden, and is practically complete from the first; the segment of intestine involved is usually the small intestine, and when the colon is implicated the lesion most commonly takes the form of volvulus. As a typical example of the condition may be selected the strangulation of a loop of ileum beneath an adherent peritoneal adhesion. The small intestine, by its mobility, by the smoothness of its surface and by its relatively small girth, is much more apt to be snared by a band than is a loop of the colon. The wall of the lesser bowel is comparatively thin and frail, and the effects of strangulation are very soon made manifest in its delicate tissues. The nerve supply of the lesser bowel is elaborate, and in close association with the great nerve centres of the abdomen. The colon, on the other hand, has stouter walls, its sacculi and the appendices epiploicæ may offer some obstacle to the smooth gliding of a loop beneath a band, and, if lightly snared, the disposition of its muscular layers would

facilitate its escape. The colon is cast in a coarser mould than is the lesser bowel. Its physiological purpose is less important. It is, indeed, little more than a receptacle for *débris* discharged from the intestine above it; and, as one might expect, its nervous organisation is not so elaborate, nor is its connection with the great nerve centres of the abdomen so intimate and direct as it is in the case of the jejunum and ileum.

It thus happens that the phenomena of strangulation are much more pronounced, both as regards the pathological and clinical aspects, when the small intestine is concerned than they are when the segment snared belongs to the colon. Other things being equal, the strangulation of six inches of ileum is a much more severe lesion than is a corresponding strangulation of six inches of the sigmoid flexure. It is not only much more severe, in the sense of being more clearly marked in all the phenomena produced, but it is in a corresponding degree more serious.

If a strangulation of the colon is to produce manifestations equal in degree with those which attend strangulation of the lesser bowel then a greater extent of intestine should be involved. When a considerable segment of the colon is implicated, as in volvulus of the sigmoid flexure, the phenomena are very acute, and are quite on a par with the effects attending a strangulation of the lesser intestine. In such instances what the colon has lacked in fineness and sensitiveness of structure it has made up in the extent of tissue involved.

The changes brought about in the bowel by absolute occlusion of the kind now under consideration are identical with those which attend a strangulated hernia.

The difference between the intestine above the obstruction and that below is very sharply marked.

Lavater, in graphically describing the effects of strangulation, observed that the bowel above the obstruction grows red, the bowel below it grows white, and the coil involved grows livid and purple.

The **intestine above the seat of strangulation** is distended and filled with gas and fluid. The degree of distension varies, but the bowel may be often found to be twice or even three times its normal size. The distended gut is a dull red. This tint is due to a certain degree of congestion, and upon the serous surface the dilated blood-vessels form a dense tracery. The dilated gut may be actually much thickened by œdema, but it never shows any traces of hypertrophy. Indeed, if there be no œdema the bowel

wall will be found to be actually thinned, and this condition can be often seen in coils which are at some distance from the obstruction, but which have nevertheless taken part in the general distension. These thinned coils will be pale.

The mucous membrane of the gut near to the occlusion is found to be swollen with œdema, and of a deep red colour. Superficial erosions are not infrequent in the gut just above the obstruction, but the ulcers which are so common, and indeed so usual, in the intestine above a stenosis are in this instance absent.

Now and then gangrenous patches are found in the wall of the intestine which is immediately above the involved loop. This condition is, however, only found in cases of strangulation which have been of unusually long duration. In no circumstances is it common; in internal strangulation it is quite rare, and the examples met with are usually provided by cases of strangulated hernia.

The **intestine below the strangulation** is pale, contracted, and empty and accords with the condition of the "starvation intestine."

As a rule, the contrast between the bowel above the obstruction and that below is very marked, but now and then I have seen quite a definite degree of congestion in the bowel immediately below the implicated coil.

It may be mentioned in this connection that in certain cases of strangulated hernia the bowel below the stricture has been the seat of acute enteritis.

The **strangulated loop** will exhibit those changes which have been so carefully observed and so elaborately described in connection with strangulated hernia. The strangled loop becomes congested and œdematous. As the engorgement increases the colour changes from a dark blue to a reddish blue, and thence to a chocolate or a port-wine colour, and finally, in extreme cases, to black. These colour changes, and, indeed, all the phenomena of strangulation, are more marked in instances in which a small loop is well snared than in cases attended with the strangulation of a large coil. In the earlier phases of strangulation the individual vessels can be seen upon the bowel wall, but as time passes the outline of the separate vessels is lost.

The snared bowel preserves for a while its normal smooth and lustrous surface, but this is soon replaced by a surface which is dull, cloudy, and sticky. Finally, upon the serous membrane will be apparent the effects of local peritonitis. Now and then quite an extensive layer of coagulated fibrine, irregularly disposed, may be found upon

the strangled coil. The snared bowel is tense, owing to the infiltration of its coats, and the distension of its cavity with gas. To the touch it feels thick and fleshy.

Within the loop will be found, as a rule, only a little thin, dirty-looking fluid, which in an instance or two may be stained with blood. Clots of blood have been found within the loop.

Finally—if the patient live long enough—the bowel becomes gangrenous. It loses its elasticity, and feels soft and doughy. The gangrenous parts may be black in colour, but are more often ashen grey.

The extent of the gangrene shows considerable variation, from a mere patch to the destruction of a considerable loop of gut. At a gangrenous point the gut may become perforated.

Special stress comes upon the bowel at the line of the actual constriction, and changes follow which are identical with those met with in strangulated hernia. Linear gangrene is very apt to occur at this line. Under the influence of pressure the mucous membrane perishes first, then the muscular coat, and last of all the serous tunic. The effect of the strangulation is, as a rule, more marked in that end of the loop which is continuous with the bowel above the line of constriction.

It is by no means always easy to tell whether the strangulated gut is still living or is dead; it is still more difficult to foretell that, although damaged, it will recover. If the covering of the bowel retain its lustre, if the vessels in its walls can be seen to empty and refill on stroking, and if the gut bleeds when pricked, it is evidently still living. On the other hand, the lustre of the serous coat may soon be destroyed by inflammation, the individual vessels may be lost to view, and an extravasation of blood may have taken place at the point under examination. Mere depth of colour is not an infallible sign of the state of the gut. A loop almost black in colour may undergo complete recovery, while a like loop that is merely a bluish purple may give way after it has been liberated.

The interpretation of the varied changes found in the intestine after occlusion of its lumen has been the subject of much discussion. It cannot yet be said that the pathology of the condition is to be explained in a manner which is entirely satisfactory.

The causes of the changes found in the wall of the strangulated loop are not difficult to explain. It has been long ago pointed out that distension of a loop of intestine is

attended with such a loss of its contractile ability as soon to reach the point of paralysis. It is not difficult to understand that the distended bowel might become congested owing to gross disturbance of its circulation, but, following upon this, come definite difficulties in the way of explaining the distension which is so much in evidence.

Thus it happens that most of the interest attaching to this subject has centred around the **pathology of meteorism**.

It was assumed in a general way that meteorism was due to the circumstance that gas accumulated in the bowel and that this accumulation depended upon the simple fact that the bowel was blocked up. The conclusion which must follow from this assumption is that the degree of meteorism in intestinal obstruction must depend in the main upon the seat of the blocking and that the nearer this be to the anus the greater must be the distension of the belly.

Clinical facts, however, do not quite support this conclusion, and but very little examination into the matter from a clinical standpoint makes it evident that the explanation is not entirely satisfactory.

A good deal of light has been thrown upon this subject by certain experiments upon animals.

The most valuable series of experiments was performed by Kader,* and as his work deals with many phases of the present subject it is well that it should be considered in some detail.

Kader's experiments are divided into four groups.

Group I. A loop of intestine was strangulated together with its mesentery. The bowel was therefore completely occluded in two places and the circulation of blood in its walls was arrested. The lesion was intended to imitate acute strangulation by a band.

Group II. A loop of intestine was occluded at two points some little distance from one another. This was so done as not to disturb the circulation of blood in the isolated loop. These experiments imitated the conditions attending stricture of the bowel and occlusion by foreign bodies, etc.

Group III. The bowel was left untouched, but the mesentery of a certain loop was so ligatured that the circulation in that loop was arrested, the lumen of the bowel being perfectly free. Here were reproduced the conditions attending thrombosis of the mesenteric vessels.

Group IV. The mesentery of a certain loop of intestine was ligatured as in Group III. The bowel immediately above the loop thus deprived of blood was occluded so that no fæcal

* *Deutsch. Zeitsch. für Chir.*, 1891, p. 57.

matter passing from above could enter the section of intestine attached to the damaged mesentery. (*See* Fig. 1.)

The changes observed in the intestine as the results of the lesions just enumerated are as follows :—

Group I. When the strangulating cord is not too tightly drawn the loop of bowel presents at first the condition of venous hyperæmia and then of venous stasis. The bowel wall becomes œdematous and often presents extravasations of blood. A serous exudation takes place into the lumen of the gut.

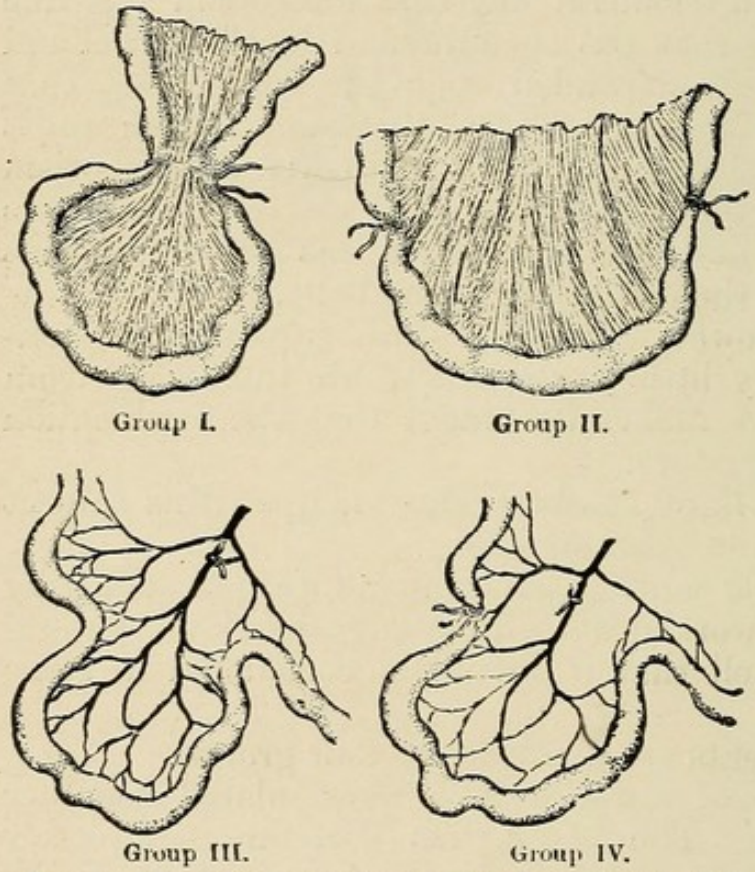


FIG. 1.—Kader's experiments to demonstrate the production of Meteorism.

If the strangulating cord be drawn as tightly as possible the loop becomes pale and then cyanotic.

As the blood supply is abruptly and entirely cut off there is little or no œdema, no extravasation and no exudation into the lumen of the bowel.

In any case the coil of strangulated bowel soon becomes paralysed. Gas develops in this coil and distends it. If the loop be apparently empty still gas develops, but if the gut contain fæcal matter then the formation of gas is more copious. The vessels of the strangulated mesentery become thrombosed. The bowel becomes gangrenous in whole or in part. Perforation may take the form of a large and very evident hole, or there may be numerous minute capillary perforations which may easily be overlooked but which allow the escape of gas. The bowel above and below the strangulated coil at first contracts for a few moments as if from cramp. The bowel above then becomes distended. This distension takes place much slower than in the strangulated loop. The bowel becomes less and less contractile, although not actually paralysed, and its mucous membrane becomes congested and its lumen occupied by stagnant fæces. The intestine below the

damaged part remains empty and to some extent contracted. Experiments by others have shown that the wall of the damaged bowel very soon permits bacteria to escape and reach the peritoneum and that such escape takes place long before there is any suspicion of perforation. As a result early peritonitis is induced, and this deepens the paralysis of the bowel and so favours an increase of the meteorism.

Group II. If the isolated loop contains no intestinal matter very little gas is developed in it. If it does contain such matter some gas is formed, but it is small in amount and does not lead to distension of the loop. The contractility of the walls of the loop is only very slightly diminished, and no gross changes—such as just described—take place in the tissues of the bowel. The intestine above the isolated loop becomes more distended than is the loop itself and its contractility becomes a little diminished. The bowel below remains unchanged or becomes somewhat contracted.

Group III. Marked changes take place in the segment of intestine which is deprived of blood. Its contractility diminishes to the point of paralysis. Its walls become thickened and œdematous, and exudation takes place into the lumen of the tube Much gas develops in the affected segment, and in time the bowel exhibits the phenomena of gangrene.

Group IV. Like changes occur to those just described. The damaged bowel becomes the seat of local meteorism in spite of the fact that nothing can enter it from above, and it can empty itself freely below. The intestine above the occlusion in the tube becomes more or less distended.

From these experiments it will be evident that the gas which causes the meteorism is the product of the decomposition of the intestinal contents, and that its amount is to some extent determined by the quantity of matter in the bowel at the time. Inasmuch as absorption from the bowel is arrested when obstruction occurs, the fluid contents of the intestine above the occluded part appear to be very copious. To some degree the bowel above the obstruction is distended by the actual accumulation, and such accumulation tends to favour congestion of the bowel wall.

Meteorism is not due to a mere collection of gas which cannot escape. The circumstances which most favour it are such as lead to gross disturbance in the circulation of the gut.

Clinically, this is very noticeable. Meteorism is marked when the mesentery or mesocolon is largely involved in strangulation. This is well illustrated by examples of extensive

volvulus. No distension of the intestine can equal that exhibited by a volvulus of a sigmoid flexure of exceptional length in which the mesocolon has been so twisted as to cut off the blood supply from the whole coil. Thrombosis of the mesenteric vessels tends to favour intense meteorism. Indeed, one of the most extreme examples of flatulent distension of the abdomen which I have seen occurred in a patient who had no intestinal obstruction, but who exhibited *post mortem* extensive thrombosis of the mesenteric veins.

In the cases of intestinal obstruction the meteorism is obviously favoured by the loss of contractility in the bowel, and this condition is very marked when the circulation in the loop has been arrested. (Compare Groups II. and III.)

The advent of peritonitis increases the degree of paresis, and is followed by an augmentation of the meteorism.

Mere abrupt occlusion of the gut without disturbance of its circulation leads to an accumulation of the bowel contents above the strictured part. Gas collects at this point, and is unable to escape downwards, but the actual distension of the bowel produced is, in these acute cases, comparatively slight, and can hardly be said to reach the degree of meteorism.

THE GENERAL PATHOLOGY OF OBSTRUCTION OF THE BOWEL.—The condition to be considered under this heading is illustrated by stricture of the bowel or any stenosis of gradual formation. The bowel is narrowed, but not occluded. The intestinal contents can pass, but pass with difficulty. There is obstruction, but not occlusion.

It is to be assumed that the narrowing has formed slowly and gradually, and therefore that the case is chronic.

The best example of this condition is afforded by a malignant stricture of the colon.

The **bowel below the obstruction** is empty and contracted. It contrasts in a very marked manner with the intestine above the seat of stenosis. It is in a state of feeble tonic contraction, the so-called "inanition contraction," its colour is pale, and its walls are unchanged. It is in the condition, in fact, of the starvation intestine. Now and then it may show some distension due to gas produced by the decomposition of such matters as have passed through the strictures. These matters in neglected cases may form substantial accumulations in the bowel, and may even be retained long enough to induce catarrh. The rectum below an obstructed colon may be found to be dilated, and in the condition known as the "ballooned rectum." This curious state is apparently the result of some nerve disturbance,

and I have never seen any condition equivalent to it in any part of the colon below a stricture.

The distension of the colon with gas, which is occasionally met with below the stricture, has never in my experience been sufficiently marked to lead to the risk of the coil being mistaken for a loop above the stricture. This is a matter of some moment because cases have occurred in which a colotomy has been performed, and the opening found to have been made below the obstruction.

The **bowel above the obstruction** becomes dilated, and its walls hypertrophied. These changes are most intense close to the stricture, and gradually diminish as the site of the obstruction is departed from. They are more marked when the colon is involved than when the stenosis concerns the small intestine.

In long-standing cases the changes in the bowel above the stricture are considerable and far spread. Thus, in cases of stricture of the sigmoid flexure, not only has the whole colon been found dilated and hypertrophied, but also the terminal portion of the ileum. The bowel may be greatly contorted and much lengthened.

The distension, especially where the colon is involved, may be enormous. Thus, in a case of 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 had 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 hypertrophy is a true hypertrophy of muscle, and not a mere hyperplasia. It is due to abiding efforts on the part of the intestine to force matters through the narrow strait in the bowel. It is the outcome of overwork. The hypertrophy concerns more conspicuously the circular fibres. Experiments upon animals show that this hypertrophy may commence as early as the fifth day after the lumen of the bowel has been narrowed, and that it may be quite evident by the ninth day. When the intestine has attained a certain

* Guy's Hosp. Reports, vol. xiv., p. 272.

† *Lancet*, vol. ii., 1876, p. 505. ‡ No. 1952.

degree of hypertrophy, and has yet failed to overcome the obstruction, there finally appears a degeneration and an atrophy of the hypertrophied fibres. The bowel wall becomes enormously increased in thickness. The intestine feels heavy, firm, and leathery. In the colon the longitudinal bands stand out with remarkable clearness. The vessels of the intestine are very prominent, and the gut becomes a little deeper in colour.

The mucous membrane of the bowel is thickened from chronic catarrh, and is very commonly ulcerated. These inflammatory changes are more marked in the colon than in the small intestine, and are most pronounced just above the narrowed part. They are due to the long-continued distension, to the constant pressure of retained fæcal matter, to the actual mechanical impact of solid masses, and to the chemical and bacteriological effects of decomposition set up in long-retained intestinal matters. It will be evident, therefore, why such manifestations of inflammation are more marked in the colon.

In the small intestine ulcers are found above the stricture, and perforation of these ulcers is a common cause of death. 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. These changes, however, in the mucous membrane above the stricture are best studied in the colon.

This segment of the colon commonly presents a condition of extensive colitis. The degree of this inflammation varies. It is usually of a chronic type, the mucous membrane is pigmented, and may appear in places to be sloughy. Some ulceration is usual. The ulcers may be quite superficial, and appear as mere erosions. As a rule, however, they extend in depth and size, they present ragged and irregular edges, and in time lay bare the muscular coats. They spread and fuse together, and so produce immense tracts of severe ulceration. Ulceration of this type may involve the whole colon. In some reported cases of stricture of the rectum the entire colon is described as being "worm-eaten" with innumerable ulcers. Certain of the less aggressive ulcers are evidently of long standing, and show marked pigmentation.

In the majority of instances the ulceration is of limited

extent. When the stricture is at some distance from the valve, ulceration may be noted in two distinct places, namely, just above the obstruction and in the cæcum, the intervening mucous membrane being healthy. 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.‡

If the perforation take place very slowly, a sacculated fæcal abscess may be produced, or there may follow a severe and ill-conditioned cellulitis of the retro-peritoneal tissue. I have seen a case in which a fæcal abscess in the left iliac fossa was the first sign of cancer of the sigmoid flexure.

Sometimes the changes in the bowel above the obstruction pass the limits of ulceration, and the part becomes gangrenous. Gangrene developed in 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 patient an adult. The anterior wall of the ascending colon was wanting (having sloughed) over

* Bull. de la Soc. Anat., 1870, p. 27.
† Path. Soc. Trans., vol. xxi. p. 171.
‡ Ibid., vol. i., p. 264.

an area measuring five inches by one inch and a half. 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

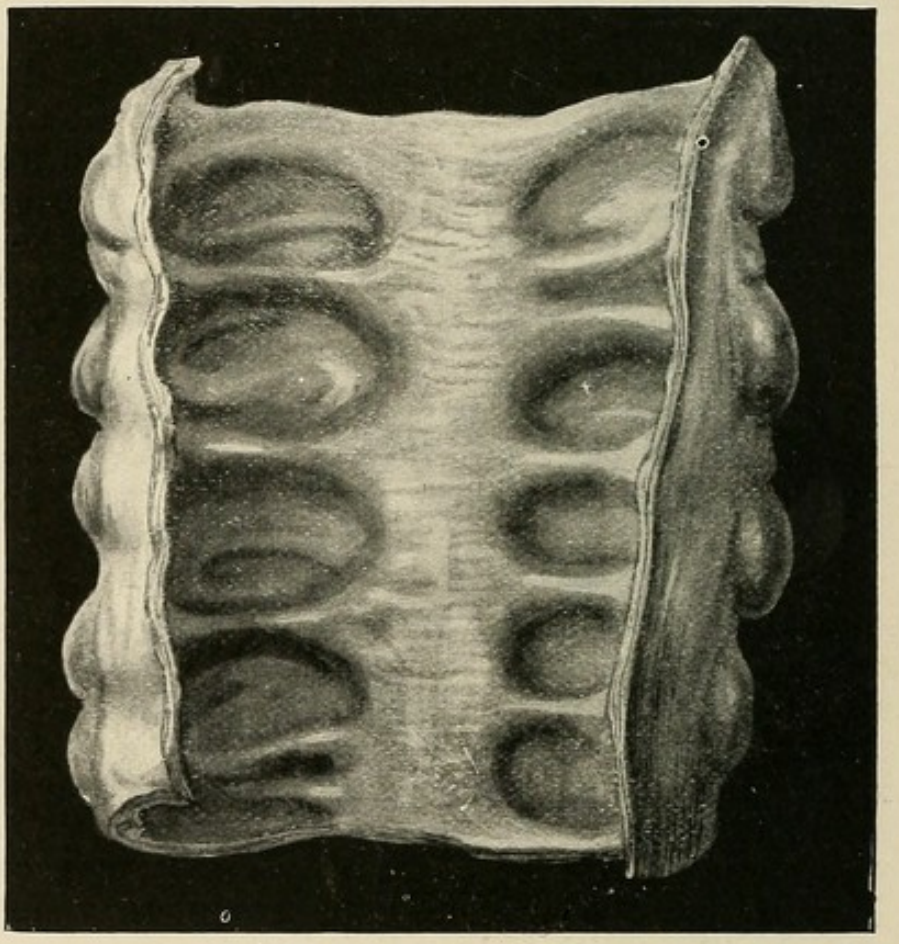


FIG. 2.—Great sacculation of the Transverse Colon due to a Stricture at the Splenic Flexure.

The wall of the gut is much hypertrophied. (*Royal Coll. of Surg. Mus.*, *No.* 2453A.)

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.

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 more common in the small than in the large intestine. An extreme degree, however, of sacculation of the colon above a stricture is shown in Fig. 2. (*See* also page 57.)

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 stones, sixteen cherry stones, and six orange pips.‡ In another very similar instance there were only three plum stones in the pouch.§ 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.

In one case in which I was excising the sigmoid flexure for an epitheliomatous growth which had caused a tight stricture, I found in the greatly dilated bowel above the stenosis a number of cherry stones which had been swallowed nine months before the operation.

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. 3.¶ It was probably produced by the excessive

* Path. Soc. Trans., vol. xxi., p. 171
† *L'Union Méd.*, 1856, No 57.
‡ Path. Soc. Trans., vol. x., p. 154.
§ Ibid., vol. iv., p. 152.
‖ *Lancet*, vol. ii., 1876, p. 505.
¶ St. Thomas's Hosp. Museum, No. Q. 129.

enlargement of a simple pouch formed above the stricture. The fundus of the pouch would be pressed against the wall

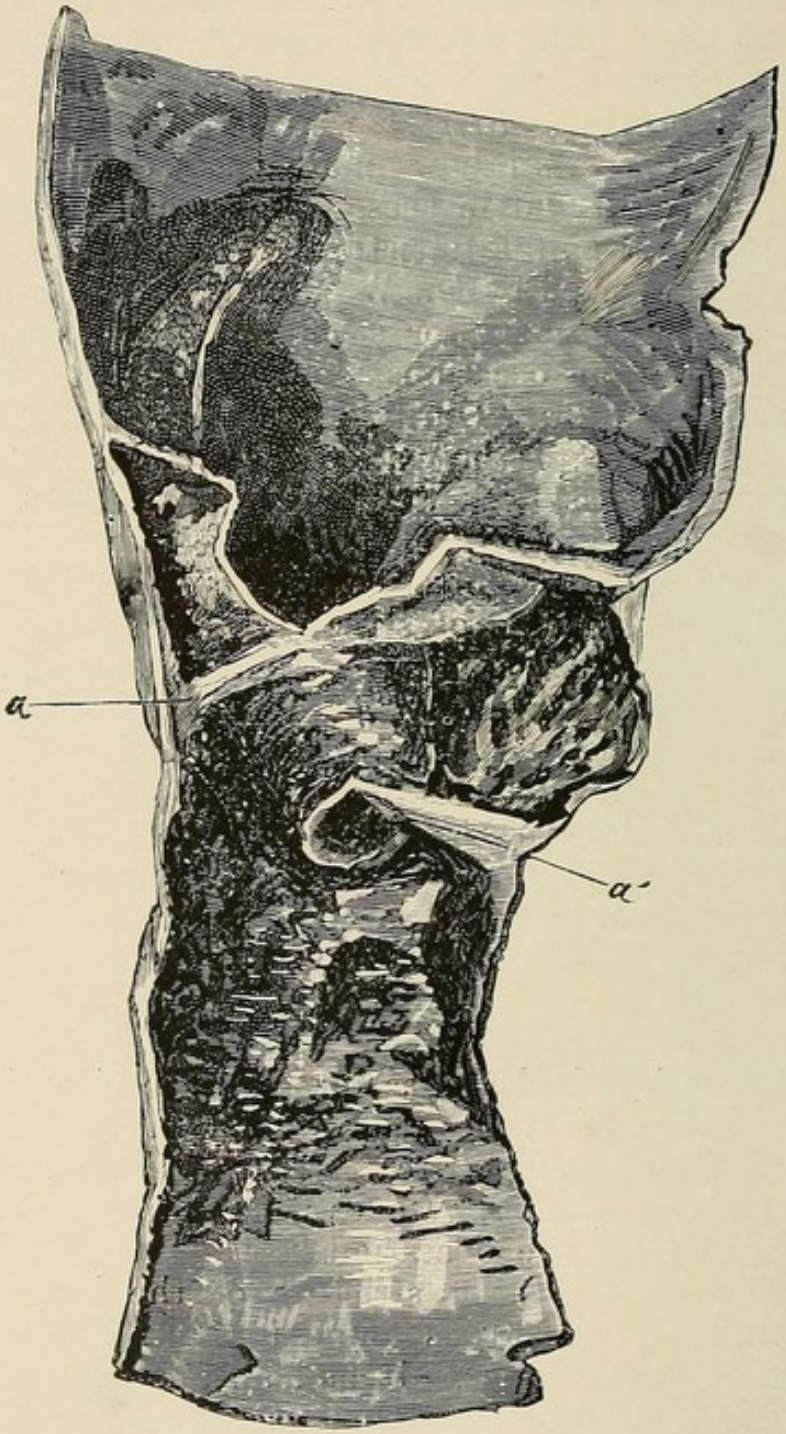


FIG. 3.—Stricture of the small Intestine with Pouch.

a and *a'* point to fræna holding in position a remarkable pouch of mucous membrane.

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 fræna and bars of cicatricial tissue which are apparently the products of an irregular ulceration, and possibly of the adhesions of adjacent inflamed surfaces.

CHAPTER II.

THE MORBID ANATOMY OF PARTICULAR FORMS OF INTESTINAL OBSTRUCTION.

STRANGULATION BY BANDS OR THROUGH APERTURES.—Under this variety of intestinal obstruction may be included:—

1. Strangulation by isolated peritoneal adhesion.
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 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. It is the strangulated hernia of the interior of the abdomen. It obstructs the gut as a hernia obstructs. 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 their symptoms and the elements of their prognosis collectively.

"Internal herniæ" are considered in a separate section (page 102). Certain of these herniæ conform to the type of intestinal obstruction now under discussion; others by no means so conform. The conditions described as internal herniæ present such varied anatomical features and such diverse clinical developments that they are conveniently dealt with under one special heading.

1. Strangulation by Isolated Peritoneal Adhesions. THE CAUSES OF THE BAND.—These isolated adhesions (known commonly 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 commonly produced by chronic diffused peritonitis on the other, it follows that these isolated bands are usually due to moderate and well localised forms of peritoneal inflammation.

Among the phases of local peritonitis the following may be mentioned as the most common antecedents of the "band" or "false ligament":—perityphlitis, pelvic peritonitis, peritonitis following upon injury, upon abdominal operations, upon strangulated hernia, upon ulceration of the bowel and upon mesenteric gland disease. Tuberculous peritonitis which has ended in real or apparent recovery may also be a factor in the etiology.

Among six cases of strangulation by bands alluded to by Dr. Coats* no less than four appear to have owed their origin to healed tuberculous trouble.

This form of strangulation may occur even during the

* Trans. Path. and Clin. Soc., Glasgow, 1893, vol. iv.

progress of the disease. Larguier des Bancels* reports the case of a boy, aged eight, who during the progress of tuberculous 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 membrane.

So little is known of the reputed "intra-uterine peritonitis" that the assertion that some bands are due to this condition may be considered as not proved. Most of the "congenital bands" depend upon developmental defects in the vitelline duct.

From my own experience I should say that one of the most common causes of the peritoneal false ligament is perityphlitis. It is needless to state that of all forms of limited peritonitis this form is the most frequently met with.

I have knowledge of several instances in which "pelvic inflammation," "metritis," or "pelvic cellulitis" appears without doubt to have provided the band. In one fatal case of acute strangulation under my care the obstructing false ligament was produced by a localised peritonitis which had followed an excision of the rectum. The instances in which intestinal obstruction of the present type has followed upon an abdominal operation are quite numerous.

Lucas-Championnière† makes mention of five instances in which symptoms of intestinal obstruction appeared in a few days after operations which concerned the abdominal viscera.

Dr. G. Rohé‡ in a very exhaustive paper upon this subject deals with seventy-five examples of death from intestinal obstruction following upon abdominal operations.

In the majority of the instances the obstruction was due to adhesions and peritoneal bands. It is well, however, to mention here that certain reported cases of death from intestinal obstruction after laparotomy certainly appear to be rather cases of peritonitis. This is especially the case in the somewhat numerous instances in which death is ascribed to "septic intestinal paralysis."

I have described elsewhere§ the various forms of intestinal obstruction which may follow after hernia, and although strangulation by an adherent band or omental cord has been

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

† *Revue de Chirurgie*, 1892, p. 264.

‡ *American Journ. of Obstetrics*, Oct., 1894.

§ *Lancet*, June 7, 1884.

met with after hernia it is not a common phase of the trouble. (*See* page 41.)

The patch of peritonitis which may form over the site of any deep intestinal ulcer may attract a fringe of omentum and form an omental cord, or it may lead to an adhesion between another coil of bowel which may in time become a strangulating agent.

With regard to mesenteric gland disease, 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.*

This is not, however, the only form of obstruction which may be indirectly due to this variety of gland disease, and to avoid repetition they may be alluded to in passing.

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.†

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 often 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 case depicted in Fig. 92.

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. ‡

THE MODE OF FORMATION OF THE BAND.—The actual production of the band-like adhesion after peritonitis is easily demonstrated.

It is well known that in this affection, and especially in the so-called adhesive form, a fibrinous exudation appears

* *See* specimens, Guy's Hosp. Museum, No. 1819 (36); and St. Bart.'s Hosp. Museum, No. 2165; also cases by M. Bricheteau (Bull. de la Soc. Anat., 1861, p. 118), and by Mr. B. Hill (*Lancet*, vol. i., 1876), p. 773.

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

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

upon the surface of the inflamed membrane. Any two surfaces 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 the greater part of the exudation is in time absorbed. I have many times found the extensive soft adhesions exposed in operating for perityphlitic abscess to have entirely vanished when the affected region has been laid open at a second operation.

It is, so far as I know, impossible to state under what conditions adhesions will persist on the one hand or vanish on the other. Extensive and tough adhesions may follow upon a peritonitis of moderate degree, while little or no trace may be left of a peritonitis of a quite acute character.

That there is, however, considerable absorption of the fibrinous exudation in every case there is little doubt. What 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 substantial 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.

One circumstance which has distinct influence in this direction is certainly the movement of the adhering parts. During the progress of peritonitis the intestines are relatively still and more or less distended. As a result of this distension coils of bowel may be brought together which 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 which 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 (Fig. 35). 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. 4 and 30). 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. The adhesion, subjected to the rolling movements of the intestines over one another, and to frequent torsion, now in one direction and now in the other, tends to become rounded and cord-like, and the more it is stretched the more completely is this transformation favoured. Thus are formed "peritoneal false ligaments" and the bands and cords now under discussion.

The moulding of a mass of adhesion-tissue into a cord by movements within the abdomen is illustrated by the changes 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 which 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

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

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.

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 which may lead to strangulation of a loop by "knotting."

THE FORM AND DISPOSITION OF THE BAND.—The appearance of these false ligaments and bands, in cases in which they have produced 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

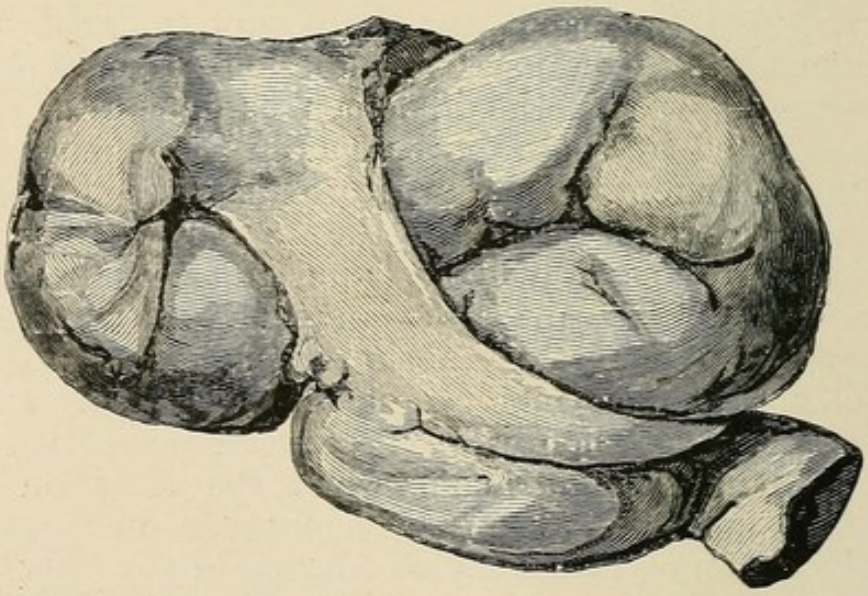


FIG. 4.—Strangulation by a broad Peritoneal Band passing between two adjacent Coils of Ileum.

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

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

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 shown in Fig. 4.*

The false ligament is usually single, and hence the name bestowed upon it by Mr. Gay of "the 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 often be found. This is especially the case when the band is due to tuberculous or pelvic peritonitis. The same applies, although in a less degree, to the local peritonitis set up by inflammation about the cæcum. Here, in addition to any adhesion which may have become isolated, elongated, and cord-like, there will very probably be some matting together of parts in the immediate vicinity of the appendix. Many cases, however, are reported where the only relics of a perityphlitis 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 which is sometimes associated with caseous degeneration of a mesenteric gland. I have met with several cases, and not a few specimens, which illustrate this circumstance.†

A single adhesion may readily follow upon the little speck of peritonitis attending an intestinal ulcer (Fig. 32). 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, however, evidently instances of Meckel's diverticulum or a diverticular ligament. (*See* page 46.) I am, indeed, under the impression that the majority are of this character.

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

* London Hosp. Museum, No. Ad. 78.

† Case of Glenard's Disease, treated by operation by the author (*Brit. Med. Journ.*, Jan. 4, 1896).

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

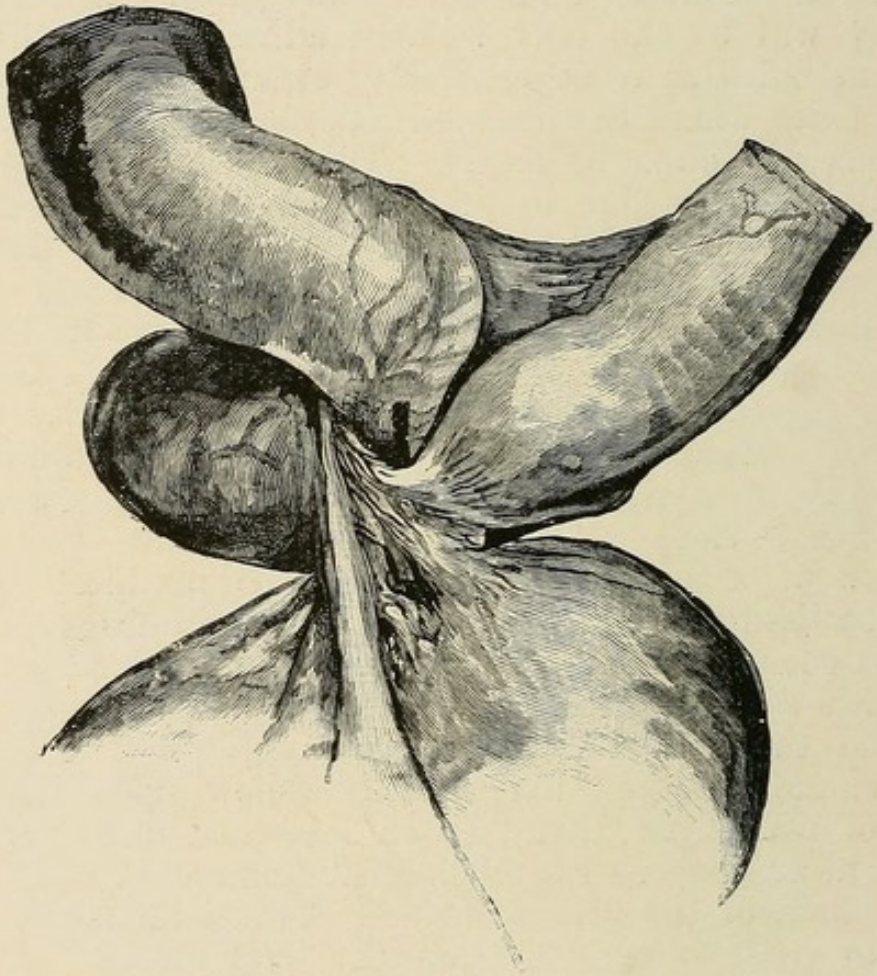


FIG. 5.—Strangulation of the Ileum by a Y-shaped Band attached to the Fundus of the Uterus.

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

adhesions in this case appear to have been due to mesenteric gland disease.*

Mr. Lupton † records a case in which the bowel was constricted by no less than four bands in four separate places. Symptoms of obstruction had lasted over seven days. The operation revealed only one of the bands. The patient survived the operation twenty-four hours.

The false ligament, although single, may have a complicated arrangement, and lead to extraordinary forms of

* *Lancet*, vol. i., 1876, p. 773.
† *Lancet*, May 1, 1897, p. 1204.

constriction of the bowel. Thus in the specimen shown in Fig. 5* 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

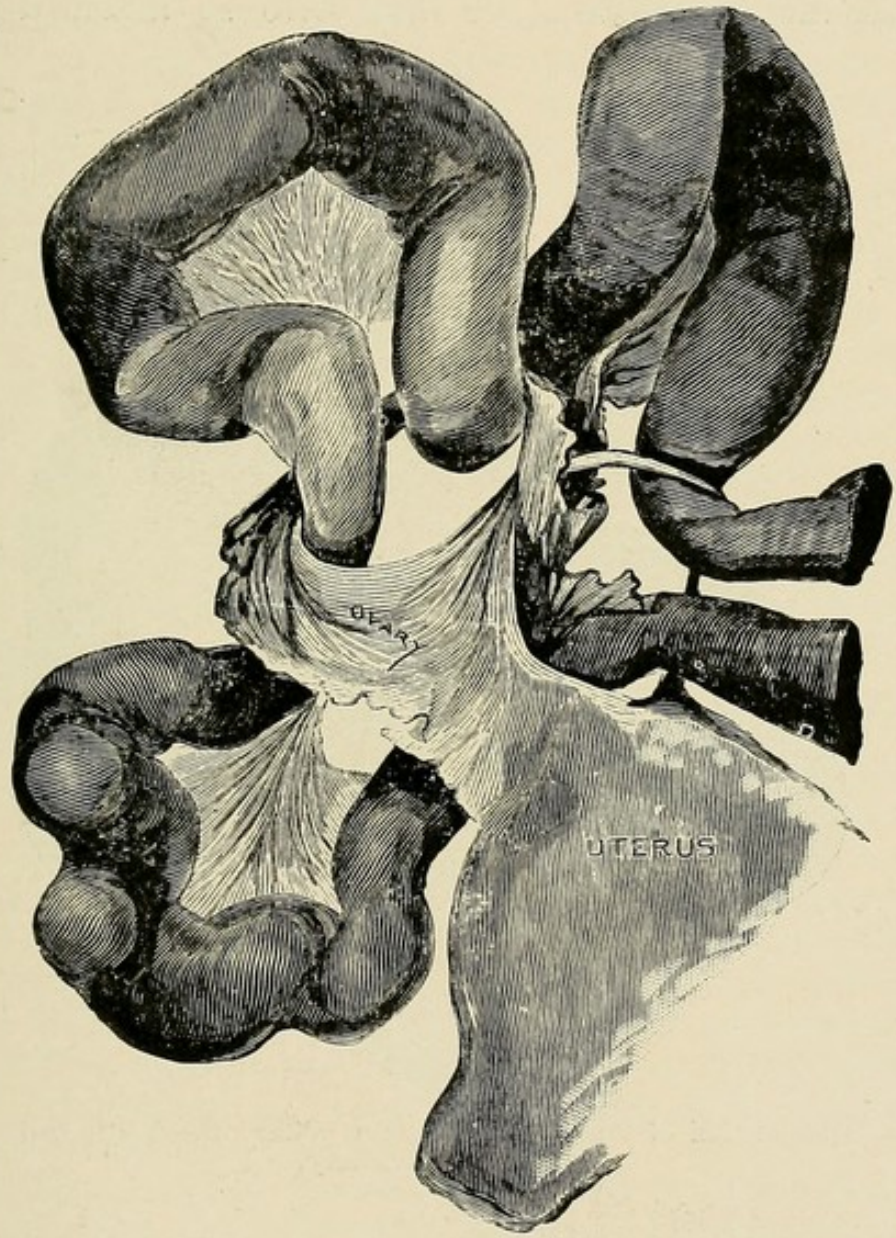


FIG. 6.—Strangulation of the Ileum by complicated Bands passing between the Uterus and Ovary.

with points on the small intestine about one inch and a half apart. There were many adhesions about the pelvic viscera. In Fig. 6† it will be seen that an adhesion connecting the uterus, ovary and mesentery leads to a complicated form of strangulation and to a double constriction of the bowel.

* St. Bart.'s Hosp. Museum, No. 2164.

† Guy's Hosp. Museum, No. 2507 (50).

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 which has become strangulated, or may have so attached them-

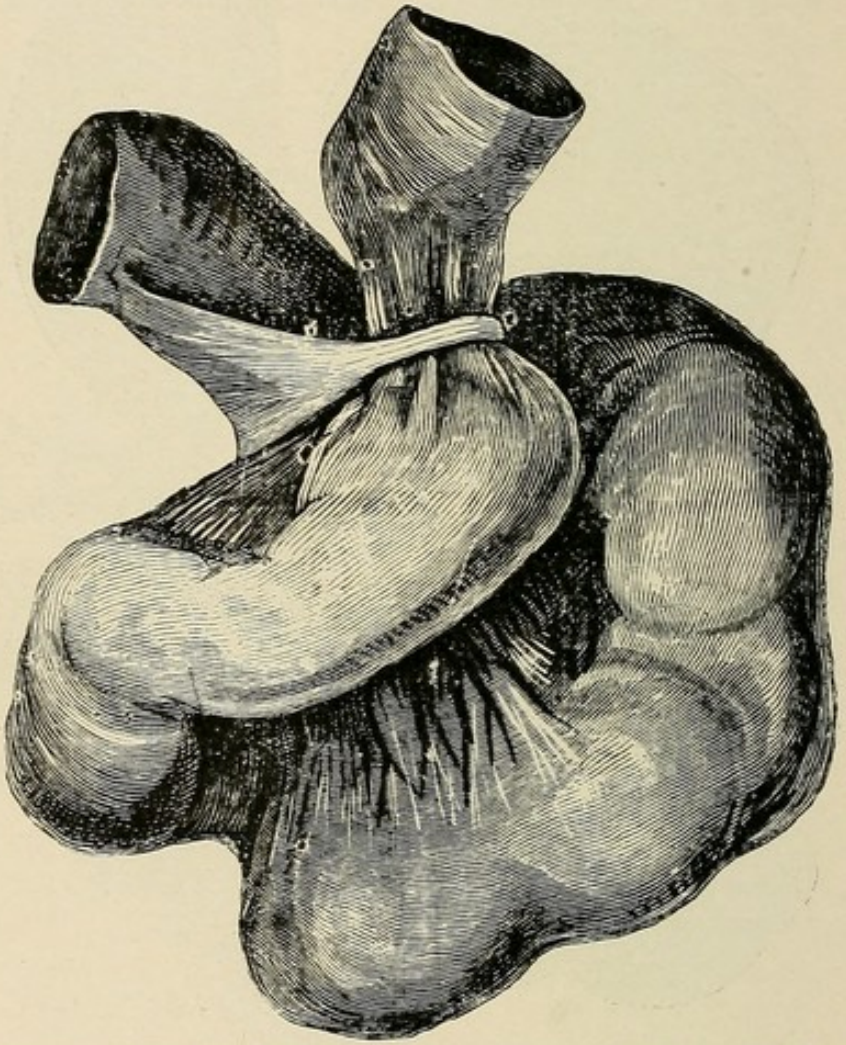


FIG. 7.—Strangulation of small Intestine by a solitary Band attached at either end to the Mesentery.

selves 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 which 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. 7,* and it would appear to be frequently due to a limited peritonitis incident upon mesenteric gland disease.†

A certain number of "bands" so attached are, however, without doubt relics of incomplete development connected with the vitelline duct. In that 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 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 some local peritonitis in connection with hernia, one of its extremities may be found attached in 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 perityphlitis, both ends of it may be found connected with the cæcum or appendix, as is apparently the case in a specimen in the Royal 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. 32.

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

* University Coll. Museum, No. 1164.

† *See* specimens at St. Bart.'s Hosp. Museum, No. 2165; and Lond. Hosp. Museum, No. Ad. 79.

‡ No. 1360A.

§ St. Thomas's Hosp. Museum, No. R 15.

‖ Mr. Ward; Path. Soc. Trans., 1852, p. 362.

¶ Dr. Hilton Fagge; Guy's Hosp. Reports, vol. xiv., 1869, p. 272.

omentum and the mesentery.* Between the ascending and descending colon.† Between the colon and the ovary.‡

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.

Methods of Strangulation.—When a portion of the intestine is strangulated by an isolated peritoneal adhesion the gut will be found to be constricted in 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 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 falciform 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.

* Dr. Hilton Fagge, loc. cit.
† Seerig; Rust's Magazin für Heilkunde, band xlvi.
‡ Rokitansky; Brit. and For. Med.-Chir. Review, vol. iii.
§ Manual of Path Anatomy (Syd. Soc.), vol. ii., 1850.

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.

A loop caught beneath a band is very apt to undergo rotation, and such twist or volvulus may contribute more to the actual obstruction of the bowel than does the band which represents the strangulating agent. The bowel so snared and twisted may become untwisted and escape.

FIG. 8.

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 mesenterial peritonitis, so that if the noose should slip over such a loop, the constricting cord will find at the base of the loop a narrowed neck around

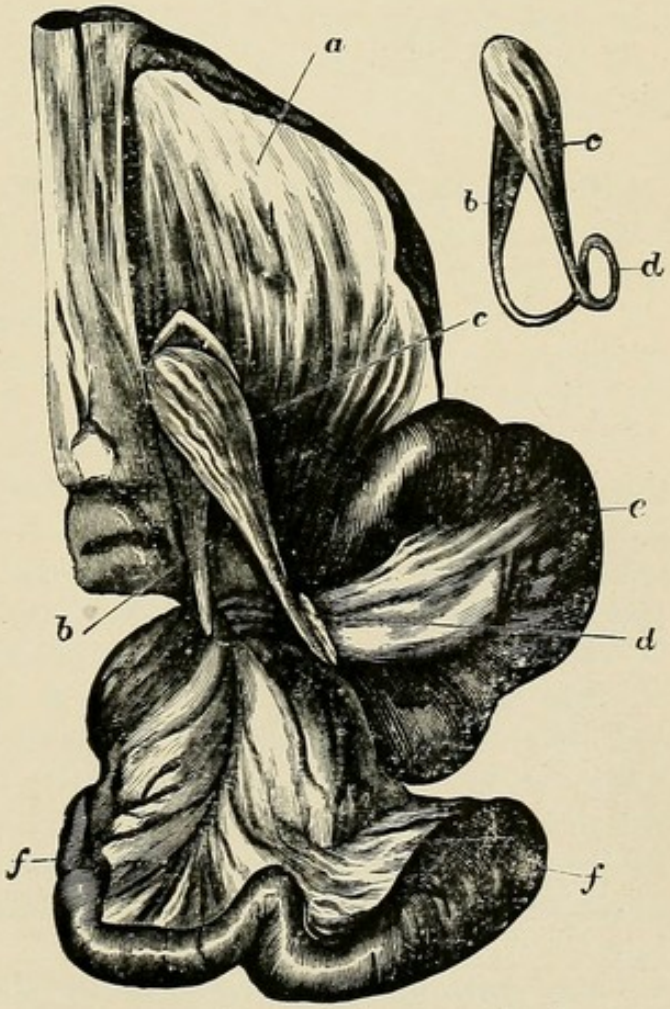


FIG. 9.—Strangulation by a Band.
(*Astley Cooper.*)

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*.

which it may take 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. 8). 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. 9.*

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. 10). If the top of the intestinal loop passes directly through

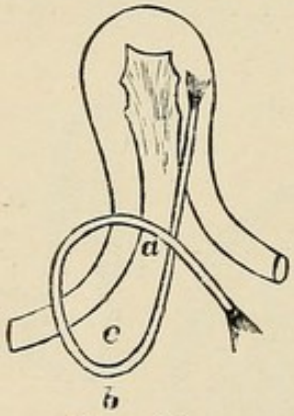


FIG. 10.

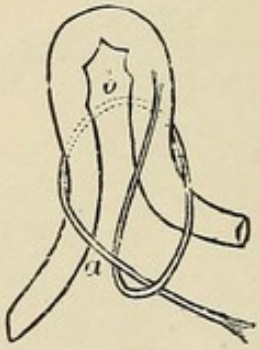


FIG. 11.

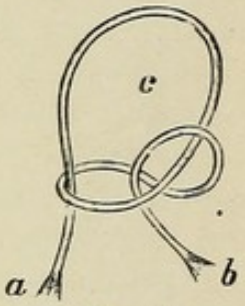


FIG. 12.

the coil *c*, a simple knot is formed about the piece of the intestine, as is shown in Fig. 11. It is evident that the same result can be produced by the coil being thrown over the top of and around the intestinal loop.

"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. 8, between its points of attachment *a* and *b*. If now one leg of the so-called primary noose passes through it we have a knot like that shown in Fig. 12, and if now the intestinal loop passes directly through *c* (Fig. 12), it becomes firmly caught and strangulated.

"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

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

† Sir A. Cooper: loc. cit., p. 528.

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 eight 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.

With regard to the amount of intestine which may be involved in a noose or knot, it must be remembered that the false ligament may, in certain circumstances, attain a considerable length. Thus, in Mr. Obre's case already alluded to (page 29), the false ligament was 17½ 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.

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 which exist upon the question has been furnished by Hueter.† To the works of these authors the reader is referred.

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 reported 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

* Die Unterleibsbrüche. Handb. der Allgem. und Speciel. Chirurgie, Von Pitha und Billroth, 1882, p. 146.

† Grundriss der Chirurgie, p. 248. Leipzig, 1883.

‡ Path. Soc. Trans., vol. iii., 1851, p. 111.

§ Ibid., vol. iv., p. 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, p. 601.

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 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 both sides 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 29.)

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.

The point of attachment of the epiploic band will obviously depend upon the situation of the peritonitis, which renders it adherent. Such adhesion may follow after

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

† Path. Soc. Trans., 1882, p. 146.

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 perityphlitis very often leads 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 prolapsed. 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.

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 which 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,

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

† St. Thomas's Hosp. Museum, No. R 14.

although 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 or omphalo-mesenteric duct. It occurs in about 2 per cent. of the bodies examined, and is a little more common in males than in females. When met with in its most perfect condition it exists as a tube, having a structure similar to that of the small intestine itself, and 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 free 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 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.

Mr. Bernard Pitts† reports a case in which a fæcal discharge at the umbilicus, due to a Meckel's diverticulum, appeared when the child was three weeks old, persisted for seven years, and then ceased spontaneously.

The opening at the umbilicus may be so wide that the mucous membrane of the diverticulum may prolapse and form a spur, on either side of which will be a very apparent opening into the ileum.

These conditions, however, of the diverticle are comparatively rare. Most commonly it exists as a blind tube coming off from the ileum. The length of this tube is on an average two to 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.

* *Lancet*, vol. ii., 1873, p. 773.
† Trans. Path. Soc., vol. xxxiii., p. 145.
‡ Guy's Hosp. Museum, No. 1819 (45).

In only very rare instances has it been seen to assume a polypoid form and present a comparatively narrow attachment. Kelynack* figures such a diverticulum. The diameter at the point of junction with the ileum was three quarters of an inch. Its terminal point formed a large pouch with a diameter of three and a quarter inches.

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. When this occurs the extremity of the abnormal tube presents an ampulla of globular shape, and the process is said to be "clubbed." The end may appear bifid. 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. A like specimen is figured by Hudson in the Pathological Society's Transactions for 1889. 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 fifteen to thirty-six inches above the ileo-cæcal valve. It is rare for the process to take origin beyond these limits. Indeed the average distance of the diverticulum from the ileo-cæcal valve is three feet. 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.

* *Brit. Med. Journ.*, Aug. 21, 1897. † For an instance of a very wide diverticulum, *see* specimen No. 1819 (50), in Guy's Hosp. Museum.

‡ Etude sur les Diverticules de l'Intestin. Paris, 1862. § No. 1819 (50).

The diverticulum always arises from the side of the gut most remote from the mesentery.

It is a question whether those elongated diverticula which are described as growing between the layers of the mesentery are real instances of Meckel's process. These rare forms are alluded to below (page 56).

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 is, indeed, very frequently met with. Often the cord is pervious for a little way, and presents a minute canal in 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. In 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

* St. Bart.'s Hosp. Museum, No. 2168, and many other specimens.

† 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		—
To cæcum	2		23

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

Near umbilicus	7	To mesentery	7
To femoral ring	1	To the bladder	1
To small gut	3		—
To cæcum	1		20

the cæcum. Not infrequently the attachment to the mesentery is at the spot occupied by diseased mesenteric glands.

I have found the diverticular ligament adherent to the bladder

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 process is long, and especially where 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 perityphlitis, 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, as already mentioned.

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 os pubis and the umbilicus) to the right iliac fossa. The deeper extremity of the cord had snared in a noose a large portion of ileum.

* Guy's Hosp. Museum, No. 1819 (36).

† Path. Soc. Trans., vol. xxi., p. 185.

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

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 complicate this matter still further, 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 which 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.‡

There can be little doubt but that these strangely attached diverticular ligaments have very often been mistaken for isolated peritoneal adhesions; and, in any case, where a "solitary band" exists without a trace of ancient peritonitis, there are substantial 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 was produced. Such is apparently the case in a specimen in one of the museums,§ in which one ligament encircles

* Path. Soc. Trans., vol. xxvi., p. 47.
† Spangenberg; Arch. f. Phys. v. Meckel, b. v., s. 87.
‡ St. Bart.'s Hosp. Reports, vol. xvii., 1881, p. 277.
§ St. Bart.'s Hosp. Museum, No. 2173.

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 forty-eight. 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. *Strangulation as by a Band.*—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. An illustration of this mode of constricting the bowel is shown in Fig. 13 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 stated that beneath the process some bowel was strangulated.

It is probable that the bowel so engaged had become twisted upon itself, and that its lumen had been closed by the volvulus rather than by the adherent process.

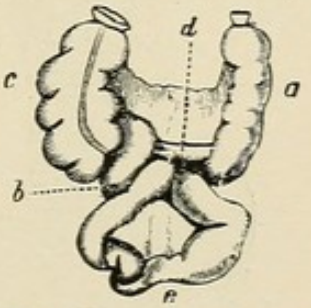


Fig. 13. — Strangulation by an adherent Diverticle (*Rayer*).

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

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.

It is common for the bowel beneath the adherent diverticle to be twisted upon itself. Dr. Hector Mackenzie‖ reports a case in which five to six feet of ileum were thus twisted, and actually strangled.

* Mém. de l'Acad. des Sciences, 1700, p. 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, p 69.

§ Archiv. Gén. de Méd., tome v., p. 68. ‖ Path. Soc. Trans., 1890, p. 127.

2. *Strangulation by a Noose.*—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 37, would 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 probably of this character. An example of this variety of strangulation in its simplest form is depicted in Fig. 14.* In some instances the band will be seen to have passed twice round the bowel at the point of constriction.† In other specimens one turn and a half is made. A reference to the drawing taken from Sir Astley Cooper's work (Fig. 9) 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

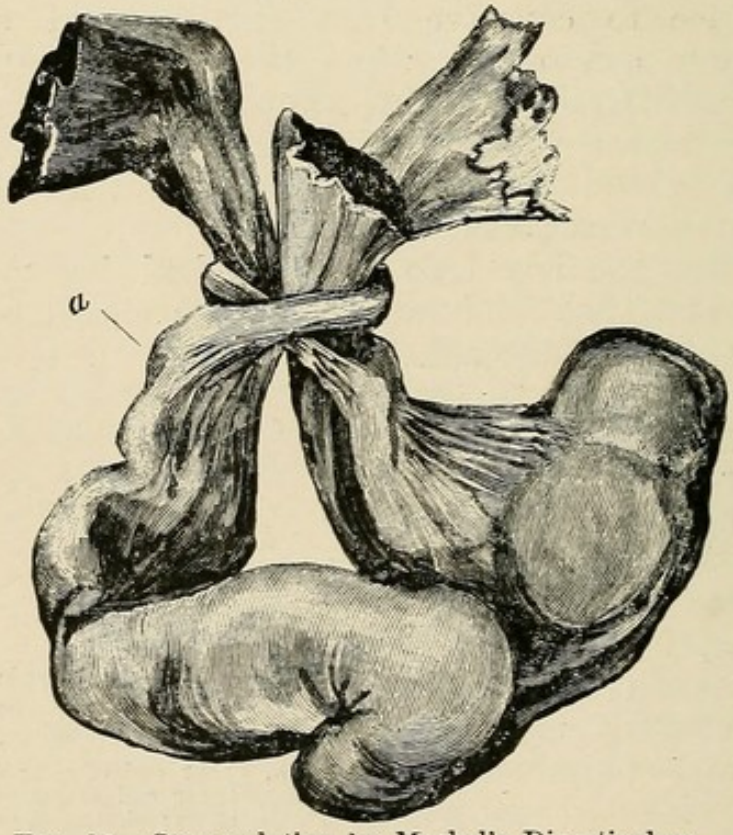


FIG. 14.—Strangulation by Meckel's Diverticulum.
a, point of origin of diverticle. The distal end is attached to the mesentery. The loop involved measured 12 inches.

* Lond. Hosp. Museum, No. Ag. 2.

† For specimens *see* St. Bart.'s Hosp. Museum, No. 2172, and University Coll. Museum, No. 1167.

‡ Path. Soc. Trans., vol. xxi., p. 185.

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 matters of some speculation.

Fig. 15 will possibly serve to show how the snaring ligament, when it is long, may present a relation to the bowel which would be very difficult to appreciate and interpret.

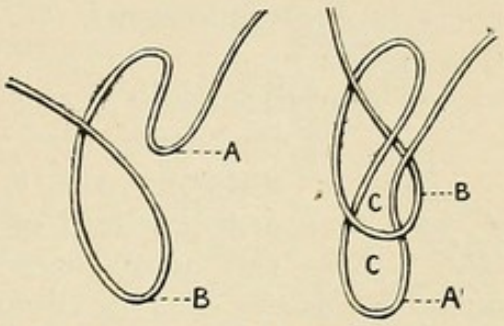


FIG. 15.—Diagram to show a possible method of snaring by a long ligament.

Here the loop A has passed through the bight B. The complex disposition of the band can be illustrated by assuming a knuckle of bowel to pass through the snare at either of the points marked C.

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 Leichtenstern's figures, strangulation by the noose is relatively more frequent in the case of peritoneal adhesions 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 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

* Mém. de l'Acad. de Chirurg., tome iii., p. 468.

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. 16). 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.

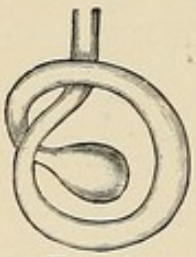


FIG. 16.

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. 17. Of this variety M. Regnault gave many years ago an excellent example. The diverticulum was in this case six inches in 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. 18), one above, *a*, and the other below, *b*, the origin

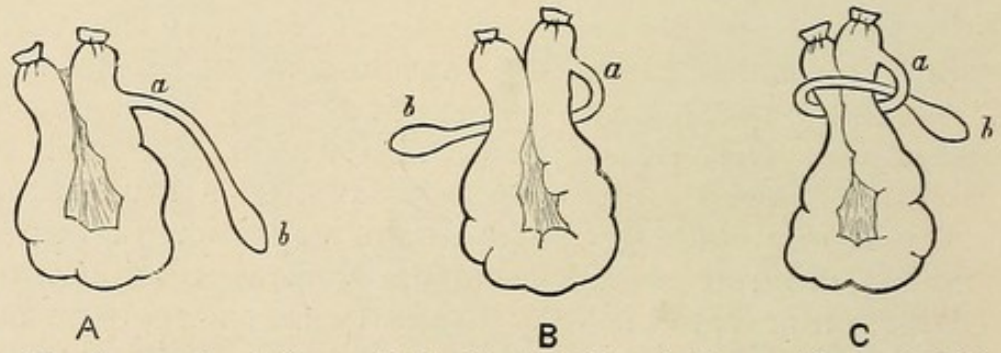


FIG. 17.—One mode of Strangulation by the Diverticulum. (*Regnault-Béclard*).
a, origin of diverticle; *b*, its clubbed extremity.

of the diverticulum *d.* One of the loops 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.

Fig. 19 shows the strangulation of a coil of ileum by a diverticular ligament which ended in a rounded mass of fat.‡

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

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

‡ Royal Coll. of Surg. Museum, No. 2695 B.

Diverticula and diverticular ligaments may lead to other forms of obstruction which do not, however, come under the present category. These forms may be enumerated here for the sake of completeness, and will be dealt with further 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, an obstruction follows in the bowel so displaced. The occlusion is somewhat similar to that which would take place in a coil of thin india-rubber tubing if thrown across a tense wire cord and allowed to become dependent. (*See* page 75, Chap. III.)

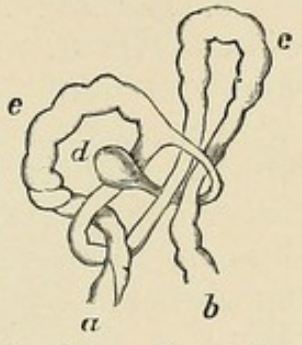


FIG. 18. — Strangulation by the Diverticulum by a double Knot.

5. *Strangulation by Kinking.*—If, in 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,

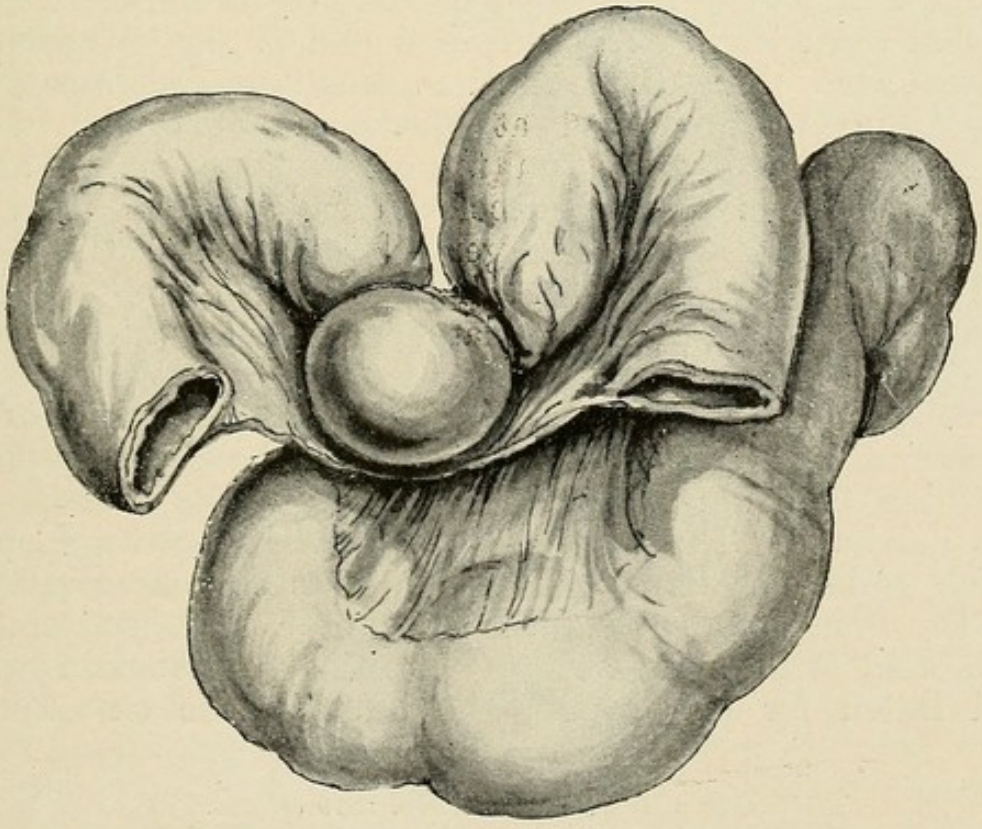


FIG. 19.—Portion of Ileum strangulated by a fibrous cord (the remains of the omphalo-mesenteric duct) which terminated in a rounded mass of fat (*Royal Coll. of Surg. Mus.*, No. 2695 B).

may cause such bending of the bowel, when the punch is much distended, as to give rise to obstruction. This form of obstruction is dealt with in the next chapter (page 77).

6. *The Diverticulum in Association with Intussusception.*—The diverticulum may become invaginated into itself, and protruding into the ileum may produce or be associated with intussusception. A specimen in Guy's Hospital Museum* shows a short finger-like diverticulum which had become inverted, had projected into the lumen of the intestine, and had apparently caused an intussusception. Fig. 72 is from a specimen in the museum of the Royal College of Surgeons.† Here a diverticulum, one inch and a half in length, had become so invaginated as to project into the lumen of the ileum and produce an intussusception. The patient was a boy aged four years. The symptoms were acute, and he died on the fifth day. Mr. Golding Bird‡ has recorded a case of intussusception of the ileum through the lumen of a Meckel's diverticulum, which was itself prolapsed at the umbilicus, and patent at that spot.

7. *Volvulus of the Diverticulum.*—Mr. Carwardine§ reports a case of volvulus of Meckel's diverticulum which caused the death of a newly-born child on the third day of life, an operation having failed to give relief. A large Meckel's diverticulum, distended with meconium, had become twisted upon itself. The intestinal end of the diverticulum showed some three turns, and was thus rendered impervious. The ileum was occluded at the point of origin of the process. The diverticulum formed a huge sac, and into the bowel beyond it no meconium had entered. It seems as if there had been a congenital stricture of the ileum, and that all the meconium had poured into the diverticulum, converting it into a large receptacle which became finally twisted upon itself.

8. *Stenosis of the Bowel at the Point of Origin of the Diverticulum.*—A large number of cases have been reported in which the ileum at the seat of origin of the diverticulum was narrowed. The degree of stenosis has been subject to much variation. Some illustrative cases may be given.

Dr. Southey‖ reports the case of a boy, aged sixteen, who died with symptoms of intestinal obstruction which had lasted for ten days. The attack came on suddenly

* Guy's Hosp. Museum, No. 1819 (45).
† Royal Coll. of Surg. Museum, No. 2718 A.
‡ Clin. Soc. Trans., 1896, p. 33.
§ *Brit. Med. Journ.*, Dec. 4, 1897, p. 1637.
‖ Clin. Soc. Trans., vol. xv., 1882, p. 159.

(during perfect health) with colicky pains, retching, and purging. The diarrhœa was soon replaced by absolute constipation which persisted until death. Vomiting came on, and on the sixth day was stercoraceous. 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 would 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 goosequill. (*See* Fig. 20.)*

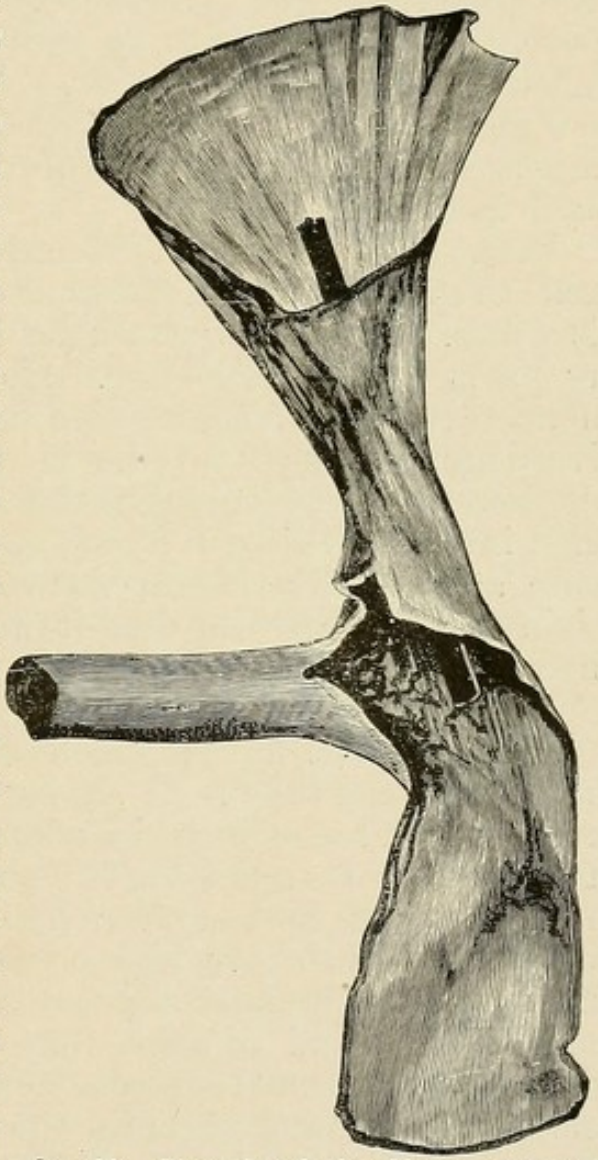


Fig 20.—Stenosis of the Ileum above the origin of a Meckel's Diverticulum.

It is assumed that the acute symptoms which caused death were due to strangulation of the bowel beneath the diverticulum, which, it will be noticed, was adherent. As no loops were found to be actually strangulated, it is more probable that the narrowed ileum was occluded by acute bending or kinking due to traction upon the diverticulum. Dr. Southey reports another case (in the same paper) of a girl, aged thirteen and a half 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

* St. Bart.'s Hosp. Museum, No. 2175.

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 possible by the stenosis of the bowel.

In a case by Dr. Hare a diverticulum one inch and three-quarters in length was adherent to the inguinal canal into which it had protruded. 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 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 diverticulum arose from the ileum and was attached to the gut 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 a specimen (No. 1361) which affords another example of the present condition. It shows a diverticulum, two inches in length and one inch in width at its base, which ends in a cord two and a half inches long attached to the mesentery one inch and a half 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 similar to these may be cited where the small intestine was greatly contracted about the point of attachment of an isolated "adhesion."‡

With regard to the nature of these constrictions in the gut it may be mentioned that congenital strictures of the lesser bowel are met with most frequently in the ileum at

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

† Bull. de la Soc. Anat. de Paris, 1864, p. 496.

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

a spot corresponding to the usual origin of Meckel's diverticulum. [This subject is dealt with in chapter VIII.] There is every reason to believe that these congenital strictures are due to excessive changes incident upon the obliteration of the vitelline duct. In all the examples of complete stricture there has been no trace of the duct. It is probable that in the cases now under consideration the stenosis is congenital, and due to irregular developmental changes. I was at one time of opinion that the strictures found in these cases might be acquired, and due to the effects of continued traction upon the gut. I was struck with the fact that the diverticulum in nearly all the instances of associated stricture was adherent. It can be understood that traction upon the bowel would be apt to lead to bending of it, to the production of occasional obstruction, and at least to interference with regular peristaltic movement. These conditions might well lead to ulceration of the bowel, and that to a cicatricial stricture. In the first of Dr. Southey's cases, to which allusion has been made, the bowel was found to be ulcerated at the seat of the stricture. Too much weight, however, cannot be attached to this fact, and in the examples I have been able to examine of stricture associated with a Meckel's diverticulum the narrowed part has shown no appearance of ulceration nor of cicatricial contraction. It is just possible that in a few instances the stenosis may be secondary to the adherent diverticulum, because I have met with instances in which a loop of small intestine held by an undoubted adhesion has been found to be narrowed at the point of attachment of the band. I have excluded from such instances those examples in which both the stricture and the adhesion were evidently due to a primary ulcer of the intestine.

Other Diverticula of the Intestine.—It will be convenient here to deal with certain other diverticula which are met with in the bowel, and which, when situated in the ileum, may possibly be mistaken for Meckel's process. These diverticula are of two kinds—(1) congenital and (2) acquired.

1. Congenital Diverticula.—A pouch is occasionally found in the *duodenum*. It is always small, is placed in the "second part" of the intestine just above the biliary papilla, and is composed of the normal coats of the bowel. The mouth of the pouch is wide, and its depth is, as a rule, about one inch. There is every reason to believe that these isolated pouches which are so constant in their position are dependent upon developmental defects or aberration associated

with the hepatic diverticulum. It is interesting to note that congenital stricture of the duodenum occurs at the same level. So far as is known these pouches produce no symptoms and have given rise to no troubles. In the Royal College of Surgeons Museum * is a specimen of a duodenal diverticulum found in the body of a man aged seventy-two. It had caused no trouble.

Certain diverticula of congenital origin, and distinct from Meckel's diverticulum, have been met with in the *small intestine* below the duodenum.

Thus Pollard† describes the following specimen: "At a distance of twenty-four inches from the pylorus the intestine bifurcates. The two segments are similarly supplied with mesentery, so that it is only by tracing them that the true intestine and the diverticulum can be distinguished. The diverticulum after a course of thirty-six inches reaches the umbilicus beyond which it originally terminated as a large *cul-de-sac* in the umbilical cord. The other segment of the intestine terminates at the ileo-cæcal valve after a course of sixty-three inches." Possibly of like nature to this is a specimen of apparently "double intestine,' from the Warren Museum, U.S.A., figured in Dennis's "System of Surgery." ‡

Buzzi § describes a diverticulum of the jejunum situated about three feet from the duodenum.

In Dennis's "System of Surgery" (loc. cit.) is a drawing of a specimen in the Warren Museum showing a diverticulum, very much like a distended vermiform appendix, growing from the small intestine at its line of attachment and extending between the layers of the mesentery. Some writers have described a Meckel's diverticulum with a similar relationship to the mesentery.

Congenital diverticula in the *colon* are very rare. Hale White describes a diverticulum half an inch long and admitting a No. 10 catheter, which was discovered in the colon of an adult ten inches from the ileo-cæcal valve. ‖

Futterer¶ gives an account of a congenital diverticulum of the sigmoid flexure which formed an enormous globe-shaped projection from the bowel wall.

* No. 2428 B.
† Path. Soc. Trans., 1896, p. 47.
‡ Vol. iv., p. 295, 1896.
§ Virchow's Archiv., 1885, vol. c., p. 357.
‖ Clifford Allbutt's "System of Medicine," vol. iii., p. 973.
¶ Archiv. für Path. Anat., 1886, p. 555.

Congenital diverticula of the *rectum* have been reported by Hulke*, Ball†, Maas‡, Terrier§, and Platt‖.

In Ball's case there was some congenital atresia of the anus. In Maas' case the patient was a boy of fourteen, who had presented some distension of the abdomen since birth. This increased and caused dyspnœa and disturbance of the heart. The boy died suddenly, and the autopsy revealed an enormous diverticulum of the upper part of the rectum.

In Terrier's case the diverticulum caused a constant sense of weight in the rectum. The pouch was successfully excised.

Platt's case presents features of considerable clinical interest. 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 tuberculous 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 during life 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 diverticulum of the rectum, into the orifice of which the finger had been introduced in the rectal examination.

2. Acquired Diverticula.—The greater number are merely 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, in most instances, simply of mucous membrane and peritoneum. They present in their walls few, if any, 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 more often found in the large than in the small intestine. They have been seen in the jejunum, and are encountered with still greater frequency in the ileum. (Fig. 21.)

* Trans. Path. Soc., 1873, p. 87.
† "Diseases of the Rectum," 1887, p. 42.
‡ Annual of the Universal Med. Sciences, 1889, vol. iii.
§ *Revue de Chirurgie*, 1889, p. 929.
‖ *Lancet*, vol. i., 1873, p. 42.

They may appear in any part of the colon, but are most common in the sigmoid flexure and rectum.

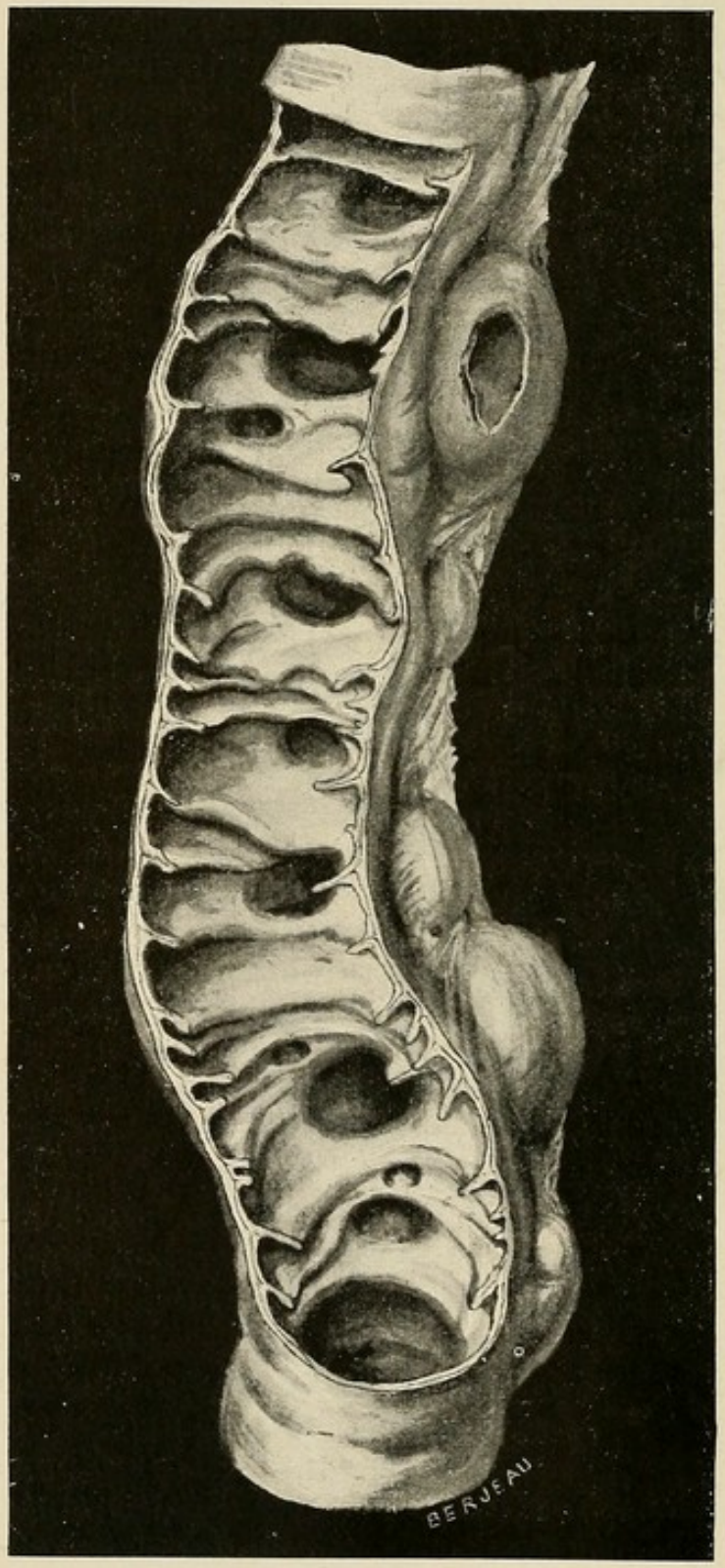


FIG. 21.—Multiple Sacculi or Diverticula of the Small Intestine.

The protrusions are along the mesenteric border of the bowel, and are composed only of mucous membrane (*Royal Coll. of Surg. Mus.*, No. 2455 C).

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. Hamilton* describes numerous pouches of larger size in the same section of the bowel. In another case reported by Hale White† the descending colon, sigmoid flexure and upper part of the rectum presented numerous diverticula about one-third of an inch in diameter. The largest were about half an inch in

* *New York Med. Rec.*, 1888, p. 721. † Trans. Path. Soc., 1885, p 215.

depth. Fig. 22, 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.

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. The majority of those in the colon are about the size of a pea. 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 diverticula shown in Fig. 23.§ It is extremely rare for them to assume the conical shape or finger-like outline so commonly met with in Meckel's diverticula. They may be narrower at the attached extremity than at the fundus, and are apt, when of good size, to assume a polypoid outline. Fig. 24 shows a pedunculated diverticulum which contained a foreign body.

Fig. 22.

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.

These multiple pouches may be regarded as herniæ of the mucous membrane through the muscular coat. They occur, with but few exceptions, in elderly people; and those of the colon are usually associated with a history of chronic constipation. In the small intestine also the diverticula

* Path. Soc. Trans., vol. vi., p. 191.
† Ibid., vol. xxvii., p. 147.
‡ Guy's Hosp. Museum, No. 1,819 (69).
§ Royal Coll. of Surgeons Museum, No. 1177.

are often attended by conditions bringing about distension of the bowel. (*See* page 20 and Fig. 2.) In Sir Astley Cooper's case the pouches were in the jejunum, while in the

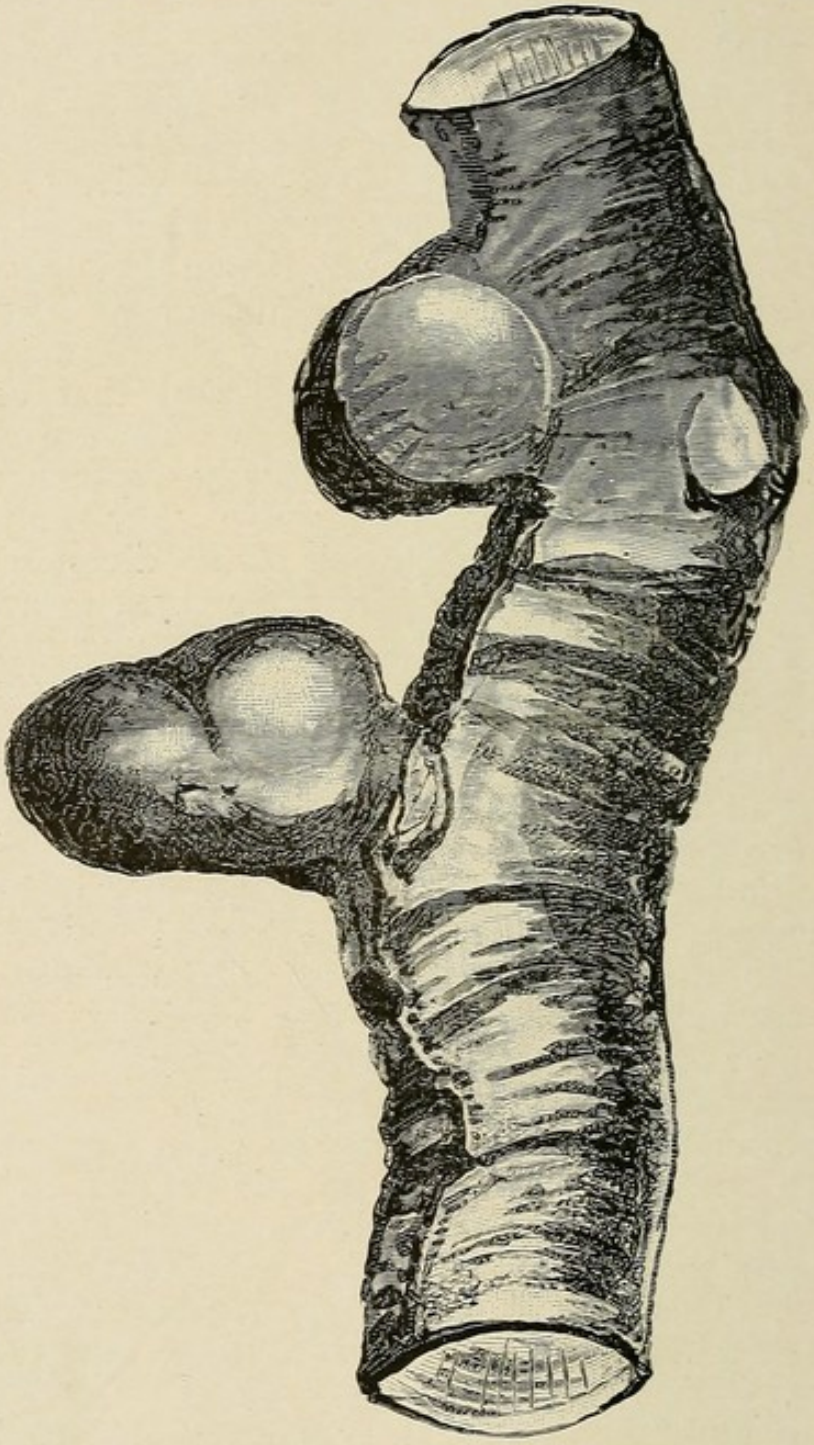


FIG. 23.—Distension Diverticula.

ileum was an obstruction that had, no doubt, encouraged a long-continued distension of the gut. 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 be due to distension it is difficult to understand why they are so uncommon even in cases of chronic intestinal obstruction.

In the Royal College of Surgeons Museum* is a specimen of the colon containing pouches, from these come off certain secondary diverticula, which contain concretions composed of eighty parts of cholesterine and twenty parts of carbonate of lime.

Fig 24.—Diverticulum of the Lower Jejunum.

The process is perforated, and contains a pea (*Royal Coll. of Surg. Mus.*, 2452).

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. (*See* Fig. 24.) Attention 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 Royal 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. (Fig. 25.) In this

* No. 2455 E.

† *Medical Times and Gazette*, vol. ii., 1872, p. 482.

‡ Royal Coll. of Surgeons Museum, No. 2693.

case the comparatively large size of the involved appendix is conspicuous. (*See* also page 64.)

I have found cases on record where a diverticulum in the sigmoid flexure communicated with the interior of the bladder by an ulcerated opening. Here also it is probable that inflammation was 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 another† seems to have been more troubled by the escape of urine into the rectum. It is just possible that in those somewhat numerous cases in which air and fæces are found to pass from the urethra the communication between the colon and the bladder is effected through a distension diverticulum of the bowel.

Mr. Harrison Cripps, in dealing with examples of this communication, has shown that in the majority of instances the fistula is not due to malignant disease, but has followed upon simple inflammatory changes.‡

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 Bennett, 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.¶

I have met with a case in which the appendix was adherent to the bladder, and beneath it was a coil of compressed ileum.

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 had entered and had become strangulated. In other instances, equally uncommon, the appendix is said

* Path. Soc. Trans., vol. x., p. 131.
† Ibid., vol. x., p. 208.
‡ "The Passage of Air and Fæces from the Urethra." Lond., 1888.
§ Guy's Hosp. Museum, No. 2508 (50).
‖ *See* a good case by Mr. Gay; Path. Soc. Trans., vol. iii., p. 101.
¶ Path. Soc. Trans., vol. iv., p. 146. The specimen is now in St. Thomas's Hosp. Museum, No. R 17.

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 average length of the appendix is only three and a half inches. It is often four or five inches, and has been found to reach and even exceed the length of nine 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. In 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 the 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 coils of the bowel hang listlessly in the pelvis, and so form, by means of 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.

In a case of congenital malposition of the colon reported by Dr. Florence Boyd (page 240) it would appear that some

* For cases *see* Bull. Soc. Anat. de Paris, 1841, p. 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 small intestine were compressed beneath the stretched mesentery, there being at the same time an absence of adhesions.

D. To the bands formed by adherent appendices epiploicæ allusion has already been made. (*See* page 61.)

Dr. Perry* reports two interesting examples of this condition. Both patients were women and both were aged forty-eight. In both there were symptoms of acute obstruction and in both laparotomy was performed. The patients were in a very exhausted condition at the time of the operation and death followed in each instance in some few hours.

In one case a loop of ileum, measuring four to five inches, had slipped between two adjacent appendices epiploicæ which were united by fine thin adhesions at their tips. The pair of appendices were situated ten inches from the lower end of the rectum. In the second example thirty-one inches of the ileum had been snared. The pair of appendices which had become adherent to one another were attached to the bowel twelve inches from the lower end of the rectum. In Mr. Holmes's case described on page 68, it is just possible that the strangulating ring found on the sigmoid flexure was formed out of two adherent appendices of the type described by Dr. Perry.

In the museum of the Royal College of Surgeons† is a specimen taken from a girl of fifteen, the subject of tuberculous peritonitis, in which a coil of ileum thirty inches in length was strangulated beneath a " band." The band was formed by an appendix epiploica which arose from the sigmoid flexure and attached itself to the mesentery.

Fig. 25‡ shows constriction of the bowel by one of the appendices epiploicæ which is adherent to the omentum. The specimen is alluded to on page 61.

Mr. Bidwell§ records a case of acute intestinal obstruction in a woman, aged twenty-eight, which was due to the strangulation of a loop of ileum beneath a band formed by an adherent appendix epiploica arising from the sigmoid flexure. The appendix was attached to the anterior abdominal parietes and the snaring of the ileum was rendered possible by the fact that both ileum and sigmoid flexure were in part adherent to the abdominal wall. These adhesions had followed upon an ovariotomy performed five months previously. The obstruction was removed by operation.

* Path. Soc. Trans., 1889, p. 93.
† No. 2691 A.
‡ Royal Coll. of Surgeons Museum, No. 2693.
§ *Brit. Med. Journ.*, May 8, 1897, p. 1151.

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.

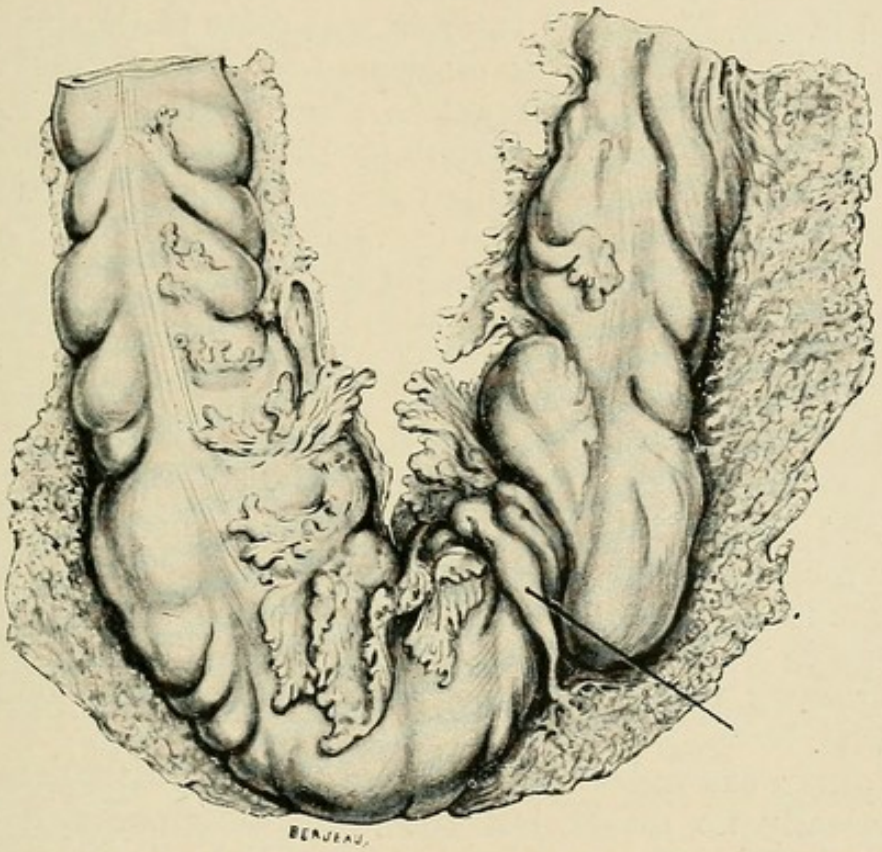


FIG. 25.—Portion of Colon constricted by one of the appendices epiploicæ (A) which has become adherent to the omentum, which is itself attached to the bowel by moderate adhesions. (*Royal Coll. of Surg. Mus.*, No. 2693.)

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. As an example of this form of obstruction may be mentioned a case recorded by Hector Cameron.† A man died with symptoms of acute

* Guy's Hospital Reports, vol. xiv.

† Trans. Path. and Clin. Soc., Glasgow, 1893 p. 78.

intestinal obstruction. A year or two previous to his death he had received a severe kick in the abdomen which was followed by much abdominal pain and distension attended with vomiting. The *post-mortem* showed that "the mesentery had been torn away at one point from its attachment to the bowel, and through a round hole thus produced a loop of gut had passed, been strangulated and rendered gangrenous."

In this case the rent was close to the bowel. In a case recorded by Mr. Maylard* the rent was close to the spine.

The patient in this latter example was a boy of twelve. He died of acute intestinal obstruction which had existed for five days, although for the first three days the symptoms amounted to little more than colic. The boy did not survive a laparotomy carried out for his relief. The operation showed that "a long loop of ileum—about four feet—at a distance of eight inches from the ileo-cæcal valve had passed through an aperture in the mesentery close to its spinal attachment. The opening, which appeared small enough to admit only the tip of the little finger, was enlarged and the bowel withdrawn. The bowel was completely gangrenous and had, therefore, to be removed." Three years previously the boy had been ridden over by a cart, the wheel passing obliquely across the thorax and abdomen. There was pain in the abdomen, and the child was kept in bed for seven days. From the time of this accident until the advent of the fatal illness he had been quite well.

In other examples of this variety of obstruction there is practically no doubt but 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. The hole is found in the mesentery of the terminal part of the ileum, and is close to the bowel. I have described the condition leading to these congenital holes in my Hunterian Lectures on the Anatomy of the Intestinal Canal and Peritoneum.†

The hole is generally circumscribed by an anastomosis between the ileo-colic branch of the superior mesenteric artery and the last of the intestinal arteries.

A common situation for the hole is shown at A in Fig. 26. I have frequently found this particular spot in the mesentery of the fœtus marked by an area of peritoneum which is entirely devoid of fat, of glands and of blood-vessels.

In the fœtus at full term, and in children before puberty, his area is usually about the size of a shilling piece. The

* The Surgery of the Alimentary Canal, Lond., 1896, p. 352.

† London, 1885, p. 28.

margins of the district are marked by the arteries named, and are occasionally rendered more pronounced by some opacity of the membrane.

In one instance of strangulation through a hole in the mesentery the upper margin of the aperture was marked by a dense and distinct band, which contained in its substance a large branch of the superior mesenteric artery.*

It is easy to understand that a little atrophy of the well-defined and transparent area of peritoneum just described would lead at once to the formation of a hole.

In the body of a man aged fifty-two I found this particular area in the mesentery very pronounced. It formed a patch of oval outline measuring one inch and three-quarters by one inch and a quarter. It was entirely devoid of visible vessels, of glands, and of fat; while the adjacent mesentery was quite opaque from adipose tissue. The margin of the space was markedly opaque, thickened, and abrupt, and was skirted on the side nearest the cæcum by one of the terminal branches of the superior mesenteric artery. The serous membrane which formed this area was very thin and clear, and so atrophied that it was cribriform, being pierced by about twenty holes. It was evident that but a slight degree of force would be required to drive a knuckle of bowel through this wasted membrane and so produce a strangulation through a "mesenteric hole."

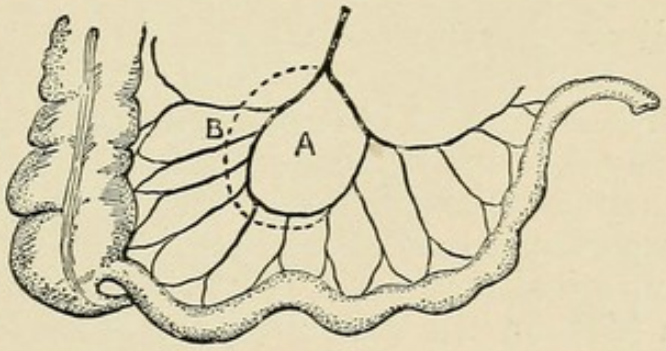


FIG. 26.—A, site of congenital hole in the mesentry; B, pouch in the peritoneum.

In one specimen which came to my notice—in a male fœtus at full term—this peculiar oasis in the mesentery was well defined, and the last intestinal artery had produced a fold on the cæcal margin of the patch (B, Fig. 26). By this means a pocket was formed which could with little inducement have lodged a knuckle of intestine.

Dr. Coats† has alluded to an instance of strangulation through a hole in the mesentery, in which it would appear that the aperture was of congenital origin. Another example, in a girl of sixteen, in which the hole measured

* Contrib. à l'Étude de l'Occlusion Intest., par M. Le Moyne. Paris, 1878.

† Trans. Path. and Clin. Soc., Glasgow, 1893, p. 57.

two inches by two and a half inches, is recorded in the *Lancet* for October 30th, 1897 (page 1111).

In reviewing the whole series of cases of strangulation through mesenteric holes, one notices that in most cases the amount of bowel involved was considerable. In one case it was of sufficient length to become twisted upon itself and form a volvulus.*

In size the mesenteric hole or slit 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 mesocolon.

B. Slits and Apertures in the Omentum.—An example of this form of obstruction is shown in Fig. 27.‖ 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 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

* *Brit. Med. Journ.*, April 24, 1897, p. 1022.

† Dr. Leared; Path. Soc. Trans., vol. xiv., p. 156.

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

§ Path. Soc. Trans, vol. xii., p. 110.

‖ University Coll. Museum, No. 1161. *See* also specimen in St. Bart.'s Hosp. Museum, No. 2177.

¶ Bull. et Mém. de la Soc. de Chir. de Paris, tome v., 1869, p. 635.

several large and 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 (page 64).

Dr. Quain describes an autopsy where forty inches of the ileum were found to have passed through a slit in

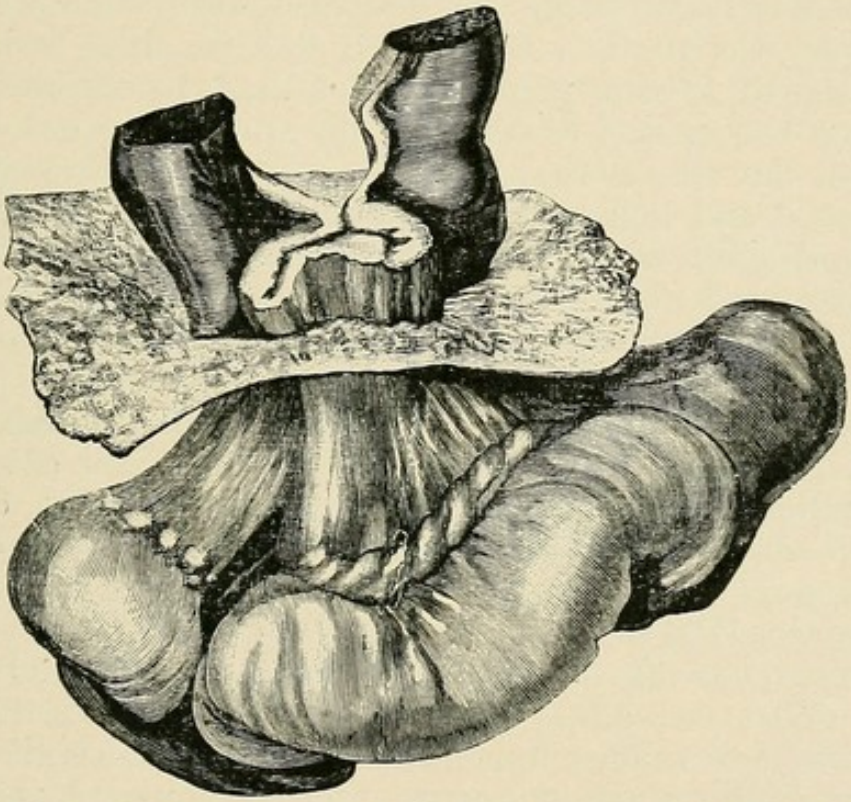


FIG. 27.—Strangulation of small Intestine through a hole in the Great Omentum.

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.‡

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.§

* Path. Soc. Trans., vol. xii., p. 3.
† Path. Soc. Trans., vol. xii., p. 103.
‡ Schmidt's Jahrb., b. 96, s. 207.
‖ *Med. Times and Gazette*, 1858.

I have operated upon a case in which repeated attacks of intestinal obstruction were due to the snaring of a loop of small intestine through a slit in the sustentaculum lienis. That fold of peritoneum was in this instance represented by two substantial parallel cords.*

In some cases rings and slits have been formed between intestinal loops which 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 which 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.

The Portion of Intestine Involved and the Mechanism of the Obstruction.—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 (page 62), and another where a loop of the sigmoid flexure was strangulated through a rent in the mesentery (page 68). Instances may be given where a part of the colon has been obstructed beneath a tightly drawn mesentery (Duchaussoy), together with a few other observations of the same character. So 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 almost 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 readily in this form of obstruction.

In the great majority of all cases the segment of small

* *Brit. Med. Journ.*, April 20, 1895, p. 864.

† Abdominal Hernia, chap. xxxv.

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 snared.

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 the most likely therefore to be ensnared by those many adhesions which may result from pelvic peritonitis. They are, moreover, in the closest association with the cæcum and appendix, and are most apt to be strangulated by adhesions that may follow upon perityphlitis, and by the cord formed by the vermiform appendix when it becomes adherent. Then, again, Meckel's 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 which 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 which 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 the jejunum would be equally movable at both ends, one end of the terminal part 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

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

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, in 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 engaged 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 actual *mechanism of the obstruction* varies a little in different cases. In many instances no doubt, 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. (*See* also the account given of the general pathology of occlusion of the bowel, page 9.)

It may be 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 increased peristaltic movements. It is probable that these 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

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

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 which preceded actual stopping of the circulation. Increasing distension, moreover, of the implicated bowel must always be an important feature. This distension is due not so much to matters passed into the partly occluded intestine from above, but to gas developed within the strangulated and paralysed loop.

The subject of meteorism or tympanitic distension of the bowel has been dealt with on page 13. The part such distension may play in aiding and increasing the process of strangulation is demonstrated by certain experiments. 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 or volvulus 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.

* 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.

The twist is given to the bowel partly by distension, partly by its 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. 5, 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 is 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 III.

ANOMALOUS FORMS OF OBSTRUCTION DUE TO ISOLATED BANDS AND 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.

As all these cases are quite rare it will be convenient to deal with their clinical manifestations at the same time that their morbid anatomy is considered, inasmuch as it is scarcely possible to classify them in a satisfactory manner according to their symptoms.

These anomalous cases may be arranged 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. Obstruction effected by adhesions which retain the bowel in *a bent position.*
4. Obstruction by means of adhesions which *compress* the gut.
5. Obstruction by the *matting together* of several coils of intestine.
6. 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 which 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 more 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., p. 252; Paris, 1864; case by M. Besnier. And Guy's Hosp. Reports, vol. xiv.; Dr. Hilton Fagge.

‡ Path. Soc. Trans., vol. vii., p. 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 twenty-two, forty-five, and sixty-five, 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, collapse, intense and persistent vomiting (becoming stercoraceous in at least one instance), and absolute constipation. In the case fatal in ten hours there were diarrhœa and profound collapse. The main points of difference between these cases and those of strangulation 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 lead to intense venous engorgement, to peristaltic movements, and local meteorism.

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. 28). 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.

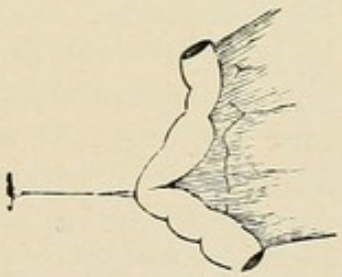


FIG. 28.

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

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

of origin as to bend the intestine transversely, and finally occlude its lumen.* He gives a case in the person of a man, aged twenty-two, which 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 which was 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 overcome. (*See* page 51.)

A specimen (No. 2695A) in the Royal College of Surgeons Museum shows a diverticulum which had caused such an acute bending of the ileum from which it sprang as to occlude it. The patient was a middle-aged man, who was seized with symptoms of acute obstruction quite suddenly. He died in five days, a laparotomy having failed to reveal the cause of the obstruction.

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 some 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 a 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 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 nine, in whose abdomen at the autopsy many old adhesions were found resulting from a local peritonitis set up by tuberculous disease 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

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

† Leichtenstern, loc. cit., p. 530.

of obstruction seems to have been due to a band which fixed the small intestine to the liver, and which 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's case the dragging of the empty and pendulous coils below the attachment of the diverticle appears to have helped in maintaining the obstruction. Dr. Turner reports an acute case of kinking in a boy aged ten. The diverticular band was adherent to the umbilicus. There was a sharp flexion of the ileum at the point of origin of the diverticulum caused by the passage of the coils immediately above it behind the cord from left to right. There was much traction upon the ileum. The bowel thus narrowed by kinking was finally blocked by a plum stone.‡ In the museum of the Royal College of Surgeons§ is a specimen showing a coil of small intestine adherent to the abdominal wall, and very sharply bent at the point of adhesion. The specimen was from the body of a lady aged forty-five, who four days after ovariotomy developed symptoms of acute obstruction, of which she died in three days. The obstruction was due to acute kinking of the adherent bowel. Dr. Quain‖ reports the following case in a woman aged fifty-three: 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.

In a case under my care I evacuated a large perityphlitic abscess which had existed for some time. Symptoms of intestinal obstruction of a subacute character followed the operation. I opened the abdomen, and found that a coil of small intestine had become adherent to the abscess "wall,"

* Path. Soc. Trans., vol. xxvii., p. 157.
† Ibid., vol. xvi., p. 126.
‡ Path. Soc. Trans., 1881, p. 86.
§ No. 2692.
‖ Path. Soc. Trans., vol. v., p. 179.

and had been kinked by the collapse of that wall after the pus had been evacuated. The releasing of this coil put an end to the obstruction symptoms.

During the progress of tuberculous peritonitis, and particularly during the period when recovery is taking place, minor obstructive attacks may occur which are possibly due to kinking. As illustrative of the association between peritonitis and kinking of the bowel may be mentioned cases reported by Paul* and Cave.†

THE SYMPTOMS due to kinking of the bowel are in the main very similar to those which attend strangulation under a band. The onset is usually less abrupt. Very often there have been many minor attacks, or the final attack may have been preceded by colic, constipation, and vague intestinal uneasiness. The progress of the case is less acute than in strangulation by a band, patients living eleven, fifteen, and twenty days in some instances. In Dr. Turner's case alluded to above the trouble proved fatal on the fourth day.

The symptoms also are such as would suggest that the occlusion is not absolute. The pain, although severe, will present very unequal degrees of intensity; the vomiting, although often incessant, 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.

In some instances there has been some diarrhœa. The symptoms are occasionally curiously relieved by posture, and in a great many of the cases there is a tendency to relapse. In a few of the more chronic—or rather of the less acute—cases I have seen evidence of some little hypertrophy of the bowel. In such rare instances there may be much rumbling and gurgling in the abdomen.

3. **Obstruction by Adhesions which Retain the Bowel in a Bent Position.**—These cases, which are not uncommon, 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 usually on the abdominal or pelvic parietes or on the pelvic viscera. It may be on the liver. The usual causes of the adhesion are hernia, perityphlitis, pelvic peritonitis, peritonitis due to injury, to operation, to ulceration of the gall bladder or of the bowel.

* *Lancet*, 1894, vol. i., p. 609.
† *Brit. Med. Journ.*, 1891, vol. ii., p. 67.

In the cases which have followed hernia the part of bowel adherent is the same which had occupied the rupture. The condition is met with, therefore, only after enteroceles, and only 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.

As an illustration of this fact may be cited a case recorded by Mr. Jones.*

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.

Quite a large number of these cases depend upon the adhesions which may follow upon perityphlitis. I have met with instances in which acute obstruction has followed, and others in which the patient had had repeated minor attacks, or presented symptoms which might be termed chronic. A good instance of an acute attack depending upon adhesions set up by a diseased appendix is reported by Mr. Cheyne.† The patient was operated upon thirty-six hours after the most acute symptoms had set in, and made a good recovery.

So many of the examples of the present form of obstruction depend upon pelvic peritonitis that the majority of the subjects—taking the whole series together—are found to be females. This disposition to one particular sex is further emphasised by the cases which have followed upon abdominal operations, and upon troubles incident to gall stones. The cases in males are largely made up by such as have followed upon perityphlitis. In one recorded case in a man the adhesions which caused the obstruction had followed upon a little peritonitis excited by tapping the bladder above the pubes.‡

I have met with a case in a male subject in which a coil of jejunum had become adherent to an inflamed gall bladder

* *Lancet*, 1891, vol. i., p. 1370.
† *Brit. Med. Journ.*, 1894, vol. i., p. 967.
‡ Dr. Briddon, *New York Med. Journ.*, 1882, p. 116.

—from which a gall stone was escaping—and had become thereby occluded.

In very many of the cases the hepatic flexure of the colon is adherent in the vicinity of the gall bladder as a result of hepatitis, due in most cases to gall stones.

It is needless to say that practically all the subjects of the present form of obstruction are adults. Indeed, the youngest patient of whom I have any note is a woman of thirty.

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 which 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 sarcoma. 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.¶

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

* 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. Gén. de Méd., 1re Série, tome xiv., p. 193.

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

§ Dr. Hilton Fagge, loc. cit.

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

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

of obstruction appeared within a few days of the original lesion.

Harrison Cripps * has published a case where acute obstruction set in eighteen days after the removal of a large fibroid growing beneath the broad ligament. The adhesions proved so inseparable from a coil of bowel that the damage inflicted upon the latter necessitated the formation of an artificial anus.

In the majority of cases the intestinal symptoms do not make their appearance until months after the initial peritonitis. In a case under my care in which symptoms of chronic obstruction were due to the fact that the transverse colon was adherent to the uterus, the obstruction symptoms appeared two months after the subsidence of the perimetritis which led to the adhesion. In this instance I set free the bowel, and the patient made a good recovery. I think that in the cases due to hernia a somewhat earlier appearance is usual, a matter in many 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 a like character to 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.

A. 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 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.

B. 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

* *Brit. Med. Journ.*, 1894, vol. ii., p. 1103.

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 Richter'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. It is evident in this form of hernia that the main lesion is not the narrowing of the lumen of the bowel, but the sudden and severe injury inflicted upon the peritoneal nerves by the strangulation. The bowel—although not occluded—is held in a fixed position and is damaged.

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 from somewhat parallel conditions to those that produce the manifestations in Richter'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 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 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.

* For an account of this case *see* page 100.

C. 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 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. Moveover, 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 these different forms of obstruction will obviously show great variation. They may assume an acute, or a subacute or a chronic aspect, and will differ 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. The condition appears to occur most usually in connection with the sigmoid flexure or upper part of the rectum, and the manifestations produced may be identical

* *Med. Times and Gazette*, vol. i., 1869, p. 436.

† *See* case by Louis quoted above.

with those due to 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 commencement of the rectum or terminal part of the sigmoid flexure was adherent to one 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 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 or lower part of the colon. 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.*

In a case of my own of adhesion of the transverse colon to the uterus, to which I have already alluded (page 83), the symptoms of chronic obstruction had existed for two and a half years before the operation was performed.

B. *In the small intestine.*—The symptoms, when the obstruction is in this part of the bowel, may also be either 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 fifty-eight, 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

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

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 matter. As the case progressed the vomiting became more frequent (every two or three hours) and stercoraceous. 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 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 were 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 were evidences of incomplete obstruction. The constipation alternated 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 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.

In the more chronic cases the symptoms are in all particulars identical with those of stricture of the bowel.

There are the same colic, the same form of vomiting, and the same hypertrophy of the bowel above the stenosed part. Such cases, indeed, are—so far as their mechanism is concerned—identical with those of stricture of the bowel.

The form of intestinal obstruction now under consideration is apt, both when the small and the large gut are

involved, to appear in paroxysms or repeated attacks associated in the intervals between the relapses by periods of more or less abdominal uneasiness.

4. **Obstruction 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, in very rare instances, by their shrinking, so compress the intestine as to narrow its lumen. This form of constriction, rare as it is, 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 thus described by 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, 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."* It is more than probable that the examples met with about the colic flexures are due to the cicatrisation of non-malignant ulcers, and especially of the "stercoral ulcer." In other instances the cause of the constricting peritonitis is not so evident. An example of such a case is afforded by a specimen in the London Hospital† (Fig. 29). 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 wanting. 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

* Loc. cit., p. 632.

† London Hospital Museum, No. Ac. 84.

example of a constriction at the splenic flexure due to adhesions.*

In a singular specimen from the Royal College of

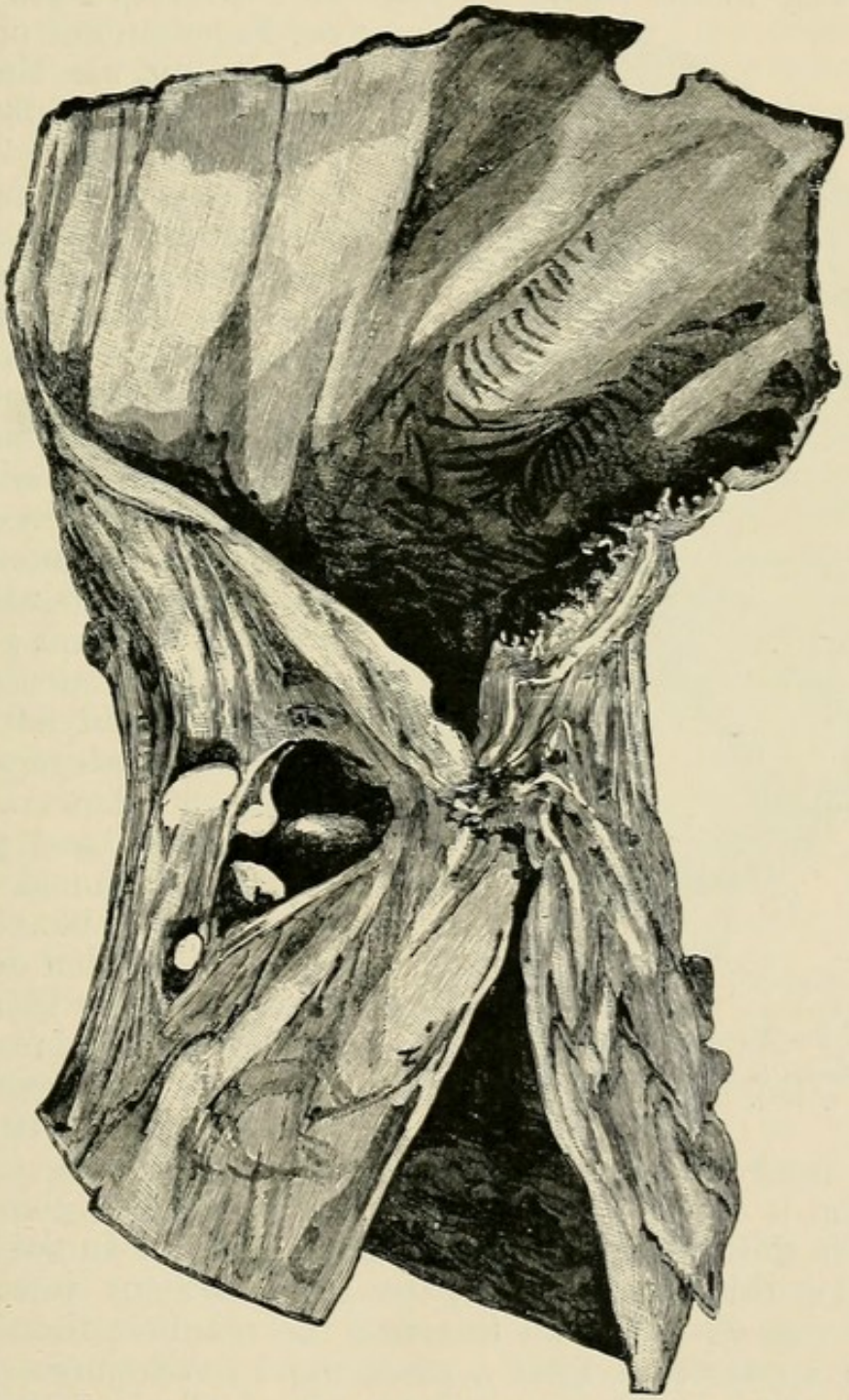


FIG. 29.—Stenosis of ascending Colon from the contraction of Peritoneal Adhesions.

Surgeons Museum, one of the appendices epiploicæ has contracted such an adhesion to the attached omentum as to cause constriction of the bowel† (Fig. 25).

* Guy's Hosp. Museum, No. 1852.

† Royal Coll. of Surgeons Museum, No. 2693.

I have found no example of this form of obstruction in the small intestine in which there has not been some complication. 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 inches of the ileum were adherent to the fundus of a cancerous uterus. The intestine so involved was so narrowed as barely to admit a goose-quill.† It is doubtful if this case would fall under the present category.

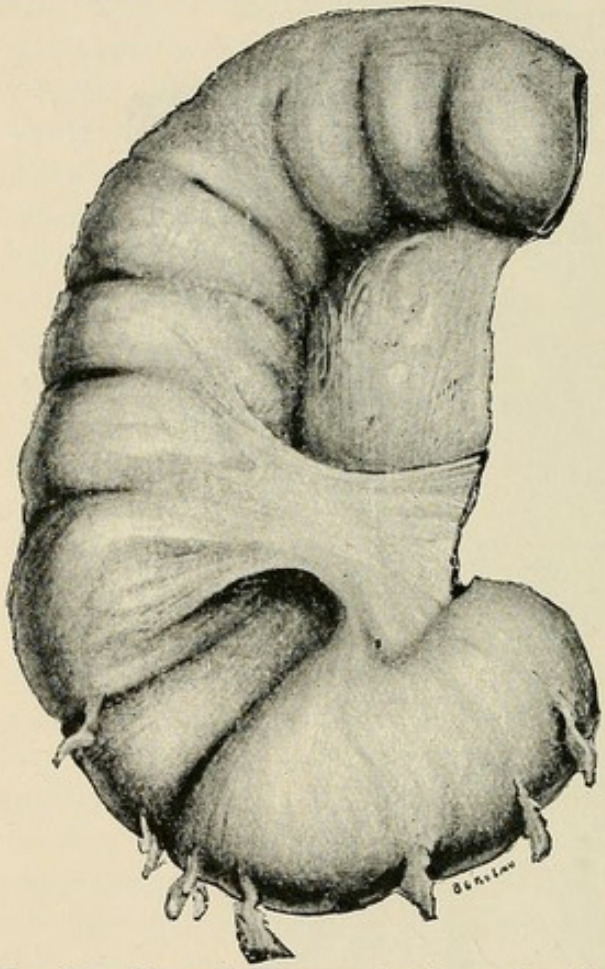


FIG. 30.—Sigmoid Flexure showing a broad membranous Peritoneal Band passing from the Mesocolon to the Gut.

The peritoneum is white and thick. (*Royal Coll. of Surg. Mus.*, No. 2696 A.)

Fig. 30 shows a broad membranous band passing from the sigmoid mesocolon to the bowel. Although the colon does not appear to have been compressed, the band may have hindered the progress of the intestinal contents.

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.

A. **The Small Intestine.**—The coils of the lesser bowel

* Loc. cit.

† Path. Soc. Trans., vol. iii., p. 108.

may be matted together in many different ways. (1) In one set of cases a small segment of the gut is so adherent as to form a permanent and unchanging loop. (2) In another set of cases many coils, representing 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.

(1) 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. 31, A and Fig. 32),* or it may be closed, the walls of the involved bowel being adherent in their entire extent (Fig. 31, B). The latter variety involves a much smaller amount of 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 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. 32; if extensive, a closed loop as in the specimen (No. Q 128) in St. Thomas's Hospital Museum.

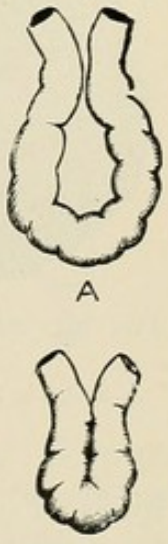


Fig. 31.

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 ulcers of the intestine, but may follow also from destructive processes induced by compression, and from injury.‡

* Guy's Hosp. Museum Reports, 1836, p. 21., and case in *Brit. Med. Journ.*, vol. ii., 1897, p. 950.

† For specimens of these loops *see* St. Bart.'s Hosp. Museum, No. 2100; Path. Soc. Trans., vol. x., case by Mr. Birkett; and St. Thomas's Hosp. Museum, Q. No. 128.

‡ Path. Soc. Trans., vol. x.; Mr. Birkett's case.

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. 33). Here the transverse colon communicated with the ileum at two points through a cavity whose walls were formed 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.

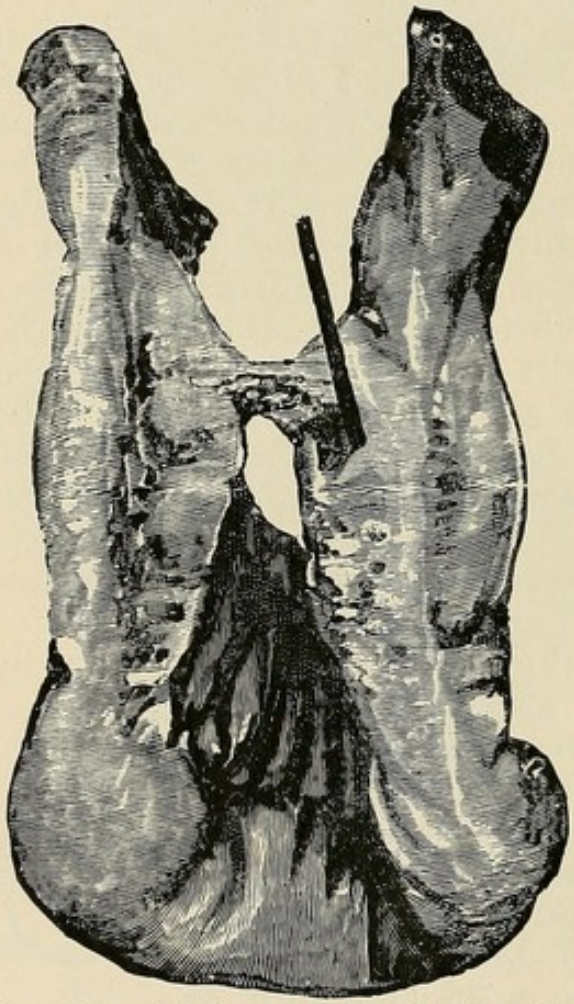


FIG. 32.—Ahdesions forming the Bowel into a Loop.

A probe is introduced into a perforation in the intestine.

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 engaged 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. 34, A). The gut above the bend in

* Vol. xiv., 1863 p. 201.

time enlarges from distension until it forms an actual ampulla (Fig. 34, 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. 34, B is taken. In this case the ampulla was so large that the lower segment of the 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.

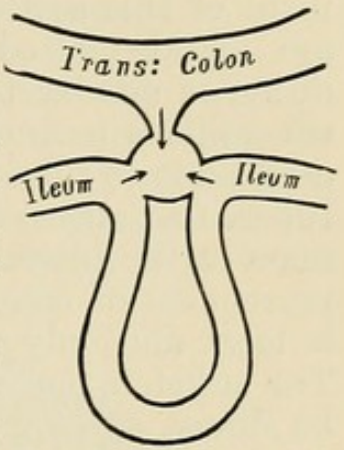


FIG. 33. — Fistula bimucosa, with formation of a Loop in the Ileum.

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.

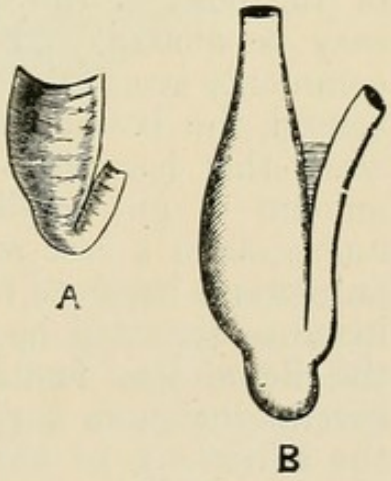


FIG. 34.

Apropos of these cases, one might notice an 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

* Bull. et Mém. de la Soc. de Chir. de Paris, tome vi., 1880, p. 282.

† M. Bricheteau (Bull. de la Soc. Anat. de Paris, 1862, p. 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.

bend retained in a fixed position by adhesions, apparently of recent formation.*

(2) In the second set of cases, alluded to at the commencement of this section (page 91), certain coils of the intestine are found matted together in a confused mass. The condition is similar to that met with in some cases of chronic tuberculous peritonitis. Certain of the examples are without doubt due to tuberculous peritonitis of a limited extent. The tubercular affection in most instances involves the whole mass of the intestines and is a very diffused process. In the present set of cases the peritonitis (no matter what its cause) is 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 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. 35. 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 implicated 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 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.§

I have met with an instance in a young woman where, as a result of mischief in the appendix, many feet of the lower ileum became matted together in inextricable confusion. The adhesions were membranous, were bright, thin and translucent, and quite like the normal peritoneum of

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

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

‡ Path. Soc. Trans., vol. viii., p. 200.

§ *Lancet*, vol. i., 1883, p. 818.

an infant. The patient was liable to obstructive attacks of short duration, which were marked by severe pain, vomiting and constipation. There was no rise of temperature and no marked tenderness of the abdomen.

Various forms of local peritonitis have led to this condition of the bowels. It has followed upon the relief of strangulated hernia, and upon ovariotomy and other abdominal operations. It has been due to pelvic peritonitis, to extensive ulceration of the bowel, and to mischief in the appendix. In one case under my care a clump of intestine

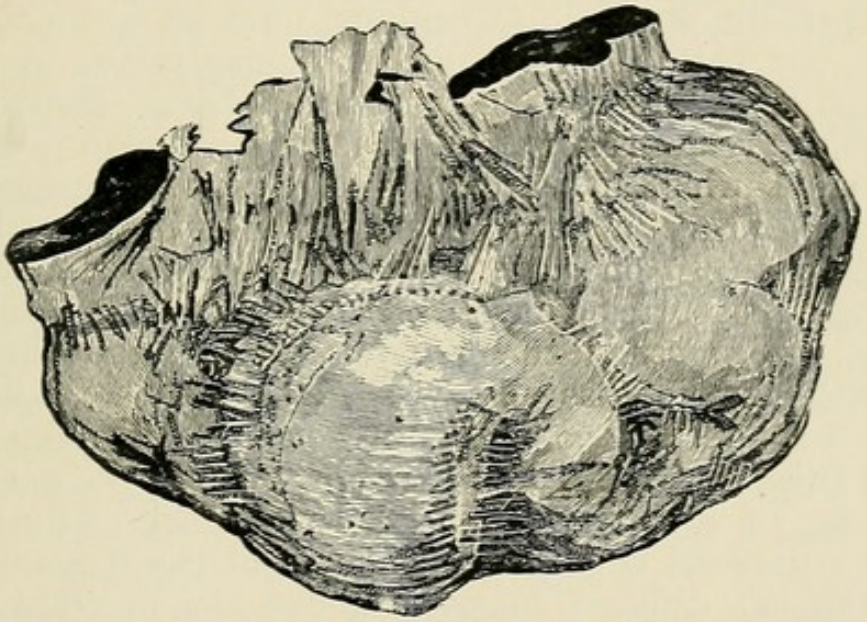


FIG. 35.—Diffused Peritoneal Adhesions.

was matted together in the pelvis and formed a confused mass. The patient, a middle-aged woman, had suffered from a dermoid cyst of the ovary which had suppurated and had—after years of suffering—discharged all its contents through the vagina and then healed.

In another case of subacute obstruction in a young married woman a lump as large as the fist could be felt in the abdomen. This was the seat of much pain and tenderness. It was the seat also of much visible intestinal movement and of many bubbling and gurgling noises. It could also be moved a little from its place. A retro-peritoneal hernia had been suggested, but the mass felt too solid, and was, moreover, usually dull on percussion. Occasionally it was resonant when percussed. The patient was thin, but free from any apparent disease. The trouble in her abdomen was almost incessant, and had persisted for some weeks. The main complaint was of colic, of griping pain after food, of constipation, and of frequent and fairly

copious vomiting. I performed laparatomy, and found some coils of small intestine rolled up in a mass around a clump of tuberculous mesenteric glands. The bowel was rectified as regards its position by enucleating the glands.

In one recorded case, at least, the intestines were found matted together by peritoneal inflammation following upon cancer of the bowel itself.*

The *symptoms* that arise are practically 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 stercoraceous 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, which 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.

* Bull. de la Soc. Anat., 1877, p. 473, M. Regeard.

The duration of the cases when once symptoms have appeared varies, and may be reckoned in months rather than in weeks. In one case 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. Symptoms may make their appearance very soon after the causative peritonitis. In one case, reported by Dr. Fagge, the patient died with symptoms of obstruction which had continued for twelve days after the relief of a strangulated hernia by operation. Here coils of gut were found matted together by adhesions which 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. Quite recently, at the London Hospital, I opened the abdomen of a middle-aged man who had presented for months the symptoms of pyloric obstruction. I found the whole of the upper segment of the abdomen occupied by a confused mass of adhesions. Stomach, liver, transverse colon, omentum, and small intestine were matted together in the most remarkable way. The adhesions were membranous, were perfectly clear, thin and translucent, and reminded me, as other cases have, of the normal peritoneum of an infant. They were not like the usual adhesions left by peritonitis. The most careful inquiry into the patient's history, supplemented by a later inquiry from his mother, threw no light upon the cause of these adhesions. He had never had any symptoms of peritonitis, and, indeed, he had presented no abdominal trouble until the gastric symptoms appeared.

This case, and one or two others like it, seem to support the possibility of intra-uterine peritonitis.

The interest of the case, so far as the present subject is concerned, rests in the fact that in spite of the mass of adhesions which existed among the coils of intestine the patient had never had colic, constipation, or any intestinal uneasiness.

The stomach was dilated and the pylorus normal, but the commencement of the duodenum was bent by these adhesions. I separated the attachments about the pylorus so far as I was able. The patient was relieved of his symptoms for only a month or so. As his condition became in time as bad as ever, I

opened the abdomen a second time and performed a gastro-enterostomy. Since this measure the patient has been quite well. The adhesions, as exposed at the second operation, presented the same aspect as before and rendered the approximation of the jejunum to the stomach uncommonly difficult.

The pylorus was examined from the interior of the stomach and was found to be normal.

B. **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.

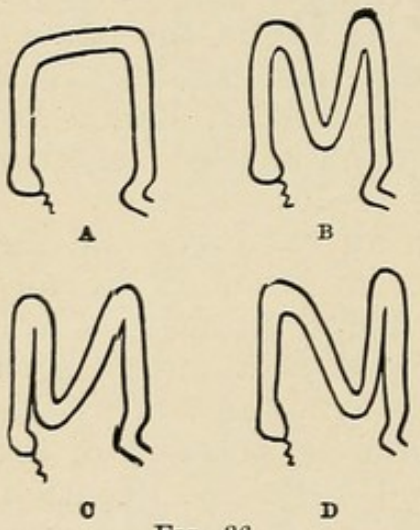


FIG. 36.

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 the 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. 36, B). This particular change is quite frequent in the subjects of chronic constipation. 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

* 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., p. 157).

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

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‡ (Fig. 36, C and D). In some 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.

It is possible 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, which 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.

There are cases where one limb of the bent colic arch is found adherent to the ascending or descending colon for its entire length, no obstruction of any kind being 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 serous coat of the ulcerated bowel. Thus, in the case reported by Mr. Shaw, the position depicted in Fig. 36, 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 apt to lead to volvulus of that part; and in the case of the deformed and adherent

* Mr. Shaw; Path. Soc. Trans., vol. iv., p. 147.

† Dr. Hilton Fagge, loc. cit.

‡ *See* case of George Luff (p. 100)

§ Dr. Fagge, loc. cit. Assuming that the bend was not due to chronic constipation.

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.

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. 36, 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, whatever its cause, while his health was good; but the shock of the accident, his advanced age, and above all, 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.

6. **Narrowing of the Bowel from Shrinking of the Mesentery after Inflammation.**—It is said that 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 found bound down to the spine by the shortened mesentery and much shrunken in appearance. This is often the result of mesenteric gland disease.

I might refer to four apparent 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."† I give this quotation from Leichtenstern, as I have no personal experience of this form of obstruction, and do not think that the recorded cases are so clear as they might be.

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., p. 157.

† Loc. cit., p. 632.

CHAPTER IV.

INTERNAL HERNIÆ.

It will be convenient to consider in this place certain herniæ which are met with in the abdominal space, and which are called "internal" because they form no protrusion outside the body cavity. In these herniæ bowel is protruded or herniated through certain apertures, but those apertures do not lead out upon the surface of the body.

From an anatomical point of view the collecting together of the rare and curious conditions which are comprised under the term "internal herniæ" is convenient, because throughout a series of cases apparently dissimilar there is the common bond of a common anatomical state.

Clinically, the cases which are comprised under this heading present many differences.

Taken altogether, they form a medley of symptoms. Some cases assume a chronic type, some an acute; some produce the phenomena of intestinal obstruction, some do not; in some the clinical associations which surround the term rupture or hernia seem fitting to the case, while in others the symptoms produced appear quite foreign to the general circumstances of a hernial protrusion.

As the conditions dealt with in this chapter are rare, and as they cannot be welded together by any common clinical type, it will be convenient to consider the symptoms of each form of hernia as it is treated upon, and to leave the ground free of the encumbrance of exceptional cases.

Very little examination into the history of recorded cases will make it evident that "internal hernia" must not be confused with "internal strangulation."

The following varieties come under the present heading:

1. Diaphragmatic hernia.
2. Hernia into the fossa duodeno-jejunalis.

3. Hernia into the Foramen of Winslow.
4. Intersigmoid hernia.
5. Pericæcal hernia.

1. **Diaphragmatic Hernia.—Pathology.**—In this lesion certain of the abdominal viscera are thrust through a hole or rent in the diaphragm into the thorax. The aperture in the diaphragm may be due to rupture by indirect violence, to wound, or to congenital defect.

The most elaborate account of this hernia is given by Lacher,* who deals with a series of 267 recorded cases. Out of Lacher's cases 150 were due to injury, and 117 were of congenital origin. In both varieties the hernia is very much more common on the left side. In the first place congenital gaps are more often met with in the left segment of the diaphragm, and many suicidal and homicidal wounds are aimed at the heart. In the second place the liver forms a protection to the right side of the diaphragm, and would almost prevent a rupture should a gap occur in that section of the septum. Out of the 117 congenital cases ninety-eight were left-sided and nineteen were on the right. Of the 150 traumatic cases 127 were left and twenty-three were right.

The opening in the diaphragm is most usually in the posterior part of the membrane, and in the tendinous portion of it.

In shape and size it varies from a mere slit, or small hole, to a gap which, in the congenital cases, may represent the absence of one half or more of the diaphragm.

Very rarely has the hernia a sac. Out of Lacher's 267 there was a sac in only twenty-eight examples, and of this number twenty-five were congenital. Jaffe† gives an account of twelve recorded cases in which there was a sac. Some writers limit the term "true" diaphragmatic hernia to the cases in which there is a sac.

With regard to the contents of the hernia the stomach is the organ most frequently protruded, and next in frequency is the colon. As a rule two or more organs are found in the hernia. In only fifty-three of Lacher's cases did the rupture contain a single viscus only. The stomach was protruded in 151 cases, the colon in 145, the lesser bowel in eighty-three, the liver in forty-five, the duodenum in thirty-five, the pancreas in twenty-seven, the cæcum in twenty, and the kidney in two.

Clinical Manifestations.—These are subject to much variation. Many of the recorded cases have occurred in still-

* Arch. für klin. Med., 1880, xxvii., p. 268.
† Path. Soc. Trans., 1894, p. 224.

born infants, or in infants that have lived only a few hours, or a few days, or weeks. Several of these infants have died suddenly. The diagnosis is always difficult, and indeed out of 267 cases a right diagnosis was made in only seven instances. In a few examples the hernia has given no trouble and has not been suspected. In the majority of instances there is distressing dyspepsia, with heartburn, thirst, colic and great abdominal uneasiness.

Vomiting is common, as is also palpitation of the heart. In some cases the vomiting has been very copious, in others less copious but very persistent. Some patients have always been worse after exertion, some have had more trouble after taking food, while others have had less. A few have had an impression that the food remained in the chest, and many have had a severe fixed pain in the chest.

Now and then there are alarming dyspnœa, great sense of oppression in the chest, and cough. Some patients are described as having had asthma. The patient may not be able to lie upon the affected side. This is a common circumstance.

When the hernia is large there may be a hollowing of the abdomen below the ribs, and a corresponding fulness of the lower part of the thorax, together with displacement of the heart and evidence of the presence of the stomach or bowel in the thorax.

The diaphragm has been found pushed up as high as the second rib,* or even as far nearly as the clavicle.† Finally, the hernia may become acutely strangulated, and the patient exhibit all the phenomena of acute intestinal obstruction.

Frey‡ gives twenty-one cases of death from strangulation of a diaphragmatic hernia. In each of the cases the cause of the hernia was a wound. In seven the strangulation occurred very soon after the injury, in fourteen it did not appear until months or years had elapsed. In some the fatal strangulation was brought on by coughing or straining ; in others it occurred without reason.

As cases illustrative of diaphragmatic hernia the two following may be selected, one as an example of a chronic case and one of an acute form.

The first case is reported by Dr. Hale and Dr. Goodhart in the Transactions of the Clinical Society (vol. xxvi., 1893, p. 105).

* *Edin. Med. Journ.*, 1869, p. 894.
† Bowditch : Diaphragmatic Hernia.
‡ Wien. Med. Wochensch., 1893, p. 160.

N.P., æt. 49, the subject of a double inguinal hernia, after much exposure and hard work in India, came to England at the end of 1891 on account of ill-health. He complained chiefly of waterbrash and acid eructations, with occasional vomiting. He was seen by Sir Joseph Fayrer, who could detect no organic disease. When Dr. Hale first saw the patient, in January, 1892, he was lying in bed, and constantly bringing up mouthfuls of dark-coloured mucus, while about every week or ten days he vomited enormous quantities of fluid of a similar character. He complained of heat and pain at the ensiform cartilage. His bowels were obstinately confined. His diet was at first restricted to milk and rusks, with only temporary relief; he was then given nothing but peptonised milk, and for a whole month vomiting ceased; as, however, it returned as copiously as ever, his stomach was washed out daily with decided benefit for about a fortnight. Milk, farinaceous food, and eggs were then given him, but copious vomiting of yeasty-looking, fœtid fluid immediately resulted. He had been losing flesh throughout his illness, but emaciation now became rapid and extreme. He was seen by Dr. Goodhart two days before death. Tympanitic resonance posteriorly as high as the middle of the left scapula and retraction of the abdomen were the only abnormal signs observed. He was thought to be dying of cancer of the stomach.

The post-mortem revealed a diaphragmatic hernia. The hernial contents were enclosed in a distinct sac which lay across the spine immediately above the diaphragm, and the orifice of which extended from the œsophageal opening on the left to the opening of the vena cava on the right. The gap appeared to be due to a congenital weakening, and subsequent bulging, of the midrib between the crura.

The sac contained two-thirds of the stomach, and with it a large loop of the transverse colon, the lesser omentum, the greater part of pancreas, and the duodenum. The stomach was twisted somewhat, so that the omentum was uppermost, and the posterior wall of the viscus, towards the pyloric end, looked forwards. The pyloric orifice was within the sac, and was unusually thin. The stomach itself was thick.

The viscera except for the displacement were normal. The pancreas was elongated from stretching.

The second case is recorded by Mr. A. E. Maylard in the *Glasgow Medical Journal* (vol. xlvi., 1896, p. 143).

A schoolboy, aged eight, was seized with vomiting on Thursday night, October 31st, 1895, shortly after having eaten some nuts and apples. He suffered no abdominal pain at the onset. The following day, Friday, he was given some castor oil which he vomited. He continued to vomit everything he took on Saturday and Sunday. On Tuesday evening his vomiting became "fæcal." Neither flatus nor fæces passed during these days. There was no history of previous disease of, or injury to, the abdomen.

He was admitted into the Victoria Hospital at 7.15 p.m. on Wednesday, November 6th—*i.e.* on the sixth day of the symptoms. He was then in a condition of some collapse with rapid and feeble pulse. He complained of pain and tenderness in the left hypochondriac region. The pain, he stated, commenced in the left groin, and was spasmodic in character. The colon was evidently distended as was the whole of the abdomen. Rectal examination revealed nothing. Laparotomy was performed one hour after admission. Prior to opening the abdomen the parts were palpated, when a very well-defined, sausage-shaped

tumour could be felt in the epigastric region, tapering off somewhat towards the right hypochondrium, but ending abruptly when traced to the left. On opening the abdomen distended small bowel presented. It led to the cæcum. This, with the colon as far as the splenic flexure, was enormously distended. The descending colon was collapsed. On examination, an aperture was found in the diaphragm through which the colon passed. No traction on the latter would release the intestine until the aperture was dilated with the finger. The gut, lax and paralysed, was withdrawn and the abdomen closed. The boy survived the operation twelve hours. The autopsy showed a circular opening three-quarters of an inch in diameter in the left leaf of the diaphragm close to the left lateral parietes. Some omentum had passed through the opening and had become adherent.

Treatment.—Operative measures are alone to be considered, and so far as the present subject is concerned they may be regarded only as they refer to cases attended with all the symptoms of acute intestinal obstruction.

Many cases presenting these symptoms have been treated by operation, but the results, so far as I know, have been uniformly unsuccessful in the saving of life.

Schwartz and Rochard* record a case where all the typical signs of acute intestinal obstruction were present. Laparotomy was performed, and a careful examination of the abdomen made, but nothing was detected. The patient died, and the autopsy revealed a loop of bowel formed by the transverse and descending colon strangulated by an aperture in the diaphragm.

The records of other cases treated by operation show that the gut when reduced may be gangrenous, or that its reduction may be impossible or only attended by much rough handling of already damaged parts.

There is no doubt but that a diaphragmatic hernia is most easily approached from the thorax. This has been shown in the treatment of recent cases depending upon wound. Postempski treated two cases with success by approaching the protrusion through the thorax. In one he reduced some bowel, in the other he sutured and reduced the wounded stomach. In both cases he closed the hole in the diaphragm.

In order to expose a hernia from the pleural side an extensive resection of ribs may be necessary.

In dealing with a case in which symptoms of intestinal obstruction have appeared, it is probable that the abdominal cavity will be opened unless a very precise diagnosis has been made. As soon as it is discovered that the case is one of diaphragmatic hernia, the pleura should be opened.

* *Revue de Chirurgie*, 1892, p. 756.

Such a measure has these advantages. In the first place, it enables the surgeon to ascertain the state of the strangulated bowel and avoid the misfortune of dragging a coil of gangrenous or perforated gut into the abdomen in an inaccessible region. In the second place, the opening into the pleura permits of the hernia being returned precisely and easily, and of the more ready closure of the hole in the diaphragm.

In one case alluded to by Mr. Stephen Paget all attempts to reduce the hernia through the abdomen failed until air was allowed to enter the pleural cavity.* Thirdly, the pleural cavity, if infected, can be treated.

Against this measure of opening the pleura it must be urged that the patient, in a case of acute intestinal obstruction, is not in a condition to stand an extended operation, and that pneumothorax is a serious complication in a case already grave enough.

2. **Hernia into the Fossa Duodeno-jejunalis.—Pathology.**—This hernia is known by many names, of which the following are the chief:—Retroperitoneal hernia, mesocolic or mesenteric hernia, mesogastric hernia, intermesenteric hernia, duodenal hernia, and the hernia of Treitz.

The fossa duodeno-jejunalis is formed by a fold of peritoneum at the point where the duodenum ends in the jejunum. It lies to the left side of this point, and can be exposed by drawing the transverse colon upwards and following downwards the under layer of the transverse mesocolon. (Fig. 37.) Its orifice looks upwards, and in well-marked specimens the fossa will engage the thumb up to the first joint. Out of one hundred bodies examined, I found this fossa in forty-eight. I have given a full account of it in Morris's "Treatise on Anatomy," page 1002.

This particular and remarkable hernia has long been known to surgeons. It was originally supposed to represent a curious deformity of the peritoneum, and was so described by Neubauer in 1776.† Sir Astley Cooper appears to have been the first to recognise that it was a veritable hernia. He gives an excellent plate of an example in his great work on hernia. The first really complete account of this hernia was given by Trietz,‡ and this was supplemented in 1868 by the excellent anatomical descriptions of the peritoneal fossæ by Waldeyer.§ The literary history of the

* Surgery of the Chest. Bristol, 1896, p. 152.
† Opera Anatomica Collecta. Georgius Hinderer. Frankfort, 1687.
‡ Hernia retroperitonealis. Prag., 1857.
§ Hernia retroperitonealis. Breslau, 1868.

retroperitoneal hernia is fully given by Jonnesco in his well-known and exhaustive treatise.*

In this hernia the fossa in question becomes deeper and deeper, and accommodates more and more intestine. The entering gut pushes the peritoneum which formed the fossa in front of it, and so makes for itself a real sac. The sac spreads in the lax retroperitoneal tissue, and attains at last enormous dimensions. Still, even in the largest herniæ there is a complete sac, although its substance may be very thin. The sac is behind the posterior parietal peritoneum, and to

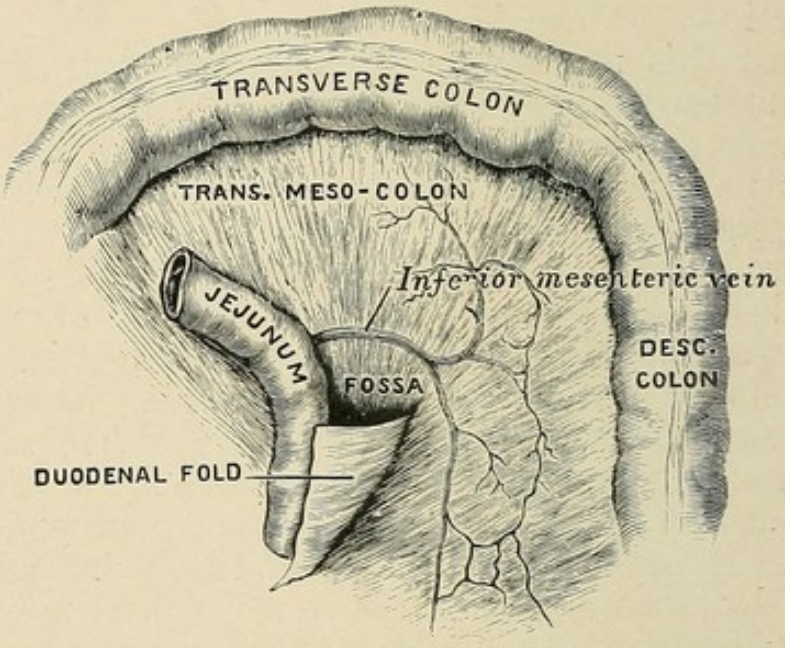


FIG. 37.—The Fossa Duodeno-jejunalis (*Treves*).

expose the contents of the sac from the front two layers of the serous membrane would have to be divided: one belonging to the posterior parietal peritoneum, and one to the involuted peritoneum which had extended in from the fossa. The sac nearly always extends to the left (*left retro-peritoneal hernia*). It may in exceptional cases extend to the right (*right hernia*). Jonnesco has collected sixty-four recorded examples of hernia into the fossa duodeno-jejunalis, and of this number only eight extended to the right, and even among these eight cases are three which are doubtful. Our account, therefore, will concern itself with the more common type of the hernia. The sac extends to the left of the spine, and the orifice of the sac is just to the left of the column. When the hernia is small it forms a flattened somewhat kidney-shaped swelling beneath the parietal peritoneum and below the level of the attachment of the

* Hernies Internes Rétropéritonéales. Paris, 1890.

transverse mesocolon (Fig. 38). As it extends it spreads upwards and downwards and to the left, and becomes more and more globular in outline (Fig. 39).

The sac extends in front of the kidney and pancreas and the great vessels. Above it reaches up behind the stomach

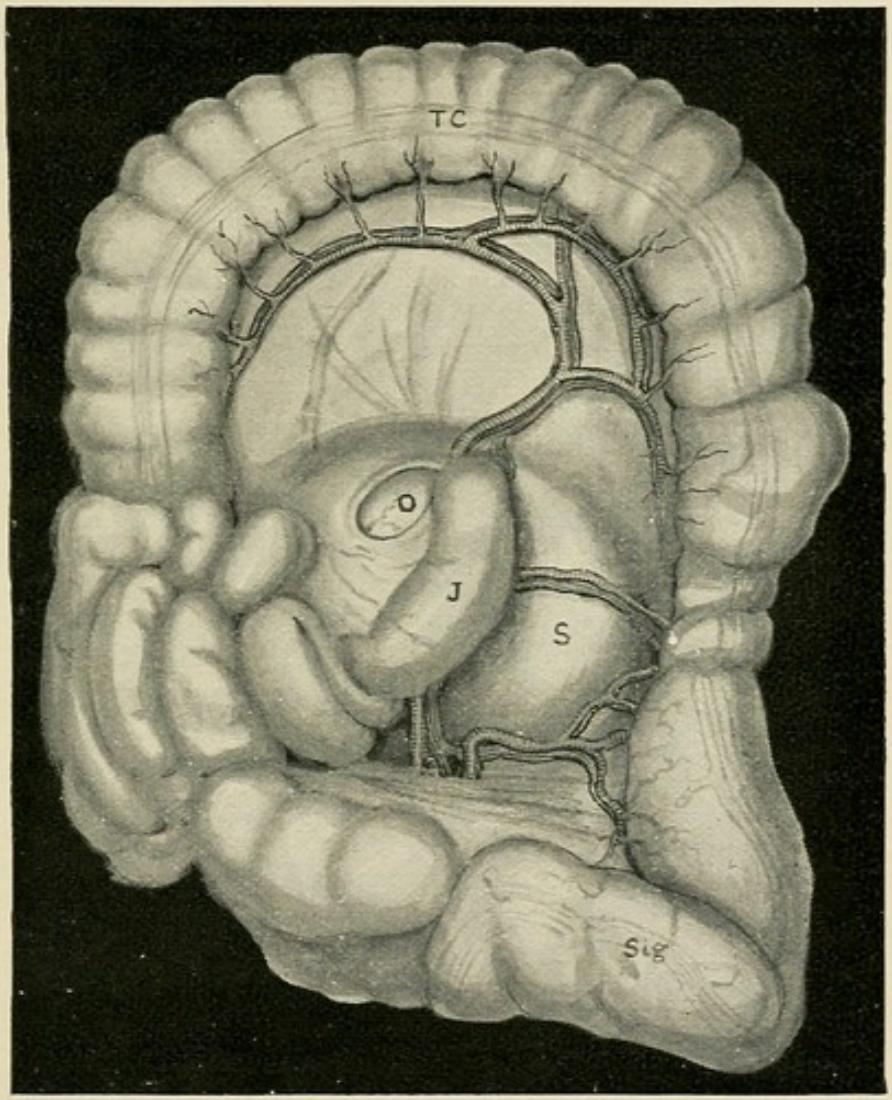


FIG. 38.—Small Hernia into the Fossa Duodeno-jejunalis (*Gruber's case*).

T C, transverse colon turned up; J, jejunum; SIG, sigmoid flexure; S, sac over which runs the left colic artery; O, orifice of sac.

and below to the pelvic brim. The spleen is pushed in front of it, and to the left. The omentum lies either in front of it or is tucked away above its upper margin. The colon, as a rule, retains to some extent its normal position and surrounds the hernia at the two sides and above (Fig. 40). The descending colon may be lost to view behind the left border of the sac. The transverse colon may cross the front of the sac or be found along its lower border. In one case reported by Treitz the whole of the colon was found to be pushed over to the right side of the sac.

The sac contains more or less of the small intestine, according to its size. Indeed, the amount of the lesser bowel contained in the hernia may vary from a few inches of the upper jejunum to the whole of the small intestine. The gut enters the sac in anatomical order, the jejunum entering

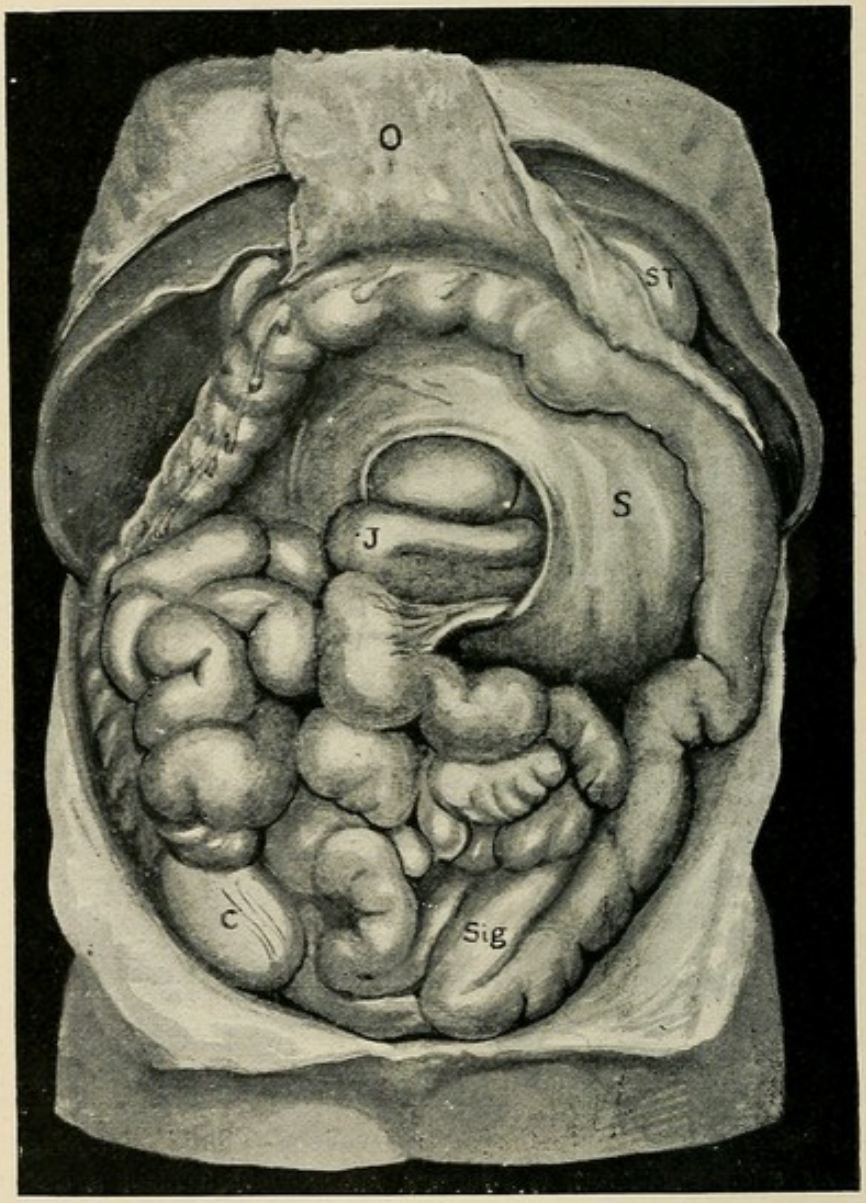


FIG. 39.—Hernia of medium size into the Fossa Duodeno-Jejunalis (*Lambl's case*).
O, great omentum attached to transverse colon; ST, stomach; J, jejunum at orifice of sac; S, the sac; C, cæcum; SIG, sigmoid flexure.

before the ileum. While the hernia is of medium size, two portions of bowel can be seen to occupy the orifice of the sac, one belongs to the entering and the other to the escaping bowel (*see* specimen in the museum of the Royal College of Surgeons, No. 2696 E). When, however, the hernia is complete, one coil only is seen, which belongs to the termination of the ileum. In a complete case, when the abdomen is opened, of the alimentary canal only the stomach and colon are

visible. The whole of the small intestine is lost to view in an enormous sac, which is placed behind the posterior parietal peritoneum, and which seems to occupy the major part of the abdomen.

The gut contained in the sac is normal in appearance. If

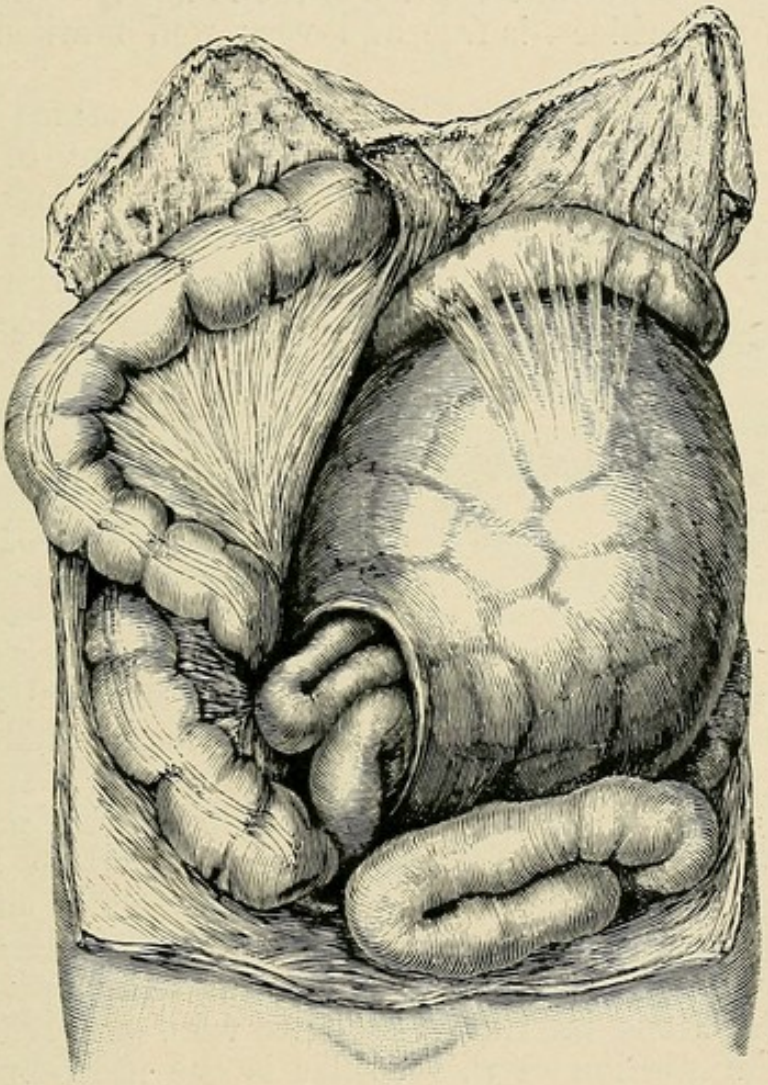


FIG. 40.—Hernia in the Fossa Duodeno-Jejunalis (*Treves*).

The hernial orifice is displaced to near the cæcum. The colon has been drawn aside to show the sac which contains all the small intestines.

strangulation occurs it is always produced by the margins of the orifice of the sac. As regards the orifice of the sac its site varies. When the hernia is small it lies close to the vertebral column and to the left of it. As the hernia increases the orifice descends obliquely towards the right. It crosses the spine, and may ultimately be found in the right iliac fossa close to the cæcum (Fig. 40). The actual orifice is either round, oval, or ellipsoid in shape. In the small hernia the longer diameter is usually transverse (Figs. 38 and 39) while in the large herniæ it is vertical (Fig. 40).

The size of the orifice of the sac varies. The mean measurement is two and a half inches by one inch and a half.

The posterior margin of the hernial orifice is ill-defined and more or less fixed, while the anterior margin—which may be considered to comprise three-fourths of the circumference of the orifice—is free and very well marked (Figs. 39 and 40).

At the anterior or free margin of the orifice the peritoneum in front of the sac joins the single layer of peritoneum which forms the sac.

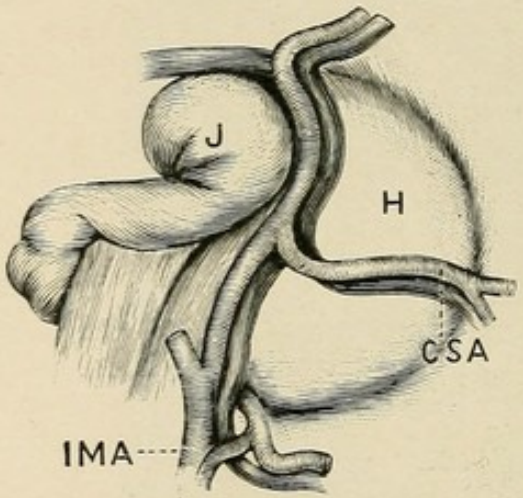


FIG. 41.—Hernia into the Fossa Duodeno-jejunalis.

Relation of vessels to the orifice of the sac:—J, jejunum occupying the orifice of the sac; H, the hernial sac; CSA, colica sinistra artery; IMA, inferior mesenteric artery (*From Jonnesco*).

At the posterior or fixed margin of the orifice the peritoneum belonging to the sac is continuous directly with the peritoneum belonging to the rest of the abdominal cavity. The two layers will join in the same plane.

The mesentery of the intestine within the sac is continuous by its two layers with the peritoneum which actually forms the sac.

It is important to note the relations of certain blood-vessels to the orifice of the sac. These vessels have the following relations to the anterior or free margin of the orifice. Curving round the upper part of this border is the inferior mesenteric vein. In relation with the anterior portion of this border is the ascending branch of the left colic artery with its vein (Fig. 41). At the lower part of the orifice the artery and vein may be separated by the free border itself. The thickness and roundness of the upper portion of the free border are due to the large inferior mesenteric vein which it contains.

In the right retroperitoneal hernia (the rare form) the sac is found on the right side of the spinal column and lying between the liver and the right iliac fossa. Its general disposition is precisely the same as in the variety of the hernia just described. It is surrounded closely by the colon on the right side, but on the left side the colon is more or less free.

The orifice is to be found at some part of the left side of the sac. Running in the anterior or free margin of the orifice will be found the superior mesenteric artery.

The small intestine contained in the sac is twisted upon itself in such a way that it is placed behind its mesenteric pedicle. This pedicle is connected with the anterior free margin of the sac instead of with the posterior fixed margin, as in the left hernia.

Clinical Manifestations.—This hernia is much more common in males than in females, in the proportion of about 5 or 4 to 1. It has been met with at all ages, in the newly-born,* in an infant of two months,† in children of fourteen,‡ and in men of sixty.§

The great majority of the cases, however, have been met with in adults between twenty-five and fifty. There are very few cases in young children, *e.g.* between the ages of two and ten years. With the exception of a case of Standenmayer's, reported by Jonnesco, I am not aware that this hernia has been diagnosed during life or before operation.

Clinically the cases may be divided into four categories :—

1. Cases discovered post-mortem.
2. Cases attended with continued digestive disturbances.
3. Cases associated with intestinal obstruction of a subacute or chronic type.
4. Cases in which the hernia is strangulated.

(1) The cases in this category are the most numerous. In not a few instances the specimen was obtained from the dissecting-room. In a large proportion of the examples there is more or less satisfactory evidence to the effect that the individual when alive had had no definite or very noticeable abdominal trouble. In certain of the cases there is positive evidence on this head, the patient having been under close observation before death, and having succumbed to some extra-abdominal affection.

(2) The symptoms in this series of instances show much variation. There are vague pains in the abdomen or actual attacks of colic, which may appear some time after taking food, especially such as is indigestible. Often the colicky pains are in no way to be accounted for. There is dyspepsia, and possibly a dilated stomach. In some cases there has been much gastric catarrh, and in others enteritis. Constipation is common or constipation alternating with diarrhœa. The symptoms are, indeed, those of continued abdominal uneasiness. A great sense of fulness in the umbilical region

* Gruber : Petersburg Med. Zeitschrift. I., 1861, p. 247.
† Treitz : Hernia retroperitonealis. Prag., 1857.
‡ Hauff : Jahrbücher der gesammt. Med. Schmidt, 1839.
§ Eppinger : Viertelsjahrsch. für die prakt. Heilkunde, 1870, b. i., p. 127.

has been a special complaint with many. If the hernia be small no abdominal swelling can be in evidence. In the large herniæ a circumscribed tumour has been described which is usually on the left side of the abdomen, which is fixed, and feels like a cyst. This tumour is more or less resonant on percussion, and it may be possible to demonstrate that it is surrounded by the colon. It does not move on inspiration. When the abdomen is the seat of colicky pain the tumour may appear to increase or become altered in outline.

(3) In the third series of cases the leading phenomena are those of intestinal obstruction. The onset of these symptoms may be abrupt or they may be preceded by such indefinite abdominal disturbances as have just been described. Two admirable examples of this phase of the hernia have been described by Standenmayer* and by Strazewski†. The former concerned a boy of seven years, who died after thirty-three days of almost continuous distress. The latter case was that of a man of fifty-five, who died at the end of fifty-three days, during which time he had exhibited the signs of intermittent obstruction.

The principal symptoms are pain of the nature of colic, vomiting, and constipation. The progress of the case is marked by attacks of varying duration and of varying frequency. The constipation may alternate with diarrhœa. In the severer attacks the vomiting may be excessive, and the patient almost collapsed. The attacks become more frequent, and at last the vomiting and colic are almost incessant and the constipation is absolute.

A tumour, with the characters described in a previous section, may be detected. Large anastomotic veins passing between the epigastric and internal mammary vessels may be visible upon the front of the abdomen.

There may be hæmorrhoids, due—it has been suggested—to pressure upon the inferior mesenteric vein.

Visible coils of intestine in movement may be seen through the thinned parietes, and gurgling and bubbling sounds in the abdomen are almost constant.

(4) In the fourth series of cases the symptoms are those of acute intestinal obstruction, and of that form which concerns especially the small intestine. Some eight examples of this variety have been placed on record, and in two of these a laparotomy was performed, but without avail.‡

* Dissertation zur Erlang. der Doctorwürde. Stuttgart, 1886.

† Journ. Hebdom. de Méd. et d'Hygiene, 1888, p. 682.

‡ Ridge and Hilton. Paper read before the Hunterian Society, Jan. 18th, 1854. The patient was a lad of fourteen; Quénu, quoted by Jonnesco. Hernies Rétropéritonéales, Paris, 1890. The patient was a man of about fifty.

In the eight cases alluded to the patients were all males and, with two exceptions, adults. The youngest patient was fourteen and the oldest fifty. In only one case was the jejunum the portion of bowel strangulation. In the other seven cases the strangulation involved the ileum.

In five of the cases the onset was sudden, and appeared without definite warning. In the remaining three instances the acute attack was preceded by more or less abdominal discomfort.

In addition to the usual symptoms one notices in reading the account of these cases that hiccough was often complained of, that the vomiting was apt to become stercoraceous, that the pains were mostly about the navel, and that in two examples a tumour, with the features already described (page 108), was noticed.

With our present knowledge it is hardly to be imagined that this rare form of acute intestinal obstruction could be diagnosed during life or before operation.

One of the eight patients lived for eighteen days after the onset of the attack, but of the others one died within twenty-four hours, three lived two days, one lived until the fifth day and two until the sixth. It will be seen, therefore, that the form of strangulation is very acute.

Treatment.—It need not be pointed out that the only treatment in this form of hernia must consist in an abdominal section, with liberation of the bowel and obliteration of the sac.

In dealing with the orifice of the sac attention must be paid to the distribution of blood-vessels in its immediate vicinity. The orifice can be enlarged by cautious division, in a downward direction, of the peritoneum which forms it. After the bowel has been withdrawn the opening into the sac can very probably be closed by suturing the surfaces of peritoneum, and the sac itself can be freely opened and its walls so fixed back that they cease to limit a cavity.

In both Hilton's and Quénu's cases the strangulated bowel was relieved without difficulty.

3. **Hernia into the Foramen of Winslow.—Pathology.**—This variety of hernia is exceedingly rare, as may be readily understood. Under normal conditions the foramen of Winslow will only admit one finger, or, at most, the thumb. It is true that its dimensions vary, but it is quite uncommon to find foramina so large as to admit two fingers. The foramen is placed above the intestinal area, and the nearest segment of bowel—the duodenum—is very fixed. It is probable that the hernia is favoured when the colon—owing

to a defect in development—is free and suspended like the small intestine from a more or less definite mesocolon. This condition existed in an example of this hernia which I have placed on record.* The hernia enters the lesser sac of the peritoneum. The gut, if strangulated, will, as a rule, be strangulated by the margin of the foramen. In my case the bowel, after entering the lesser sac, had forced its way through the anterior layer of the gastro-hepatic omentum.

In a case recorded by Blandin† some part of the herniated bowel had escaped from the lesser sac through a rent in the transverse mesocolon. By the margin of that rent the gut was strangulated.

The bowel found in the hernia is sometimes the small intestine and sometimes the large.

In Blandin's case just alluded to nearly the whole of the small intestine had passed through the foramen of Winslow. Only that part was strangulated which had escaped through the rent in the transverse mesocolon.

Rokitansky‡ mentions a case in which "a large part of the small intestine" was engaged in the rupture.

In a case by Treitz§ several coils of the lesser bowel were involved. In Square's case‖ eight inches of the lower ileum were found strangulated and gangrenous.

In the example reported by Majoli¶ a loop of the transverse colon was found strangulated in the hernia and gangrenous. In my case the cæcum, the whole of the ascending colon, and a part of the transverse colon had passed through the foramen and had become strangulated.

Clinical Manifestations.—In most of the recorded cases the hernia has been strangulated. The phenomena of strangulation may or may not be preceded by abdominal symptoms.

In Majoli's case the patient was a man of forty-four years, the subject of chronic constipation. During the month of June, 1883, he suffered more or less continuously with abdominal pains, with constipation, and with eructations of gas. He lost his appetite and became wasted. On July 5th a tumour was noticed in the upper part of the abdomen between the xiphoid cartilage and the umbilicus. The swelling was tense and resonant on percussion. It exhibited intestinal movements, and was the seat of borborygmi. Its greater diameter was transverse. It was a little tender on pressure. On

* *Lancet*, October 13, 1888.
† Traité d'Anatomie topographique, 2nd ed., 1834, p. 467.
‡ Handbuch der spec. path. Anat., Band iii., p. 218. Vienna, 1842.
§ Hernia retroperitonealis, 1857, p. 126.
‖ *Brit. Med. Journ.*, vol. i., 1886, p. 1163.
¶ Rivista clinica di Bologna, 1884, p. 605.

July 7th the vomiting commenced, the pains increased, and the constipation became more and more obstinate. The patient could take little or no food. The symptoms were now those of intestinal obstruction. The vomiting persisted and became stercoraceous, the pains continued, the whole abdomen became distended, and in spite of aperients and enemata nothing passed the rectum. The man died on July 16th.

The symptoms of intestinal embarrassment had, therefore, existed for six weeks, and during the last ten days of this period the symptoms were those of absolute obstruction. The post-mortem showed that some 30 cm. of the transverse colon had become strangulated by the margins of the foramen of Winslow.

In Mr. Square's case the patient was a man of twenty-three who was seized with sudden and violent pain in the epigastrium shortly after a very hearty meal. He presented the symptoms of acute intestinal obstruction. The pain was intense over and about the xiphoid cartilage, the epigastrium was tender and the umbilical region of the abdomen unduly prominent. The patient died three days and seventeen hours after the commencement of the attack. The post-mortem revealed eight inches of the lower ileum strangulated in the foramen of Winslow. The gut was gangrenous.

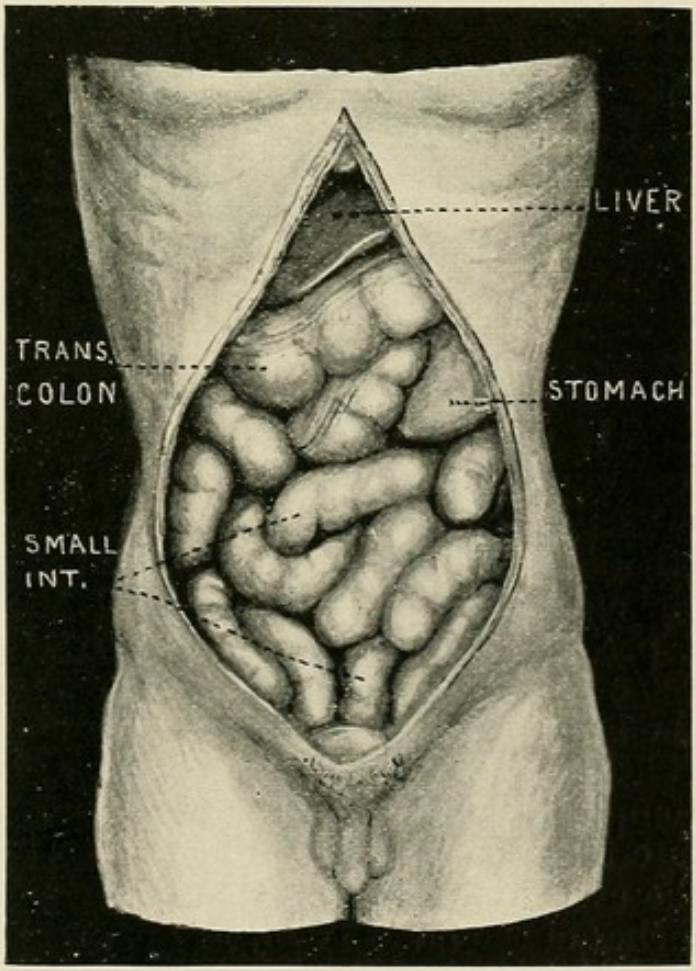


FIG. 42.—Hernia into the Foramen of Winslow

Aspect presented on opening the abdomen.
(*Author's case.*)

In the example of this hernia which came under my care the patient was a healthy man of twenty-six. On April 9th, 1888, after a heavy meal, in which periwinkles played a conspicuous part, he was seized with cramp-like pain in

the abdomen above the umbilicus. The pain was intermittent, and there was a sense of "tightness" in the epigastrium. Vomiting appeared next day and became persistent. The abdomen was seen to be swollen and to be especially prominent in the epigastric region. On April 12th the bowels were opened by an enema and the symptoms were for a time relieved. The pain and vomiting continued. The swelling of the abdomen increased, and on April 16th the epigastric swelling was found to be a little dull on percussion. There was no hiccough. From the beginning of the illness to

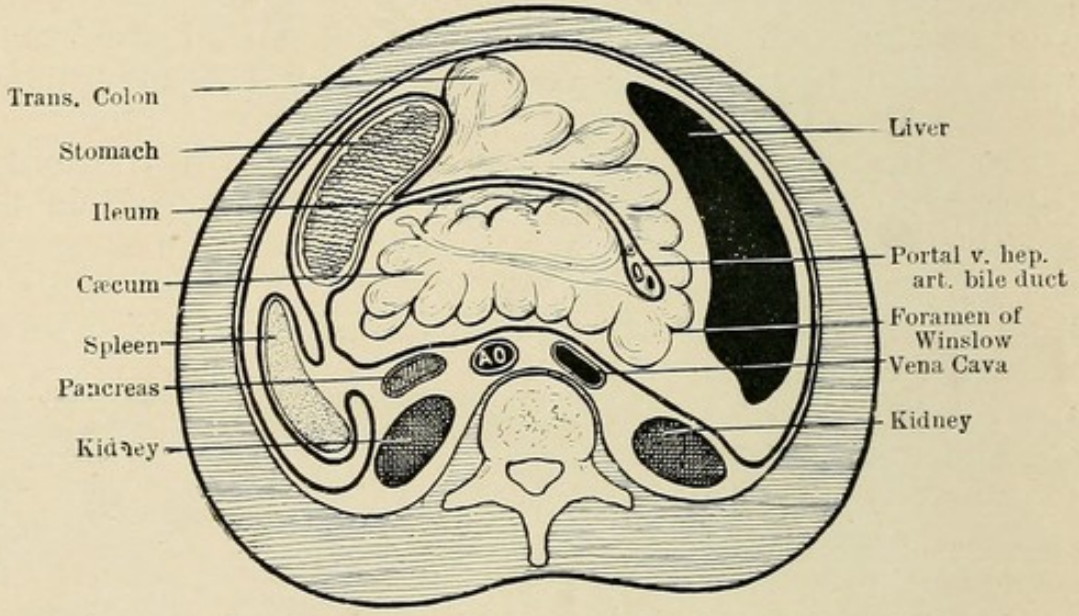


FIG. 43.—Hernia into the Foramen of Winslow (*Author's case*).

The diagram shows a section of the body at the level of the Foramen of Winslow.

the end the patient kept the sitting posture, declaring he was unable to lie down. The vomiting was never stercoraceous. Tenesmus had been marked from the commencement of the attack. The temperature was never raised. The constipation became absolute. What is defined anatomically as the epigastric region was throughout prominent and tender. I performed laparotomy on April 17th, *i.e.* eight days after the onset of the attack. I discovered a strangulated hernia in the foramen of Winslow. All attempts to reduce the hernia failed. The patient died six hours after the operation was completed. The autopsy revealed such an arrangement of the intestines as is shown in Fig. 42. The cæcum, the whole of the ascending colon, part of the transverse colon, and some inches of the lower ileum had passed through the foramen of Winslow and had become strangulated by the margins of that aperture. The cæcum had forced its way through the anterior layer of the gastro-hepatic omentum so that the vermiform

appendix was actually lying on the anterior aspect of the lesser curvature of the stomach close to the œsophagus (Fig. 43). The bowel was gangrenous in two places, and its reduction could not be effected until I had cut the portal vein, the hepatic artery, and the bile duct. The right segment of the colon had a very extensive mesocolon, the existence of which rendered the hernia possible.

All the recorded cases of which I have any knowledge

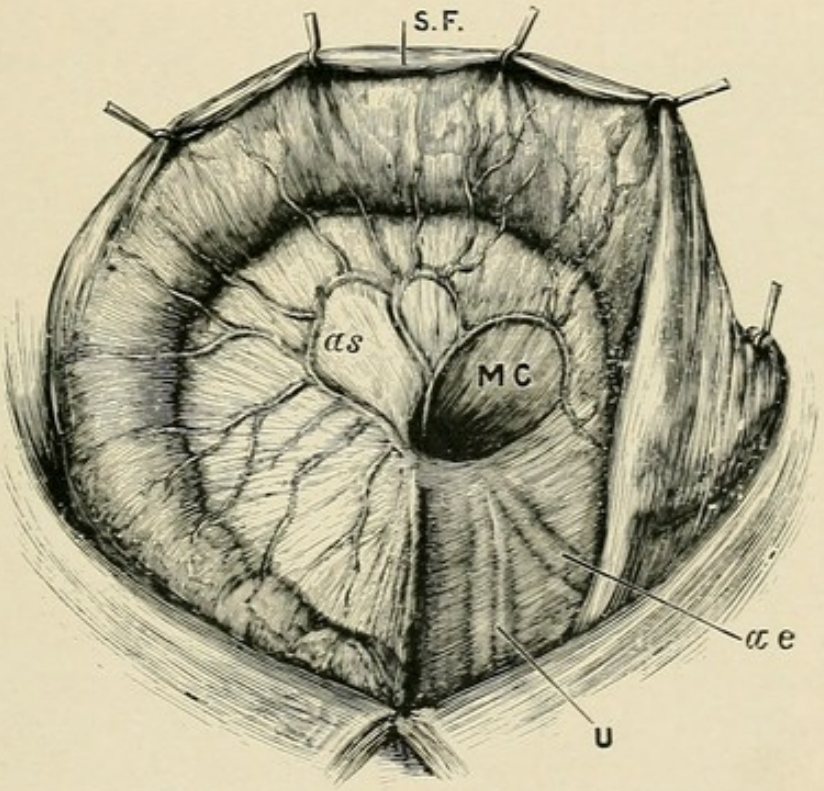


FIG. 44.—The Intersigmoid Fossa (*Jonnesco*).

S F, sigmoid flexure drawn up; M C, sigmoid mesocolon; U, ureter; *a s*, sigmoid artery; *a e*, external iliac artery. The fossa is just beneath the letters M C.

have occurred in male subjects with one exception (Treitz's case). All the patients have been adults between the ages of twenty-five and forty-four.

In the matter of *treatment* an abdominal section should be carried out and an attempt at reduction made. Should this fail, as it did in my case, it is scarcely worth while to establish an artificial anus, if at the same time there are left in the lesser sac of the peritoneum some inches or more of gangrenous bowel.

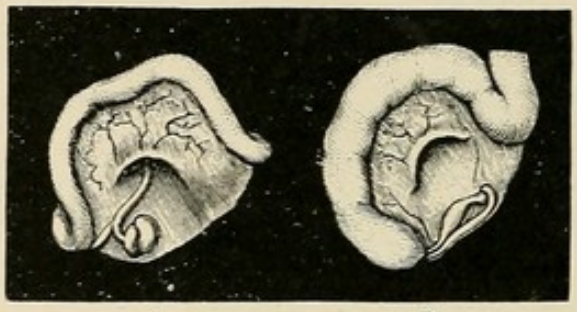
4. **Intersigmoid Hernia. — Pathology.** — This term is applied to a hernia into the intersigmoid fossa.

The intersigmoid fossa is formed by the layers of the sigmoid mesocolon. It is funnel shaped and opens below on the left side of the mesocolon. It is placed over the bifurcation

of the iliac vessels, and in very intimate relation with it is the sigmoid artery, which lies above it and to the right.

The fossa extends upwards for some little distance along the course of the ureter (Fig. 44). It is commonly met with in the fœtus between the third and sixth months (Fig. 45). It is not common in the fœtus at full term. I found it to exist in fifty-two instances out of one hundred bodies which I examined.*

The fossa varies in depth from one to one inch and a half. It will usually lodge the forefinger up to the first joint. In one case that came under my notice it accommodated the entire thumb; and in another instance I could introduce three fingers up to the joints between the first and second phalanges.



A B

FIG. 45.—The Intersigmoid Fossa.

A, from a male embryo of three months; B, from a female embryo of six months. The relations of the testis and ovary respectively are shown (*from Jonnesco*).

The sac formed by the general distension of the pouch may be small, but in one case it was as large as an adult head, and contained two-thirds of the small intestine (Jomini's case). The sac extends in the lax retroperitoneal connective tissue. The orifice of the sac lies to the left of the vertebral column and at the inferior part of the hernial tumour on its left side. The sac when small has been found to contain a few inches of the lower ileum (Eve's case).

Symptoms.—At least four cases have been recorded: one in a woman of fifty-seven,† one in a man of sixty-five,‡, one in a woman of sixty-three, § and one in a man of fifty-three. ‖ In three of the cases the symptoms were those of strangulated hernia, and were acute and rapidly fatal.

In the case reported by Eve a right lumbar colotomy was performed by Mr. Thomas Smith on the eighth day. The patient died on the tenth day.

In Mr. Eccles's case laparotomy was performed on the fourth day. A piece of small intestine was found strangulated

* F. Treves: Anatomy of the Intestinal Canal in Man. London, 1885, p. 65.

† De Haen: Ratio medendi in nosocomio practico. T. vi. Paris, 1769, p. 103.

‡ Jomini: *Revue méd. de la Suisse Romande*, 1882, p. 302.

§ *Brit. Med. Journ.*, June 13, 1885, p. 1195.

‖ Mr. W. Eccles; St. Bart.'s Hosp. Reports, vol. xxxi.

and gangrenous. It was excised, but the man died in twelve hours.

In De Haen's case there had been a history for some three years of a tumour, which occasionally appeared in the left side of the abdomen, and which would vanish again, its disappearance being once associated with the escape of much gas by the rectum. The patient was seized with symptoms of acute obstruction and died unrelieved on the fourth day.

The only *treatment* available in these cases of hernia is an immediate laparotomy. If the operation be done in good time, and care be taken of the vessels about the hernial orifice, the prognosis should be good.

5. **Pericæcal Hernia.—Pathology.**—In the neighbourhood of the cæcum there are certain folds and certain fossæ.

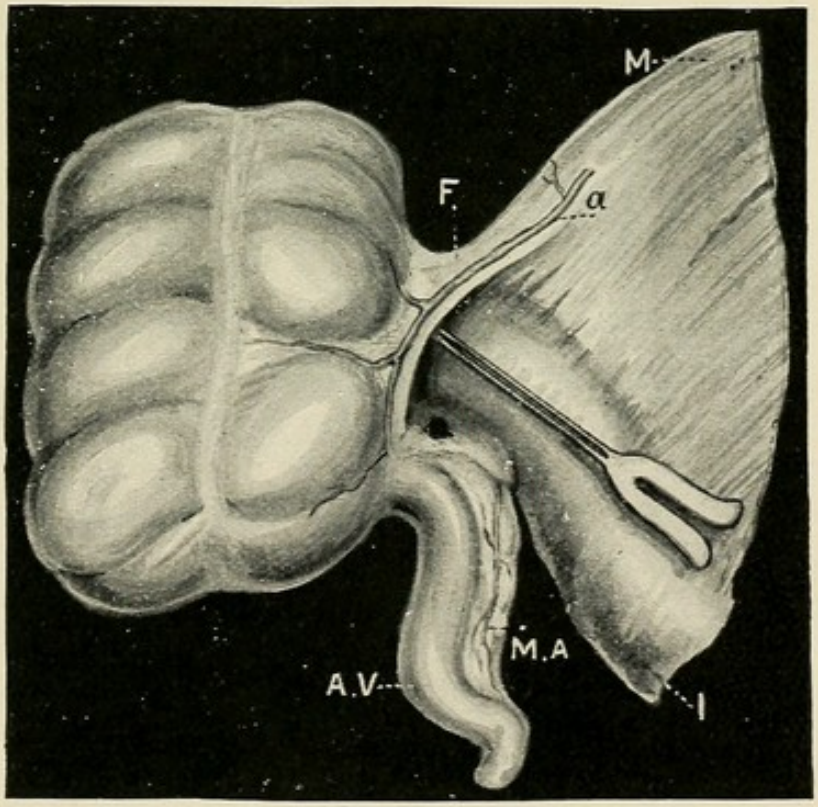


FIG. 46.—Ileo-colic Fossa (*after Jonnesco*).

A V, veriform appendix; M. A, mesentery of appendix; I, ileum; M, mesentery; F, ileo-colic fold; *a*, artery. The director is placed in the ileo-colic fossa.

These have attracted the attention of many writers and have given rise to a very copious literature and a very confused nomenclature. Dr. Richard Berry* has attempted to lessen this confusion in a little work in which he has brought together the descriptions of various authors, and has made intelligible the conflicting series of names. His account is lucid and apparently exhaustive.

* The Cæcal Folds and Fossæ. Edinburgh, 1897.

Without entering into any details, the folds and fossæ may be enumerated as follows, and may be illustrated by the very excellent drawings of Jonnesco :—

1. The *ileo-colic fossa*, situated in the angle between the ileum and the commencement of the ascending colon, and limited in front by the *ileo-colic fold* (Fig. 46).

2. The *ileo-cæcal fossa*, behind the junction of the ileum and cæcum. This fossa may extend upwards for some

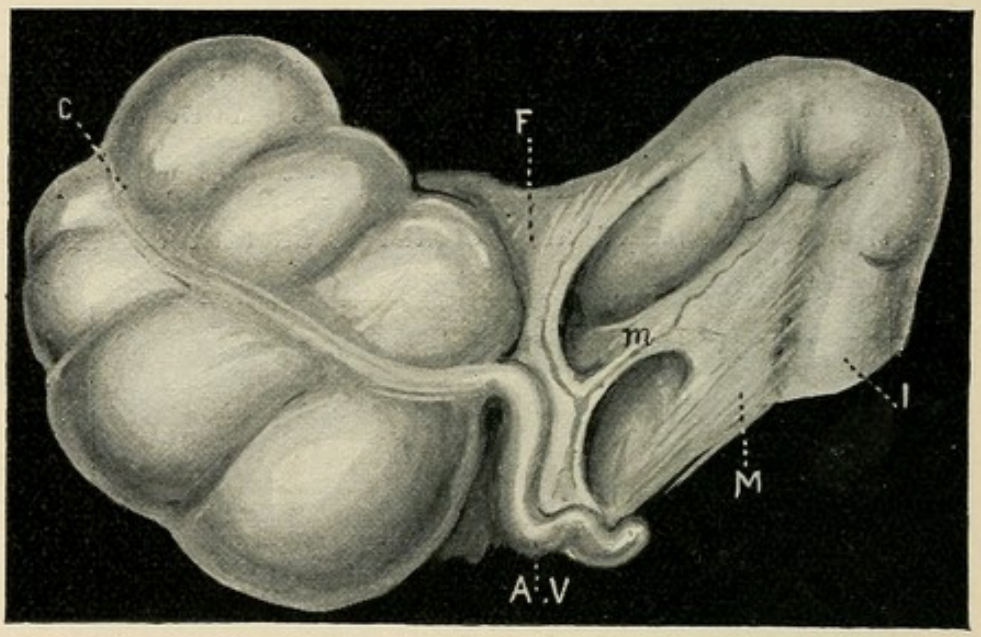


FIG. 47.—Ileo-cæcal Fossa (*from Jonnesco*).

C, cæcum ; I, ileum ; M, mesentery ; A V, vermiform appendix ; m, mesentery of appendix ; F, ileo-cæcal fold covering in the ileo-cæcal fossa.

distance behind the ascending colon. It is bounded by the *ileo-cæcal fold* (Fig. 47).

3. The *subcæcal fossæ* are situated behind the cæcum. They are liable to considerable variation and are often absent. Jonnesco describes an inner and an outer fossa in this situation which are bounded by two folds, the external and internal *parieto-colic folds* (Fig. 48).

The pericæcal herniæ are of two kinds. In the first variety the hernia takes place in one of the subcæcal fossæ. In the second variety the hernia is supposed to have been formed in the ileo-cæcal fossa.

The subcæcal or retrocæcal hernia is the usual form, and, indeed, it would appear that there is but one example of the hernia into the ileo-cæcal fossa on record. The ileo-colic fossa takes no part in the production of pericæcal herniæ.

Subcæcal Hernia. — Jonnesco has collected eleven examples of this hernia, to which he gives the name of

retrocæcal hernia. The sac finds its way behind the ascending colon, and extends in the retroperitoneal connective tissue. The orifice of the sac is below and behind the cæcum. Its margins are generally well defined. The sac varies in size, but is for the most part small. In one case reported by Parise* it measured 7 cm. by 3 cm. In other examples—as in a case by Rieux†—the sac was quite small.

One example of a large sac is given by Engel.‡ In this case nearly the whole of the small intestine was lodged in the hernia. The orifice of the sac was large. The hernia seems to have caused no trouble. It was discovered in the body of a soldier, aged thirty-one, who had died of pneumonia.

The contents of the hernia have (except in Engel's case) always been derived from the lower ileum, and have been small in amount.

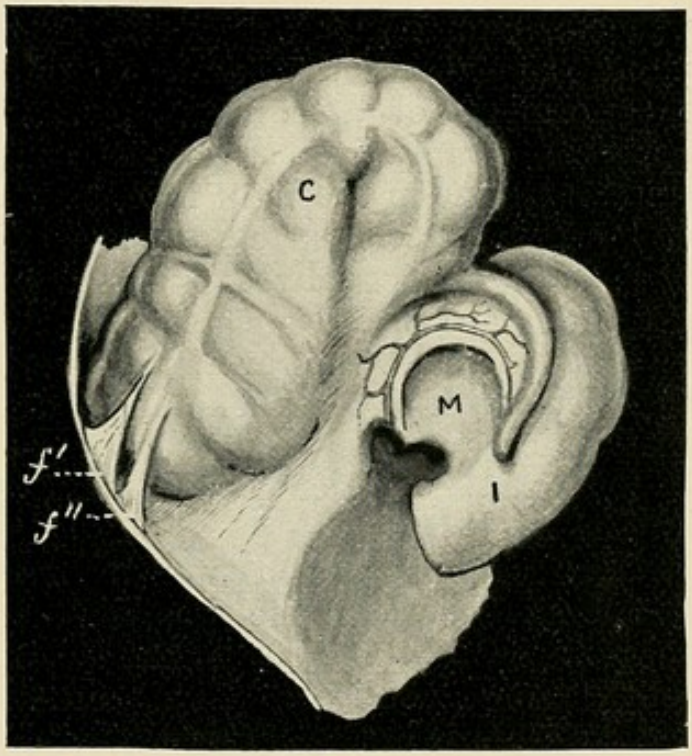


FIG. 48.—Sub-cæcal Fossæ (*from Jonnesco*).

C, cæcum; I, ileum; M, mesentery of ileum—above it is the vermiform appendix and its mesentery; *f'*, external parieto-colic fold; *f''*, internal parieto-colic fold—between the two folds is the external sub-cæcal fossa. To the right of the fold *f'* is the internal sub-cæcal fossa.

In seven out of the eleven cases the bowel was strangulated, the strangulating agent being in each instance the margin of the sac orifice.

In the other cases collected by Jonnesco there was a reducible hernia, which apparently gave no trouble.

Hernia into the Ileo-cæcal Fossa.—John Snow§ has described a case of internal strangulation which Jonnesco maintains is an example of this hernia.

The patient was a woman twenty-four years of age; the symptoms were those of acute intestinal obstruction, and she died on the fourth day. A hernial sac was discovered

* Mém. de la Soc. de Chir., Paris, 1858, p. 399.
† Thèse de Paris, No. 128, 1853.
‡ Wiener med. Wochens., Sept. 7, 1861, p. 571.
§ *London Med. Gazette*, 1846, p. 125.

in the position of the ileo-cæcal fossa. It admitted the finger for about two inches.

Symptoms.—In some cases, as already stated, the hernia gave no known trouble during life, and was unexpectedly discovered after death.

The majority of the cases in which symptoms have occurred belong all to one category. The hernia was strangulated, the onset of the symptoms was acute, and the phenomena of obstruction were severe. There was no feature in any of the recorded cases which could have assisted in the forming of a correct diagnosis. All the examples appeared simply as instances of acute strangulation of the small intestine in the right iliac fossa. The average duration of life in the recorded cases was six days. One patient died in a day, while one lived twelve days. These represent the extremes.

Exceptionally, however, the pericæcal hernia may be attended with the phenomena of subacute or chronic obstruction.

This rare condition is well illustrated by a case reported by Dr. Aschoff.*

The patient was a woman aged forty-eight. While scrubbing the floor she was suddenly seized with severe pain in the right side of the abdomen. There was some collapse and vomiting. The pain and vomiting continued, and were associated with very obstinate constipation. Some relief was obtained by enemata, and later by washing out the stomach. The abdomen became distended and the patient very ill; coils of intestine in movement were visible in course of time through the parietes.

The case was considered to be one of chronic obstruction due to stenosis at the splenic flexure, and as the patient was very cachectic it was surmised that the stricture was malignant. The vomiting became stercoraceous, and on the twenty-first day of the disease the abdomen was opened in the right iliac region with the intention of doing a right inguinal colotomy. A large retrocæcal hernia with a considerable sac containing small intestine was discovered. It was reduced, and the patient made a good recovery.

It would appear that pericæcal hernia is much more common in males than in females, the proportion being about 4 to 1. It is met with in adult life, the ages of the patients who suffered from this hernia ranging between twenty-four and forty-eight.

* Berliner Klinik, Heft. 100, October, 1896.

The *treatment* would consist of an early laparotomy and the release of the hernia. So far as I am aware, the case of Dr. Aschoff—reported above—is the only example in which a pericæcal hernia has been successfully dealt with by operation.

CHAPTER V.

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.

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

(A) **The Bowel is Twisted about its Mesenteric Axis.**—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 more than two-thirds of the number are instances of twist of the sigmoid flexure about its mesenteric axis.

The normal flexure forms a loop which is more like a capital omega than a capital sigma. The segments of gut termed the sigmoid flexure and the first part of the rectum form together one single, defined and undividable loop.

This loop begins where the descending colon ends, and ends at the commencement of the so-called second piece of

the rectum, at the spot, in fact, where the meso-rectum ceases, opposite about the third piece of the sacrum. This loop when unfolded may well be compared to the outline of a capital Ω.

So far as can be defined the common spot at which the descending colon ends is the outer border of the psoas muscle. The average length of the omega loop in the adult is seventeen and a half inches. The longest loop I have met with measured twenty-seven inches, and the shortest six inches only. The average length of the sigmoid mesocolon is one inch and a half over the psoas, one inch and three-quarters on the sacrum, and three and a half inches in its middle part. The attachment of the meso-

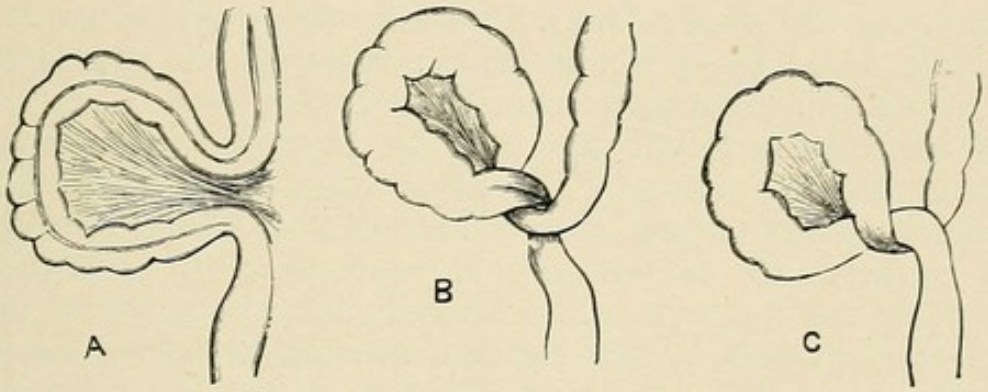


FIG. 49.—Volvulus of the Sigmoid Flexure.

colon takes the following line:—It crosses the psoas at a right angle, then makes a slight curve upwards so as to cross over the iliac vessels about their bifurcation, and then runs downwards to end in the middle line of the sacrum about its third segment. The distance between the extremities of the omega loop, *i.e.* the width across the narrowest part of the sigmoid flexure, is about three inches. A line drawn transversely across the sigmoid mesocolon at its widest part on an average measures four inches.*

The arrangement of the bowel which is favourable for the production of a volvulus is the following:—The loop must be of considerable length, the mesocolon 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. 49, 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

* F. Treves: Anatomy of the Intestinal Canal in Man. London, 1885.

such a circumstance must be most uncommon, since volvulus of the sigmoid flexure is extremely rare in the young. It may be brought about by peritoneal adhesions, especially by such adhesions as would tend to contract the attached part or root of the sigmoid mesocolon, and so bring the two extremities of the loop together.

Excessive length of the omega loop is without doubt a predisposing cause of volvulus, as is illustrated by a case reported by Bonuzzi.*

The commonest cause of volvulus, however, would appear to be chronic constipation. In this condition the loop is more or less constantly loaded, and, above all, unequally loaded. Becoming filled with fæcal matters it hangs down into the pelvis an inert heavy mass. So placed, it must drag upon its mesocolon, and while the position tends on the one hand to elongate that membrane, it appears, on the other, to approximate the ends of the loop.

I have often found the strait in the sigmoid mesocolon between the two ends of the loop occupied by peritoneum, which is dense, opaque, and thickened. The peritoneum may appear to be contracted, and is not infrequently associated with vague, ill-arranged adhesions, which pass from the left leaf of the sigmoid mesocolon to the parietal peritoneum. What relations these changes in the peritoneum have to chronic constipation I am unable to state, but certain it is that they are most often met with in elderly subjects or in those who have been greatly troubled with constipation. (*See* Fig. 30).

It must be remembered also that the omega loop is very muscular, and that it undergoes much change in dimensions as well as in position when passing from the state of dilatation to that of contraction.

Israel mentions a case in which the phenomena of volvulus appeared immediately after a copious enema of water had been administered.

When the omega loop is in the anatomical condition above described (and shown in Fig. 49, A) it is easy to understand that a twisting of the coil upon its mesocolic 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 which certain cases would appear to illustrate. The inert loop

* Annual of the Universal Med. Sci., 1893, vol. i.

may be rotated by movements in adjacent coils of small intestine, especially when such segments of the bowel are much distended with flatus.

Certain cases of volvulus have been preceded by a condition of atony of the bowel in some instances, and by diarrhœa in others. Lastly, there is no doubt but that mere distension of the sigmoid flexure alone has great influence both in 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. 49, 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. 49, 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 mesocolic axis. Since at the root of the 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 which 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 reappear immediately 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 which 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 which the two ends of the coil exercise upon one another. The loop is therefore closed at both extremities. 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 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 may seem 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 reaches about 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. ($6\frac{1}{4}$ 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.‖

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

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

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

§ Libéaut; loc. cit.

‖ Dr. Esaü; Deutsches Archiv für clinische Med., b. xvi., 1875, p. 474.

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 live long enough and the case be severe, the walls of the flexure become gangrenous. This gangrene is met with in the form of one or more patches which 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 mesocolon 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 it was still limited to the sigmoid flexure (the patient had died on the fourth day). In two instances, as already mentioned, there was perforation.

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

The remaining cases were simple examples of acute diffused peritonitis.

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

(B) **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.

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 which 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 have collected seven cases of these species of twist, and in every instance there was some congenital malformation of the parts involved. It may be here convenient to note the character of the malformation associated with these cases.

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 which 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 sac of a congenital umbilical hernia, 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 alone being unrepresented. The whole of the large intestine has at one time an extensive mesocolon, and in some rare cases this condition may persist throughout life. This mesocolon may be as ample as the normal mesentery

* Path. Soc. Trans., vol. iv., p. 317.

and, when present, it allows a remarkable freedom of movement to the colon.

(2) The ascending colon and cæcum when provided with a long mesocolon are very apt to get into difficulties. The coil 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 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 mesocolon, 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.

Mr. Walsham reports a case in a man aged sixty-three in which "the cæcum with the beginning of the colon was twisted three times from right to left around the lower part of the ileum, forming a corkscrew-like coil, the cæcum being situated at the apex."†

The symptoms of obstruction were very acute. In this case the colon traced backwards from the splenic flexure, instead of passing transversely across the abdomen, descended to the left iliac fossa, and thence turned upon itself and ran up again to the stomach. From the stomach it passed nearly vertically downwards to the cæcum, which was situated over the last lumbar vertebra and about the middle line.

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. In one 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."‡

(3) In this variety of volvulus the cæcum has been described either as "bent upon" itself or as twisted upon

* Path. Soc. Trans., vol. ii., p. 222.

† Trans. Clin. Soc., Lond., 1888, p. 139; and also Trans. Path. Soc., Lond., 1888, p. 110.

‡ Case by Mr. Charles Firth; *Brit. Med. Journ.*, vol. ii., 1882, p. 165. *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 mesocolon. *New York Med. Record*, vol. xxxi., 1882, p. 427.

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 which 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 which should represent it, presented a corresponding anomaly, while the mal-placed bowel was provided with an extensive mesocolon. A less definite case of volvulus of the cæcum is reported by Mr. Bryant (Clin. Soc. Trans., 1888, p. 142). Here, also, there was "congenital freedom of the cæcum and ascending colon."

These forms of twist must be classed among the least common varieties of intestinal obstruction.

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.

(A) **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.§

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

† *Med. Times and Gazette*, vol. i., 1872, p. 3.

‡ Guy's Hosp. Reports, vol, xiv.

§ As examples, may be quoted a case described in the *Brit. Med. Journ.*, April 24, 1897, p. 1023, and a case reported in the Trans. Path. Soc, 1890, p. 127.

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.

It would appear that the existence of a gall stone in the bowel may cause rotation. Mayo Robson reports two examples of this condition.* From a case reported by Briddon† it would seem that a lipoma in the mesentery might have the same effect. 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 which favours twisting is identical with that which 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.‡ Dr. N. Pitt§ describes a case of volvulus of some three feet of the ileum in a new-born infant who died of intestinal obstruction two days after birth. The twisted bowel was almost black

* Trans. Roy. Med. Chir. Soc., 1895, p. 117.
† Ann. of Univer. Med. Sci., 1894, vol. iii.
‡ *Lancet*, vol. i., 1883, p. 1119.
§ Trans. Path. Soc., Lond., vol. xlii.

from strangulation. Mr. Harrison Cripps* reports an almost identical case. The infant died three days after birth.

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.†

Dörfler reports a case in which the bowel was twisted several times upon itself.‡ 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.§

A volvulus may appear to be due to a congenital defect in the bowel. Thus Dr. Rolleston‖ describes a case of volvulus of the ileum five and a quarter inches from the cæcum. The cæcum had not descended into the right iliac fossa but lay over the right kidney, to which it was fixed by peritoneum. The lower five inches of the ileum had no mesentery, this portion of the gut was bound down to the posterior wall of the abdomen and the peritoneum passed in front of it. There was no trace of inflammation in the neighbourhood, and the appendix was normal. Where the fixed abnormal ileum joined the free mesentery-possessing ileum the volvulus had occurred. The patient was a man aged fifty-eight who died of the volvulus.

The general appearance of a simple volvulus of the small intestine is well shown in Fig. 50 from a specimen in St. Thomas's Hospital. The involved coil, having its blood-vessels compressed and 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.

* Trans. Path. Soc., Lond., vol. xxxi.

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

‡ Munch. med. Woch., Dec. 26, 1893.

§ As an instance, *see* case by Dr. Verneuil; Bull. de la Soc. Anat, 1870, p. 411.

‖ Path. Soc. Trans., 1890, p. 127.

¶ Oestreichische Zeitschrift für prakt. Heilkunde, 1865, N. 6.

The amount of bowel involved in the present form of obstruction varies greatly. In the majority of the cases a large loop, probably about one foot to two feet in length, is implicated. In one or two instances five feet of bowel were discovered to have been twisted.*

Ashby † reports a case, associated with adhesions, in which nearly the whole of the small intestines was twisted.

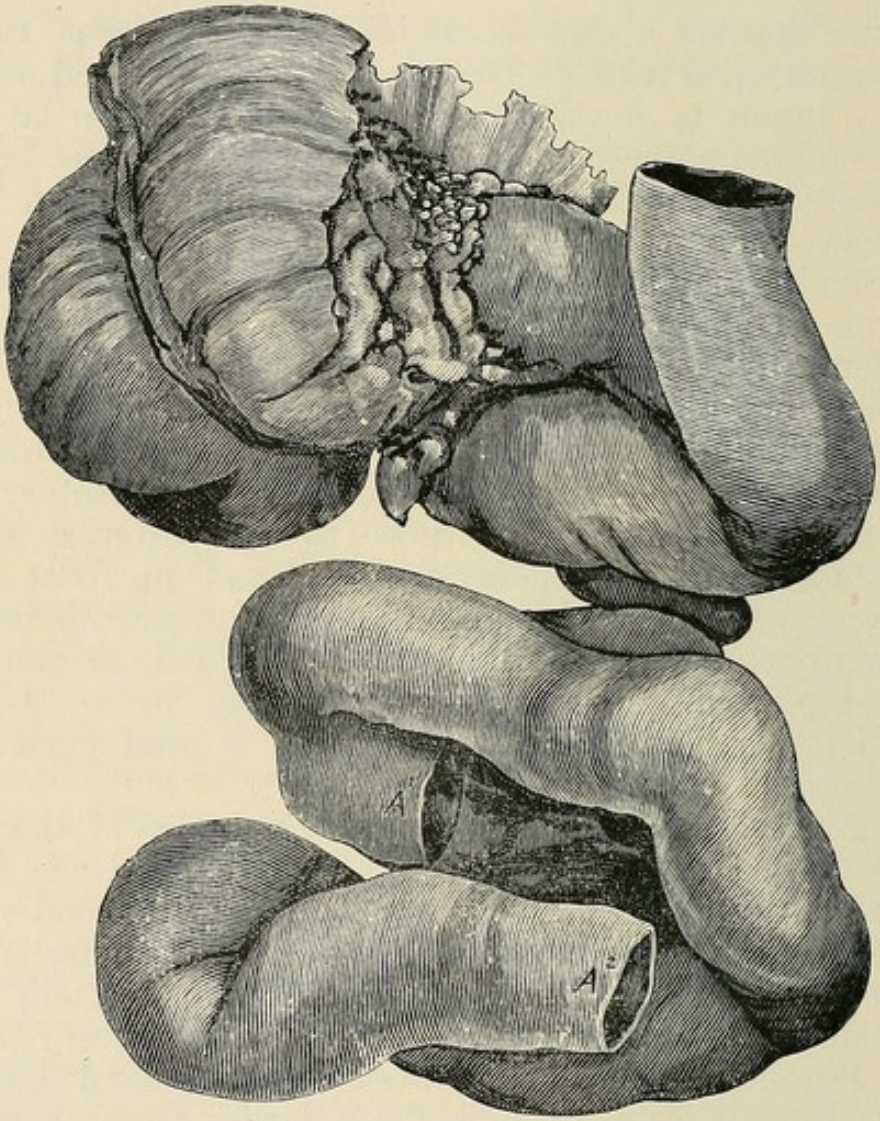


FIG. 50.—Volvulus of Lower Ileum.
A¹ and A² join one another after many convolutions.

As regards the segment of bowel involved, the twist concerns most often the lower ileum. Volvulus is said to have been found in the duodenum—as in the case of Dr. Rombold's above alluded to—and in several instances the twist has been limited to some part of the jejunum. For

* Dr. James Wilson; *Amer. Journ. of Med. Sciences*, July, 1879, p. 78: and Dr. Hector Mackenzie: Trans. Path. Soc., 1890, p. 127.

† *Brit. Med. Journ.*, 1891, vol. i., p. 413.

example Stanley* describes the case of a child aged five years, who, after a slight blow on the abdomen, developed symptoms of acute obstruction, which ended in death in forty-eight hours. The autopsy revealed a volvulus about thirty inches from the pylorus.

The majority of the patients who have exhibited this form of volvulus have been males, and the mean age in a number of cases I have collected was twenty-five years. I have mentioned that this form of obstruction has been met with in newly-born infants; it has also occurred in young children between the ages of three and ten.† It would seem to be quite rare after forty.

In a certain number of cases the volvulus would appear to have followed a blow or injury. Hawkins‡ details the case of a woman who died from acute intestinal obstruction forty-eight hours after a slight fall from a chair. The autopsy revealed a figure-of-eight twist of the bowel.

Pennington§ reports the case of a girl of eighteen who died of a twist of the ileum which came on after violent exercise.

A case by Stanley has just been alluded to, and attention may also be drawn to Mr. Turner's case, described on page 140.

I might here point out that certain reputed instances of volvulus of the small intestine—especially those attended by peritonitis—may be liable to some question as to the reality of the diagnosis. When the abdomen is opened in cases attended with the symptoms of peritonitis, the surgeon, in searching for the cause of the trouble, is apt to be misled by the confusion with which the coils of small intestine are disposed, and as these coils are heightened in colour, and as in separating them he may appear to be untwisting them, there are some bases for a not unreasonable mistake.

Two cases are within my own knowledge which have much confirmed the above impression. In both these cases a diagnosis of intestinal obstruction had been made, in both a laparotomy was performed and the surgeon reported a volvulus of the small intestine with peritonitis. The patients died, and in each case there was revealed a perforative peritonitis around the vermiform appendix on the one hand, and no evidence of volvulus of the bowel on the other.

(B) **Two Suitable Coils of Small Intestine are Twisted**

* Quoted by Maylard; Surgery of the Alimentary Canal, p. 390.

† *See* for example a case in a child of five recorded by Mr. Stavely in the Medical Society's Transactions, vol. xvi., p. 19.

‡ Med. Soc. Trans., vol. xvi., 1893, p. 18.

§ Annual of the Univer. Med. Sci., vol. iii., 1894.

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. 51); *b* points to the coil that was twisted about the axial loop.

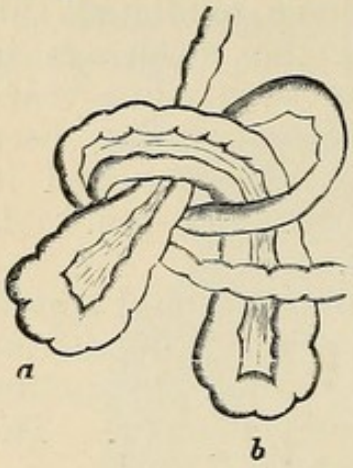


FIG. 51.—Volvulus of Small Intestine (*Leichtenstern*).

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 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.

As an example of the form of volvulus now under consideration may be quoted the following case recorded by Mr. George Turner.†

A boy, aged seven, was admitted into the Seamen's Hospital at 8.15 p.m., on July 26, 1891, with the history of having fallen from a height of twelve feet against the pole of a boat, and then into the mud of the river. He was much collapsed, and vomited several times, the vomited matter being bilious. There was great pain in the abdomen, especially in the right iliac region, where there was considerable tenderness. There was no abdominal distension. The knees were kept drawn up, and the patient was remarkably restless. There was tenesmus, but neither flatus nor fæces was passed. Laparotomy was performed twenty-four hours after the accident. There was no evidence of rupture of any viscus and no peritoneal effusion. Two coils of ileum were found concerned in a volvulus, one coil being twisted around the other. The two coils were respectively one foot and two feet in length, and these were separated by some three or four feet of normal intestine. The volvulus was untwisted, and the patient made a rapid recovery.

* *Med. Times and Gazette*, vol. i., 1866, p. 306.

† Med. Soc. Trans., vol. xvi., 1893, p. 16.

CHAPTER VI.

INTUSSUSCEPTION.

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 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.†

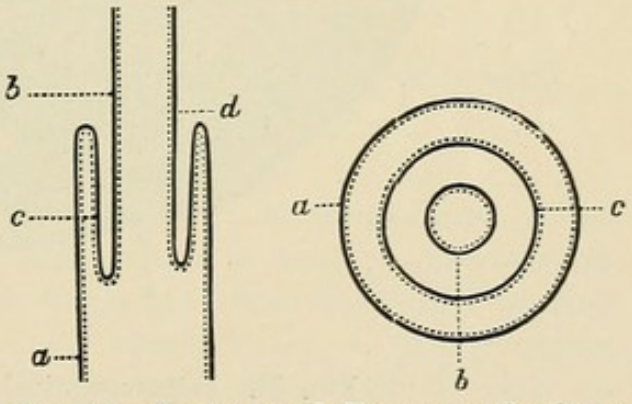


FIG. 52.—Vertical and Transverse Sections of an Intussusception.

a, the sheath or intussuscipiens; *b*, the entering or inner layer; *c*, the returning or middle layer; *d*, the neck.

Terms employed.—If an intussusception be viewed in vertical section it will be seen to be composed of six layers

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

† Viertel Jahrschrift f. d. prakt. Heilk. Prague, 1873-4.

of intestine, three on each 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 with peritoneum. On horizontal section the

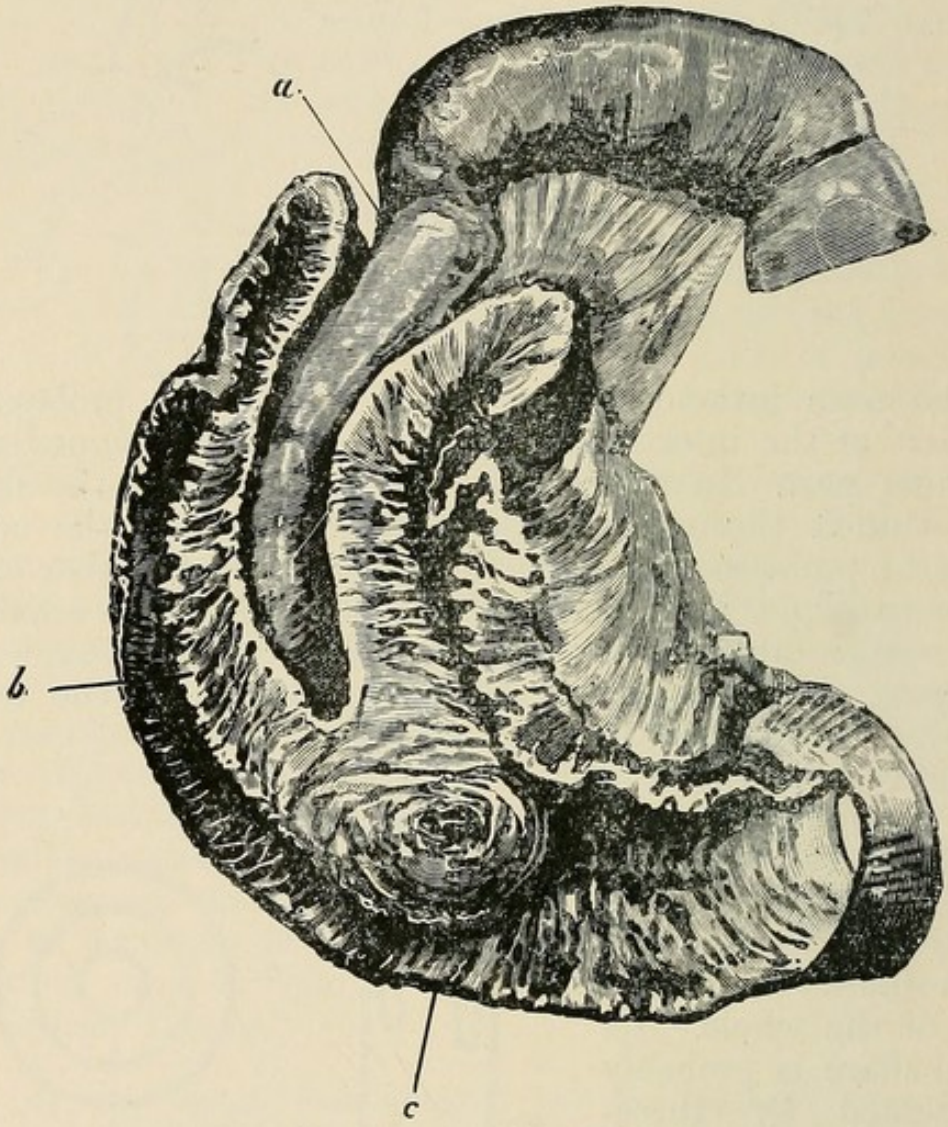


FIG. 53.—Intussusception of Jejunum.

a, internal cylinder; *b*, middle cylinder; *c*, external cylinder.

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. 52).

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. 52, *a*). The innermost cylinder is known as the entering layer (Fig. 52, *b*), and the middle one as the returning layer (Fig 52, *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. 52, *d*). 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 is well shown in Fig. 53. All intussusceptions are complete

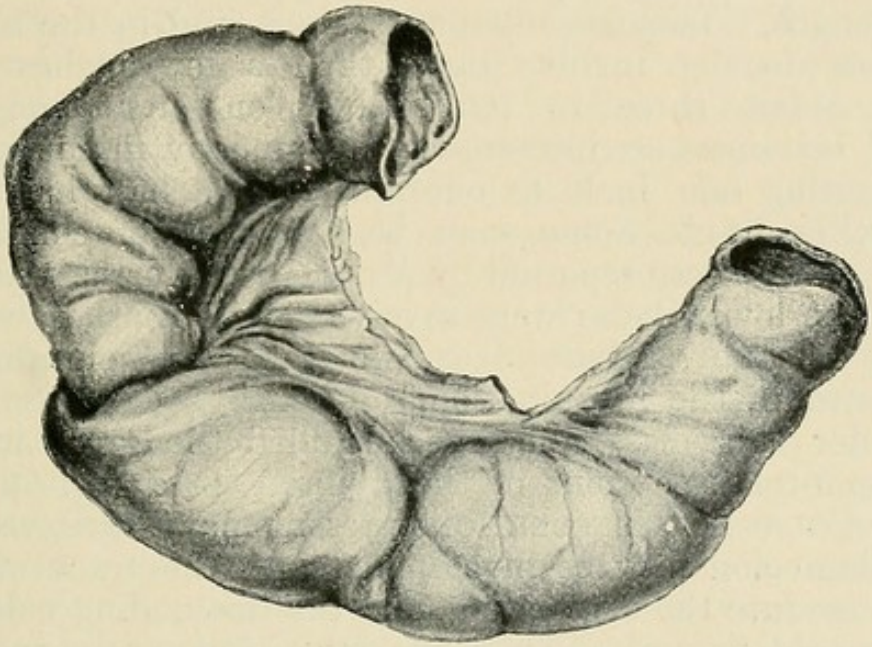


FIG. 54.—Intussusception of the Jejunum, one inch and a half in length.

(*Royal Coll. of Surg. Mus.*, No. 2698 A.)

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 slight funnel-like depression on the surface. Such invaginations do not enter into the present category.

Anatomical Varieties.—Invaginations may occur at any part of the intestine from the duodenum to the rectum. They may be conveniently divided into three classes: (1) the enteric; (2) the colic or rectal; (3) the intussusceptions which 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 reputed intussusception of the duodenum. Dr. Delepine* records a case in which the duodenum was dragged into an ileo-cæcal intussusception. They are most common in the lower jejunum and then in the ileum. Dr. Hale White reports a fatal intussusception in a man of thirty, which involved the jejunum two feet six inches from the pylorus.† (*See* Figs. 53, 62, 63, and 64.)

It would appear that jejunal intussusceptions bear to ileic intussusceptions the proportion of about 4 to 1. Invaginations involving the small intestine seldom attain great length. They are often very short, and in the majority of cases do not involve more than a few inches of the bowel, about three to ten inches, on an average. In several instances an intussusception—mostly in the jejunum—measuring one inch to one inch and a half has caused death (Fig. 54).‡ 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." (*See* Fig. 56.)

(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 which 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. (*See* Figs. 60 and 71.)

(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 in-

* Path. Soc. Trans., 1891, p. 124.

† Ibid., 1890, p. 121.

‡ *See* Museum of the Roy. Coll. of Surgeons. Specimens 2698 A, 2701.

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

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

vagination, 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 by the termination of the ileum; the external cylinder or sheath is formed by the colon 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 the sphincter. (Fig. 61.)

In the *ileo-colic* variety the termination of the ileum is prolapsed through the ileo-cæcal valve. The valve and 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 conditions of the bowel. (Fig. 55.)

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 sub-varieties the apex of the intussusception will be formed of ileum; in the latter it will be represented by the ileo-cæcal valve.

Allusion is made later (page 181) to invagination of the vermiform appendix.

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 increase 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 occasional condition in which—as a congenital anomaly—the whole of the colon is found to be suspended by a liberal mesocolon no doubt favours intussusception of the colon and favours the extension of those which reach the colon.

In many examples of extensive intussusception this congenital defect in development was in evidence.

The amount of traction brought to bear upon the parts of a growing intussusception which involves 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 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

* St. Bart.'s Hosp. Museum, No. 2188.

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

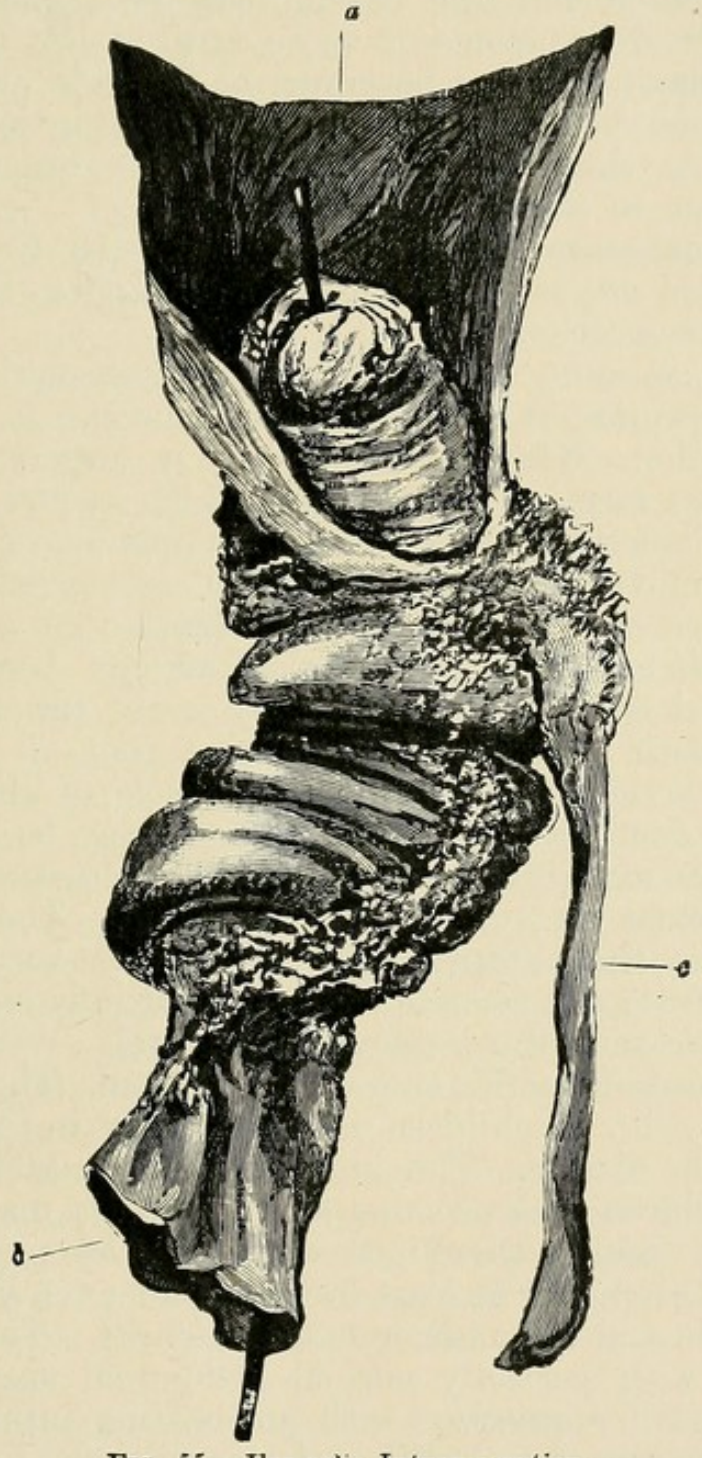


FIG. 55.—Ileo-colic Intussusception.
a, ascending colon; *b*, ileum; *c*, vermiform appendix.

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. 55 from the museum of the Royal College of Surgeons.

The Intussusception of the Dying.—All invaginations can be divided into two great forms according to the circumstances of their origin.

(1) The common or obstructive intussusception and (2) the intussusception of the dying, or as some call it, the agonic intussusception. With the former only is surgery concerned. The latter is a form of invagination which 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. The more marked irritability of the bowel in children may account for this, and it may be noted that even in children these intussusceptions are most common in the quite young, or at least in those under ten years of age. They may be said to be uncommon in adults. They occur in association with perfectly normal abdominal viscera. They may be found in connection with an existing intussusception of the obstructive type. When I was engaged in the post-mortem room at the Zoological Gardens I was struck with the fact that in nearly all the monkeys that had been put to death, for one reason or another, this form of intussusception was to be found. In those that died a natural death I saw no instance of this invagination, and I do not remember to have seen an example of the obstructive intussusception in these particular animals.

In two other points may the intussusception of the dying 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 which 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, practically always single. It is true that such invaginations may be associated with others which are secondary to it and which are clinically of no significance; but instances 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 are exceedingly rare.

A case of this kind is given by Mr. D'Arcy Power.* The patient was a boy aged five months, who was attacked with symptoms of acute intussusception, and died on the fifth day. Two intussusceptions were discovered, one at the ileo-cæcal valve about two inches in length, and one in the transverse colon which measured a little more than an inch in length. The latter invagination was ascending, or retrograde, and may have been induced by the injections of water and of air which were administered during life.

In both cases recently-formed lymph had glued together the contiguous walls of the gut. The upper intussusception showed signs of gangrene. Mr. Power alludes to two cases, one reported by Mr. Peregrine† and one by Dr. Handfield Jones,‡ which he maintains to have been both similar to his own case.

The intussusceptions of the moribund, on the other hand, are more often multiple than single. It 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

* Trans. Path. Soc., 1886, p. 240.

† *Lancet*, vol. i., 1873, p. 709.

‡ Med.-Chir. Soc. Trans., vol. lxi., p. 301.

§ Dr. Gee; *Brit. Med. Journ.*, Nov. 14, 1861. *See* also Mr. Gay's paper on Intussusception. London, 1862.

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.

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. 56 † shows the common appearance of the invaginations of the moribund.

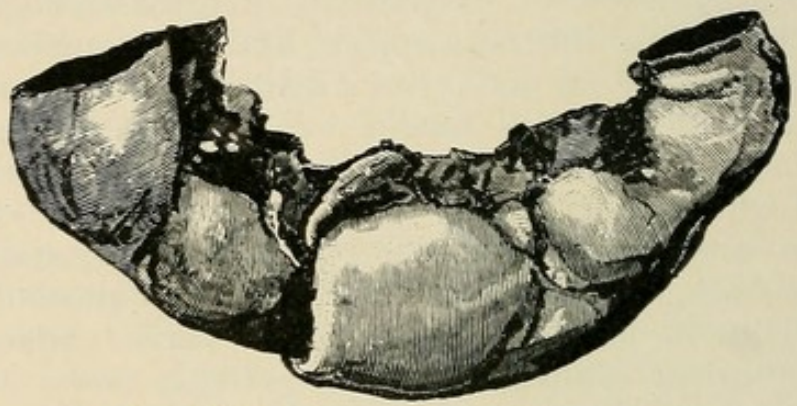


FIG. 56.—Intussusception of the Dying.

These non-clinical intussusceptions have formed the bases of many erroneous conclusions, and have been accredited with producing an obstruction which 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 which 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

* No. 1851 (42). † St. Thomas's Hosp. Museum, No. R 2.
‡ Bull. de la Soc. Anat., 1876, p. 719.

peritonitis. It would be more reasonable to assume that the chronic obstruction was due to the adhesions, and that the intussusception was of the character of those which form when the patient lies *in articulo mortis*. 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 which 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 which 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, aged twenty-two, 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.

Nothnagel ‡ quotes a case of retrograde intussusception

* Contrib. à l'Etude des Invaginations de l'Intest. grêle. Paris, 1879.
† Thèse de Paris, 1857, p. 52.
‡ Die Erkrankungen des Darmes. Vienna, 1896, p. 290.

which lasted eight months. In this example the descending colon was invaginated into the transverse colon.

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. 57). 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. 55. A good example of the cases now under notice is reported in an "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 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. 57). 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 interpenetrate one another.

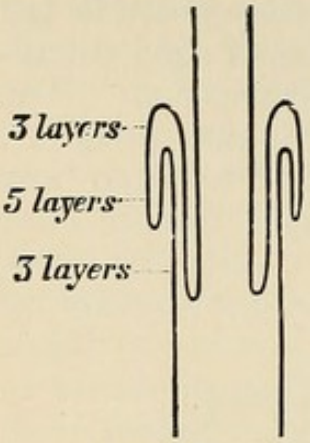


FIG. 57.

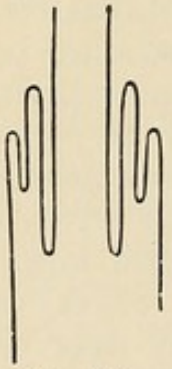


FIG. 58.

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

* *See* Leichtenstern, loc. cit., p. 612.

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. 58).

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 present no less than seven layers of intestine, as can be seen in the annexed diagram (Fig. 59). 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.

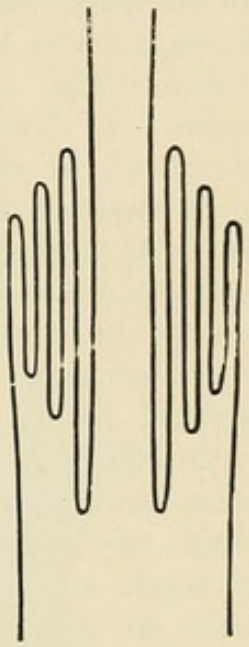


FIG. 59.

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 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

* Recueil des Travaux de la Soc. Méd. d'Observ., p. 192. Paris, 1857.

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. Thus in a specimen* of ileo-cæcal intussusception, in an infant of eight months, which reached the rectum, "the peritoneum covering the left kidney was tightly stretched, and the stomach and duodenum were drawn from their usual situation." Dr. Delepine records an instance in which the duodenum was dragged between the layers of an ileo-cæcal invagination by reason of excessive traction upon the mesocolon. The specimen was obtained from the body of an infant of five months.† The increased length, however, required in the mesentery to permit the appearance of the intussusception 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. There is no doubt that the common congenital anomaly in which the whole colon has a free and extensive mesocolon greatly assists the progress of an invagination.

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,

* Mus. Roy. Coll. of Surgeons, No. 2710.
† Path. Soc. Trans., 1891, p. 124.

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

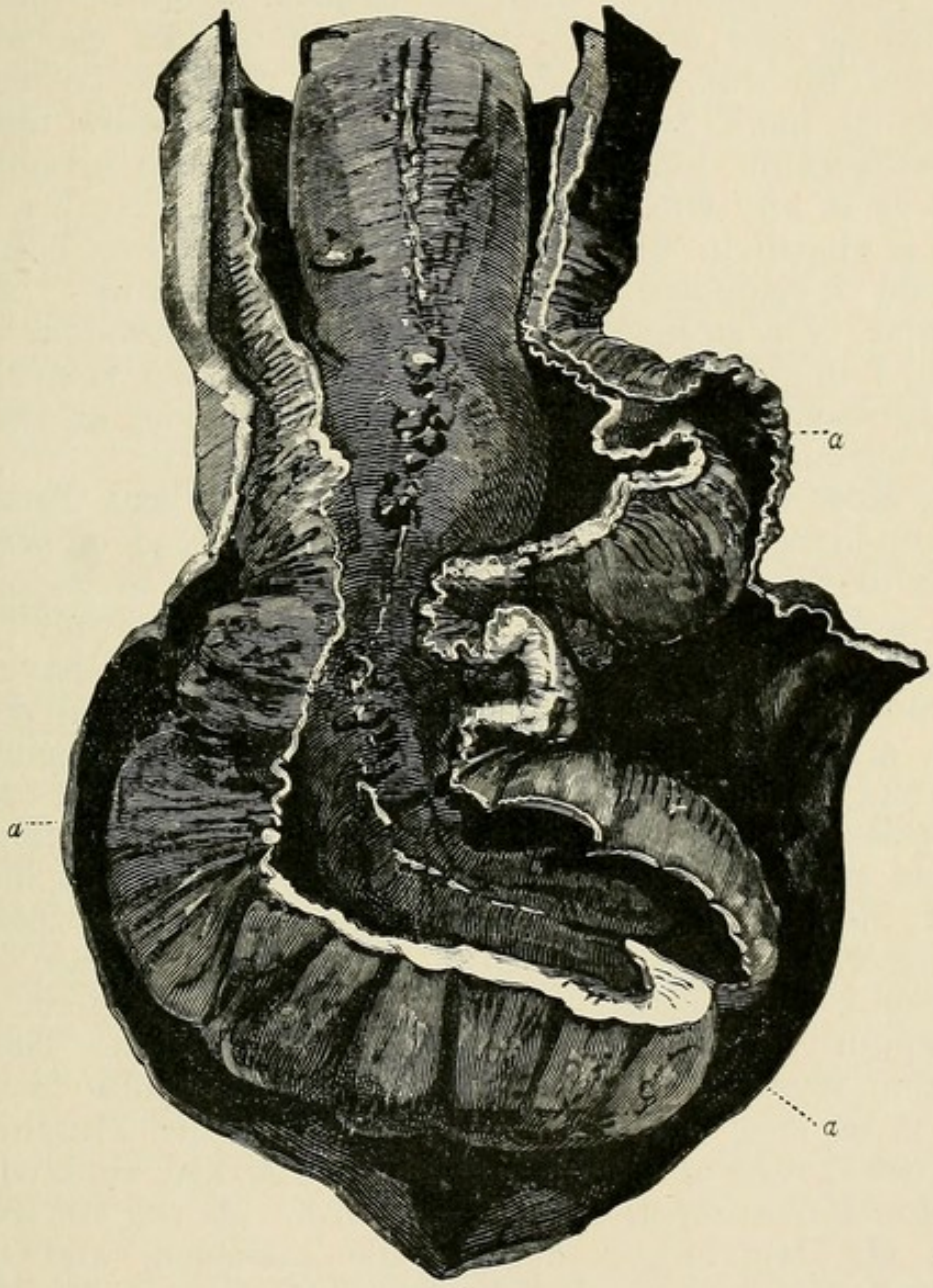


FIG. 60.—Intussusception of descending Colon into Sigmoid Flexure.

There is great thickening of the intussusceptum, especially on its convex side. *a*, the sheath.

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 mesocolon 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. 60,* 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.

2. **How Obstruction and Strangulation are Produced.**—Mere invagination of the bowel need not 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, which concerns 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

* St. Thomas's Hosp. Museum, No. R, 12.
† No. Ae 47.
‡ *Lancet*, vol. i., 1863, p. 409.
§ Med.-Chir. Trans., vol. xxxvii., 1874.

the intussusception would become engorged and swollen. The swelling is first noticed at the apex of the invagination and then in the middle layer. Later the mesentery itself becomes swollen and the arteries of the intussusceptum become compressed. 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, and as a result the whole of the intussusceptum may become gangrenous. The intussusceptum is, in fact, in the position of a knuckle of bowel in a strangulated hernia.

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. 60.

(3) The considerable thickening that the tunics of the involved bowel undergo, as the results of congestion, exudation, and inflammation, tends greatly to 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. Thus when the ileo-cæcal valve is involved in the invagination that aperture may be entirely occluded by swelling of the margins. (Fig. 61.)

(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 certain cases the polyp that caused the intussusception finally blocked entirely its lower aperture,‡ and it has been

* On Intestinal Obstruction by Invagination. London, 1862.

† *Lancet*, vol. ii., 1846, p. 88; and Path. Soc. Trans., vol. xxviii., 1877, p. 131.

‡ M. Fernet; Bull. de la Soc. Anat., 1863, p. 296.

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 be 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 layers 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 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 which has lasted for months and present in one of but a few days' duration.

For example, Mr. Marsh † performed laparotomy in a case of intussusception fifteen hours after the onset of the symptoms. In spite of the short duration of the invagination such firm adhesions existed as to make reduction impossible.

* Intestinal Obstruction. London, 1868.

† *Lancet*, vol. i., 1891, p. 368.

Mr. Parker* found an ileo-cæcal invagination in a child of three months quite irreducible on the fourth day. Mr. Winter† reports an acute case ending fatally in seven days. The patient was an infant of seven months, and the intussusception projected at the anus. At the autopsy the invagination was easily reduced, and no adhesions of any kind existed.

On the other hand there are the cases of Brinton and Hutchinson already quoted.

Carver‡ reduced an intussusception after laparotomy in a boy who had presented symptoms for seven weeks, and Baur§ points out that an invagination may exist for months and no adhesions be produced.

In dealing with the course and prognosis of intussusception I have described a case in which after symptoms extending over many months an ileo-cæcal invagination was found to be still most readily reduced, there being a complete absence of adhesions.

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, on an average, 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 entirely to prevent reduction. Very often the swelling is most marked near the apex, so that the inner cylinders

* Clin. Soc. Trans., 1888, p. 244.

† *Lancet*, vol. i., 1894, p. 600.

‡ Ibid., vol. i., 1889, p. 171.

§ Berliner klin. Wochenschrift, 1892, p. 879.

|| 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.

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. 61.*

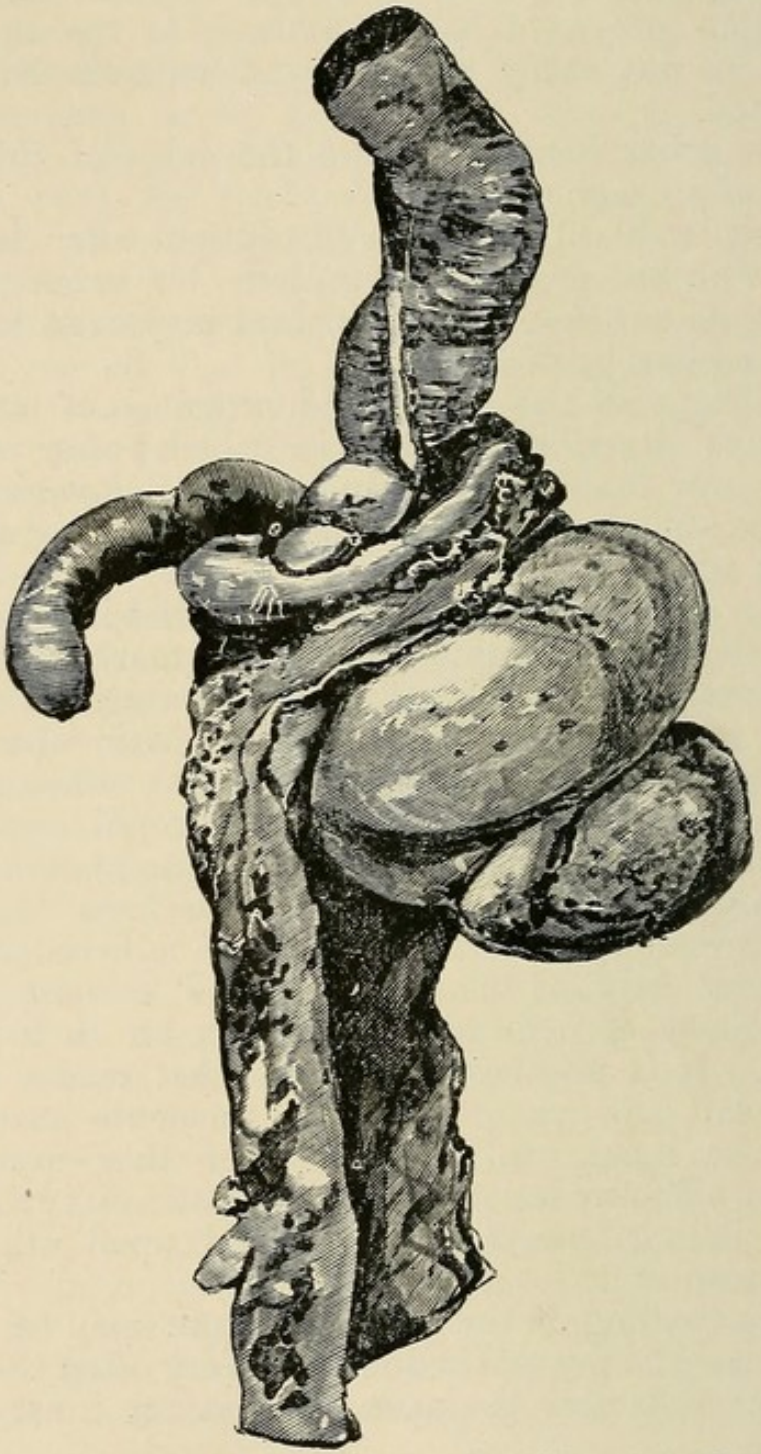


FIG. 61.—Ileo-cæcal Intussusception with great swelling of the Intussusceptum.

(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

* St. Thomas's Hosp. Museum, No. R 8.

reduction is for this reason also quite impossible. (*See* Fig. 60.)

(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. 62, 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. 63 is taken.‡

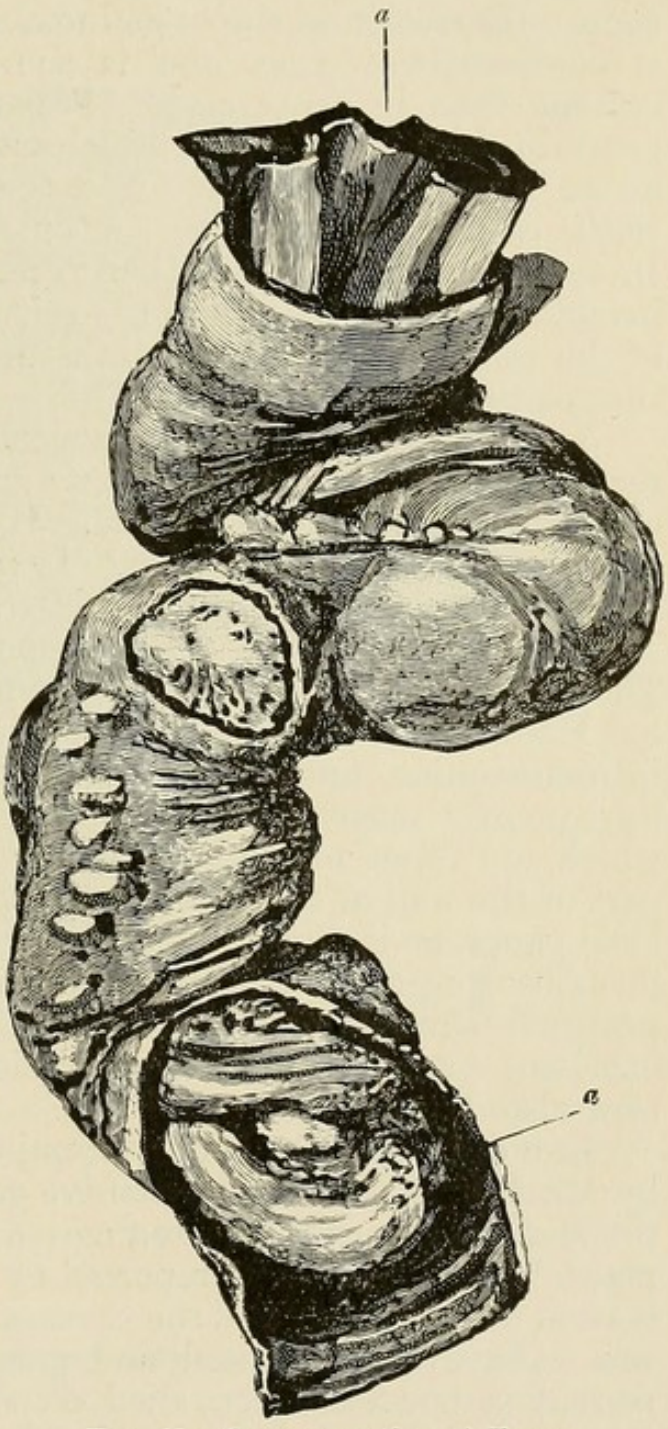


FIG. 62.—Intussusception of Ileum.
a intussusceptum.

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,

* *Lancet*, vol. i., 1876, p. 12. † No. 1176.
‡ Royal Coll. of Surgeons Museum, No. 2719.

its walls are usually hypertrophied, and in some instances this hypertrophy has attained considerable dimensions.

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 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 the result of this ulceration. In at least two instances the bowel above the invagination underwent spontaneous rupture. Both cases, more or less chronic, were in adult males. 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. 64.‖ (*See* also Fig. 62.)

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.¶ A like case is reported by Dr. Turner. The invagination was ileo-colic, and the cæcum, which formed the sheath, was extensively ulcerated and gangrenous in places. The patient, a boy of eleven, died on the tenth day.** An instance of chronic intussusception has been placed on record

* Grissole; Bull. de la Soc. Anat., 1835, p. 71.
† Holmes; Path. Soc. Trans., vol. viii., p. 77.
‡ London Hosp. Museum, No. Ae 45.
§ Heidelb. Med. Annal., 1842, b. 8, s. 428.
‖ Univ. Coll. Museum, No. 1175.
¶ Path. Soc. Trans., vol. xxviii., p. 131.
** Path. Soc. Trans., 1881, p. 83.

where the sheath was entirely ruptured and divided into two distinct parts, one of which contained the intussusceptum, while the other was empty.*

Perforations, which may occur either in the sheath or in the gut above the intussusception, are a little more frequent in chronic than in acute cases. Out of fifty-five examples of

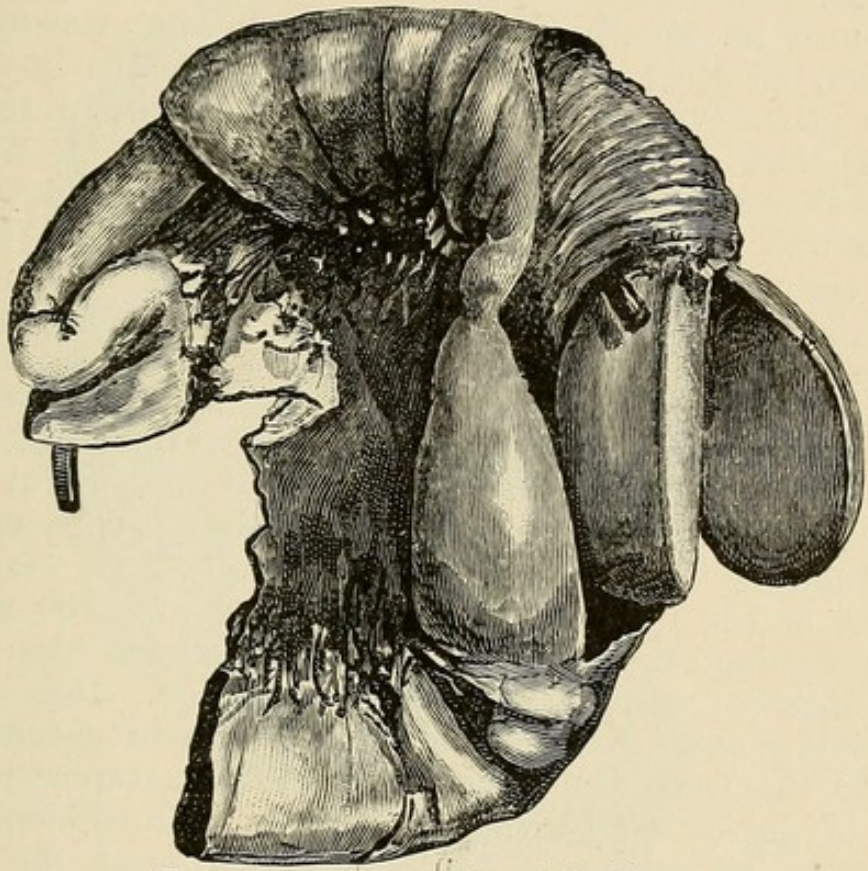


FIG. 63.—Intussusception of the Ileum.

A firm oval tumour exists at the end of the intussusceptum. A bougie indicates the lumen of the gut.

chronic intussusception collected by M. Rafinesque,† there were twelve instances of perforation. Among one hundred and seventy-five 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 which 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

* *Journ. de Méd. de Sedillot*, tome 50, 1814, p. 446.

† Thèse, Paris, 1878.

to gangrene. The microscopic changes which occur in the walls of the invaginated bowel have been fully investigated and described by Mr. D'Arcy Power.*

In more chronic cases great thickening of the layers of the intussusceptum may be met with as the 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 more usually it is most conspicuously marked in two places, viz. at the apex of the intussusceptum (*see* Fig. 61), and along its convexity. (*See* Fig. 60.) 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 very curved tumour much œdema would be impossible, the layers there being thrown into tightly arranged 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 be first to 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 about the apex lead to the knob-like tumour which offers so great an obstacle to reduction. It is also the soft swelling at the extreme end of the intussusceptum which 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 intussusception had existed for nine weeks.

The inner cylinder or entering layer is often greatly contracted, a circumstance which 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

* *Journ. of Path. and Bact.*, June, 1897, p. 484.
† Path. Soc. Trans., vol. viii., p. 179.
‡ Ibid., vol. xxviii., p. 131.

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. The intussusceptum has been found to be quite gangrenous as early as the third day.* It may involve the whole mass of

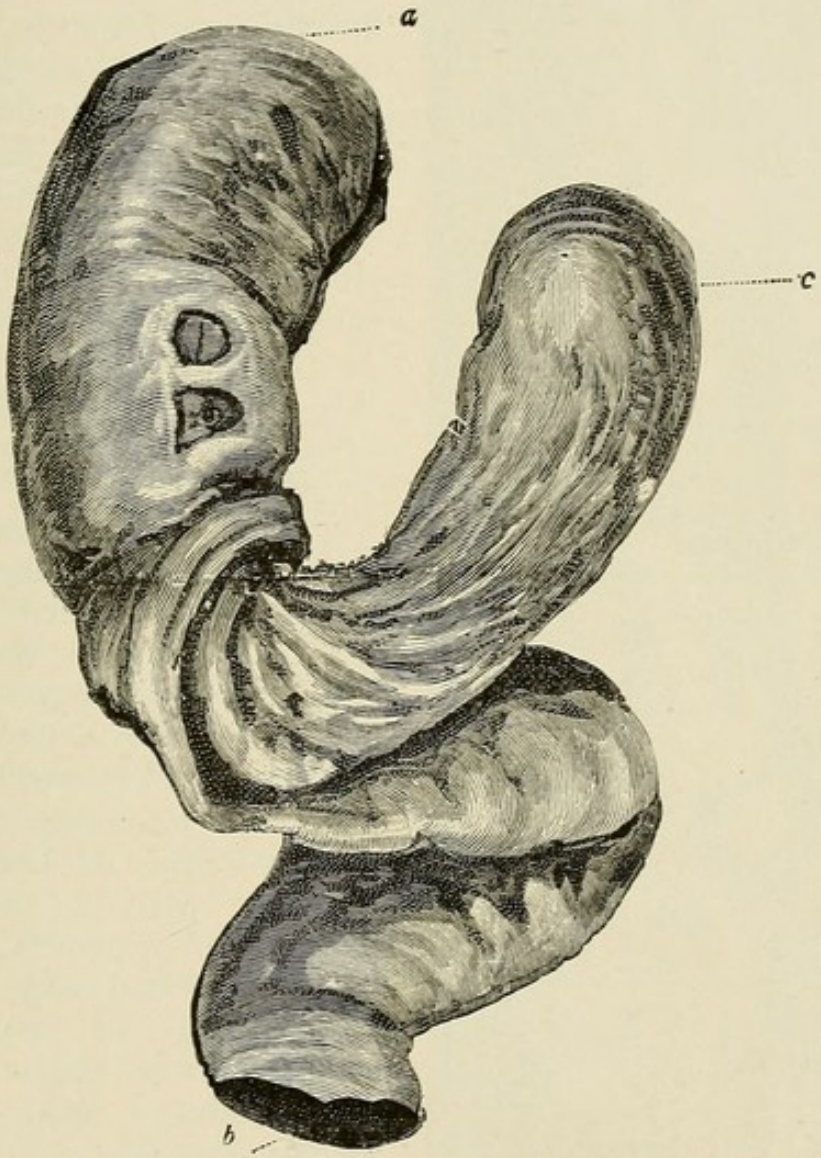


FIG. 64.—Intussusception of the Ileum. Protrusion of the Intussusceptum through an ulcerated Opening in the Sheath.

a, upper end of involved gut; *b*, lower end of involved gut; *c*, the protruding intussusceptum.

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 which end acutely. The gangrenous part 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

* Parker; Clin. Soc. Trans., 1888, p. 244.

gangrene usually appears first, and remains most 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.

FIG. 65.—Portion of the Small Intestine, 40 inches long, voided per anum as a slough, the result of Intussusception. (*Royal Coll. of Surg. Mus.*, No. 2715.)

In the Royal College of Surgeons Museum† is a specimen showing ten to eleven inches of the colon together with a complete vermiform appendix. This piece of bowel was passed per rectum in a lad of eighteen, who made a perfect recovery from acute intussusception.

Another specimen in the same museum ‡ shows no less than forty inches of the ileum which were passed per anum. At the end of this portion of bowel is a polyp half an inch long. The patient was a lady of thirty-two. The intestine was voided eighteen days after the commencement of severe symptoms of intussusception. The case ended in recovery. (Fig. 65.)

* No. 1875. † No. 2714. ‡ No. 2715.

In a case of acute intussusception recorded by Dr. O'Connor* over eleven inches of the ileum with a Meckel's diverticulum attached were passed per anum eight days after the onset of symptoms. The patient, a boy of thirteen, made a good recovery. (Fig. 66.)

Sometimes 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 the 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 which are free from adhesions. Suppose that in the invagination (Fig. 67, 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 which first comes away will have to wait, as it were, for its fellow, and they will then be discharged together, retaining the mutual relations which 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. 67, 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 serous covering external and its lumen lined by mucous membrane.

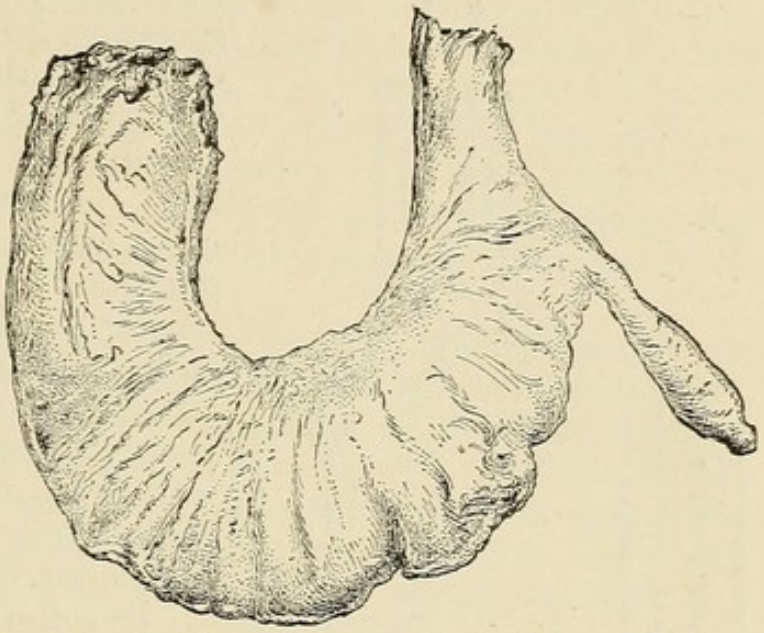


FIG. 66.—Slough of the Ileum, with a Meckel's diverticulum, passed after acute intussusception. (*Dr. O'Connor's case.*)

If, however, the inner layer is set free before its fellow (Fig. 67, C), it may become unfolded, and when the separation

* *Brit. Med. Journ.*, vol. ii., 1894, p. 123.

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, as 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.*

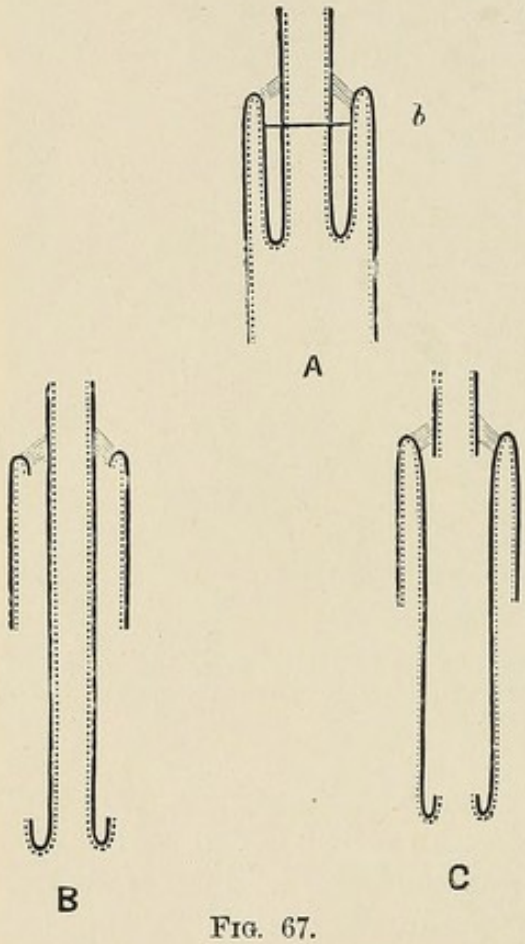


FIG. 67.

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 confined to this part, producing but limited destruction. This is illustrated by a case recorded by Rafinesque where the ileo-cæcal valve which 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.†

* A good example of this apparently inverted bowel is given 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, p. 100.

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 more 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.

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.*

Ratinesque 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 association of *epithelioma* with certain cases of chronic intussusception of the colon. In most of the recorded cases, and in most museum specimens, the epitheliomatous growth has been found upon the apex of the intussusceptum. In such instances there is very little doubt but that the growth preceded the invagination. It is very certain, however, that the neoplasm may grow after the intussusception has formed. The specimen from which Fig. 68 † 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 fifty-six, who had presented symptoms of chronic intussusception for about

* As an example, *see Lancet*, vol. v., 1863, p 409.

† University College Museum, No. 5592.

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 lumen of invaginated ileum is greatly reduced in size. The neoplasm has invaded mainly the convex surface of the intussusceptum, involving, however, both surfaces of the apex of the protrusion.

FIG. 68. — Chronic Intussusception with Epithelioma of the Internal Layer.

A bougie occupies the lumen of the intestine.

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.

A specimen in the Royal College of Surgeons Museum,† depicted in Fig. 69, shows an intussusception immensely thickened by a morbid growth which involves the whole circumference of the mucous membrane. The free surface is flocculent and ulcerated. The new growth proved to be cylindrical-celled cancer undergoing colloid degeneration. The patient, a woman of fifty, had present the evidences of chronic intussusception.

The association of cancer with intussusception as cause and effect is dealt with on page 183, and reference may be made to Figs. 68 and 69.

* An account of the case will be found in the Registrar's Reports of University Coll. Hosp. for 1881, p. 27, case No. 84.

† No. 2718.

THE ETIOLOGY OF INTUSSUSCEPTION.

1. The Immediate Cause.—Many theories have been advanced to explain the invagination of one portion of the

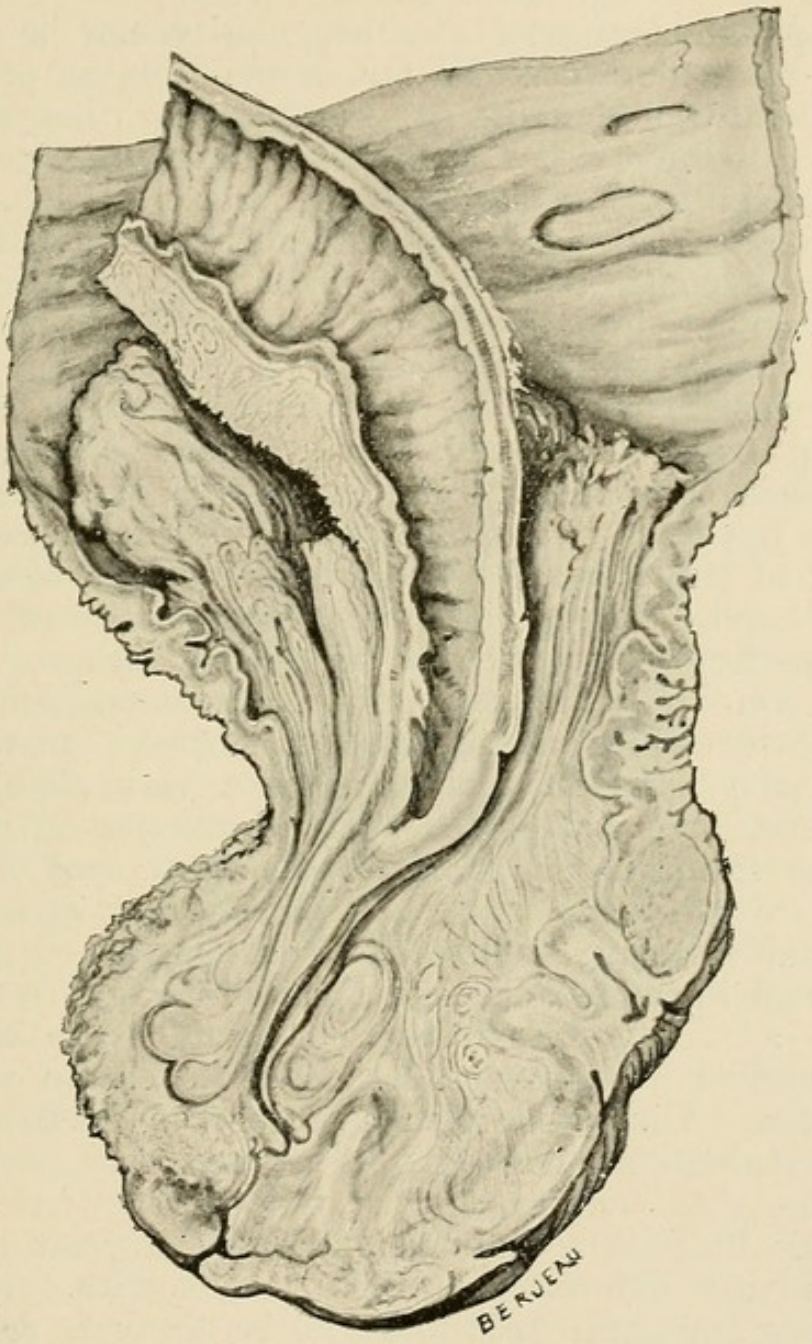


FIG. 69.—Section of an Intussusception.

The invaginated bowel is greatly thickened by a new growth (cylindrical-celled cancer). (*Royal Coll. of Surg. Mus.*, No. 2718.)

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, and with the discussions to which they have given rise, I propose to have no concern; but will consider

merely the one explanation which, 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 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 faradic 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 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

* Beiträge zur Physiologie und Pathologie des Darmes, p. 42; Berlin, 1884.

following experiment. In Fig. 70 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 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.

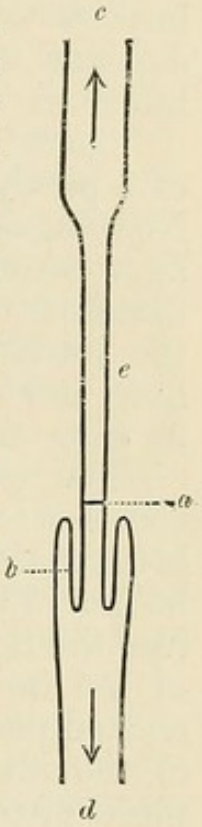


FIG. 70.

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.

There are but few clinical facts to support the existence of a paralytic form of invagination of the type described by Nothnagel. It may perhaps be considered for the present as a laboratory affection. The part played by irregular muscular action is further illustrated by the fact that when the intestines of a rabbit are merely exposed it is possible now and then to note frequent minute intussusceptions forming and dissolving.

The experiments detailed should serve to correct some common impressions which exist as to the production of invagination, and which are still expounded in certain 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. As some writers have expressed it, the contracted gut is swallowed by the non-contracted bowel below it. It is important also to note that the whole length of the contracted segment is not used in the invagination, as is often assumed.

I do not think that sufficient importance has been attached to the action of the longitudinal layer of muscle in producing intussusception, although Nothnagal 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 intussusception acts the part of a foreign body in the intestine, stimulates the intussuscipiens to contract and so force along the inturned cylinder.

Clinical facts strongly 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, cancer of the intestinal wall, and the like.*

Intussceptions 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 after typhoid fever, after cholera, after severe 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, in whom the bowel is more irritable, and in whom the tissues are susceptible of ready change and capable of being easily 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. (*See* page 148.)

And here, by-the-bye, I might venture to suggest that

* Griesenger has shown that in dysentery a paralysis of a section of the intestine is not uncommon.

† *Edin. Med. Journ.*, 1882, p. 53.

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 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 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 strongly to 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.

At birth it is true that the colon is only a few millimetres greater in diameter than is the small intestine, but at the age of puberty the colon is from two and a half to three times as large as the ileum which enters it.

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. 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, however, is still wanting. From an examination of a number of reported cases, and from certain statistics bearing upon the matter of etiology, it is probable that in 100 examples of intussusception the exciting causes would be distributed as follows:

* Loc. cit. Ziemssen's Cyclopædia, vol. vii., p. 617.

1. No evident exciting cause	52	per cent.
2. Diarrhœa, dysentery, enteritis, marked irregularity of the bowels	8	„
3. Polypi and diverticula	8	„
4. Ingesta	15	„
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, cholera, and hernia ; with these may be included cancer	12	„
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 which 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.

Wiederhofer maintains that most cases of intussusception in children occur when the child is in 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.*

If an impaired state of health has any real concern in the production of intussusception, then such a state may possibly explain—in part at least—the instances which have been ascribed to pregnancy, measles, scarlet fever and small-pox.

(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 the 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

* For marked examples *see* Path. Soc. Trans., vol. xxiv., p. 108 (anæmia); ibid., vol. xxxii., p. 82 (heart disease); and Bull. de la Soc. Anat., 1867, p. 136 (chronic phthisis).

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. 63.† 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.‡

Mr. Lockwood § reports, on the other hand, an example in which the polyp was situated entirely above the intussusception.

The polypi in these cases 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.††

Fig. 71 shows an intussusception of the rectum due to a growth which projects into the bowel. In several instances

* For marked examples, *see Lancet*, vol. i., 1876, p. 12; Path. Soc. Trans., vol. viii., p. 177; St. Bart.'s Hosp. Reports, 1876, p. 95.

† *See* also specimens in Lond. Hosp. Museum, No. Ae 45, and Royal Coll. of Surgeons Museum, No. 2719.

‡ Path. Soc. Trans., vol. i., p. 95.

§ Ibid., 1892, p. 74.

‖ Ibid., 1890, p. 121.

¶ Bull. de la Soc. Anat., 1864, p. 37.

** Path. Soc. Trans., vol. xxi., p. 188.

†† Bull. de la Soc. Anat., 1870, p. 260.

an intussusception has been apparently induced by a Meckel's diverticulum. Dr. Adams* described a case in which an inverted Meckel's diverticulum three inches in length was involved in an ileo-colic intussusception. The patient was a man aged forty-two, and the symptoms were sub-acute.

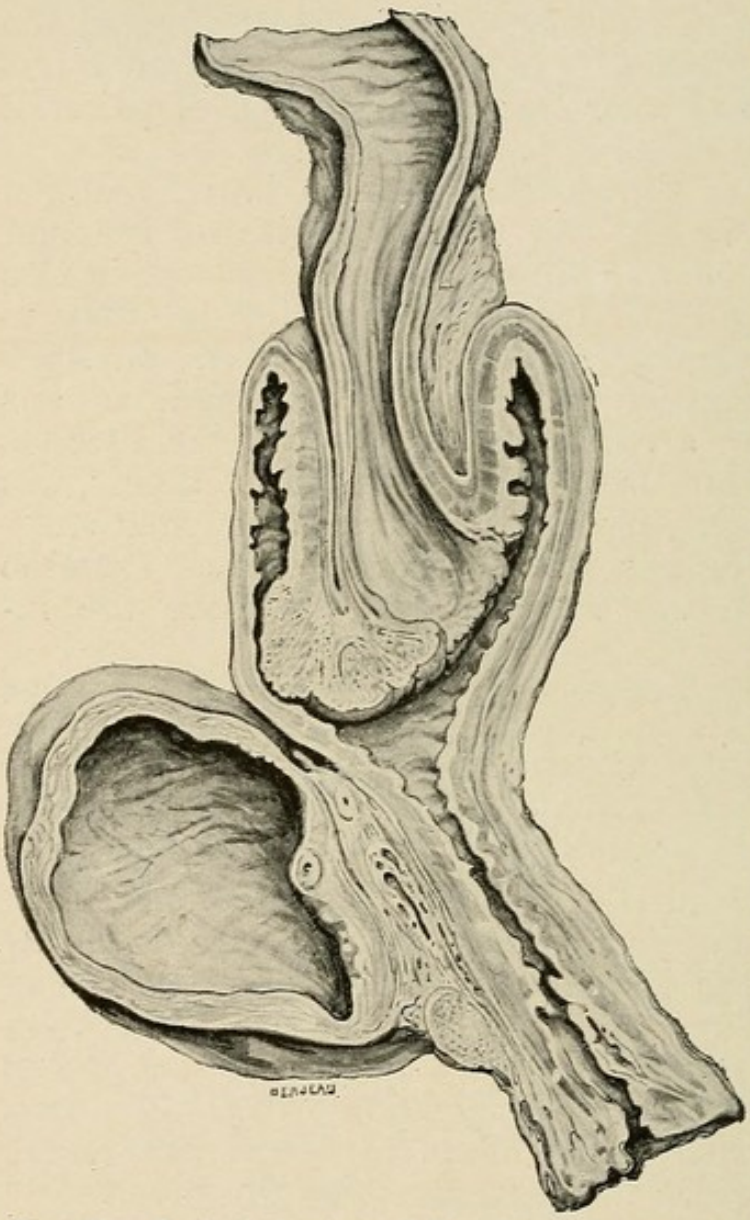


FIG. 71.—Vertical Section of Bladder and Rectum, showing an Intussusception of the Rectum due to a Growth which projects from the Bowel Wall.

(*Royal Coll. of Surg. Mus.*, No. 2722.)

A specimen in Guy's Hospital Museum† shows a short Meckel's diverticulum which had become inverted so as to project into the lumen of the ileum and had caused an intussusception. Fig. 72 is from a specimen in the Royal College of Surgeons Museum.‡ It shows a Meckel's diverticulum an inch and a half long which had become invaginated into the ileum and had led to an intussusception.

Mr. Golding Bird§ reports a remarkable case in a child of four weeks old, in which a Meckel's process opened at the umbilicus. The diverticulum became prolapsed at the navel, and through this prolapsed tube an intussuscepted piece of ileum emerged. The ileum belonged to the gut below the origin of the diverticle.

Barth‖ describes a similar case.

* Path. Soc. Trans., 1892, p. 75.
† No. 1819⁴. ‡ No. 2718A.
§ Clin. Soc. Trans., 1896, p. 32.
‖ Deutsche Zeitsch. f. Chir., 1887.

Allied to the invaginations associated with an inverted Meckel's diverticulum are the examples of intussusception of the appendix. A good instance is reported by Mr. B. Pitts,* in which the vermiform appendix became inverted, projected into the bowel and produced an ileo-cæcal intussusception (Fig. 73).

In a case of intussusception of the appendix leading to an ileo-cæcal invagination reported by Mr. Waterhouse,† the swollen appendix formed a globular mass three-quarters of an inch in length and two and an eighth inches in circumference. I have met with a very similar case in a girl of twelve, in which—being convinced that the mass projecting into the cæcum after the reduction of the ileo-cæcal invagination was a tumour—I excised the swelling. It proved on examination to be an enormously thickened invaginated appendix. It measured two inches on its long axis, and its transverse diameter, as measured after section, was one inch and a quarter. The symptoms of chronic intussusception were present.

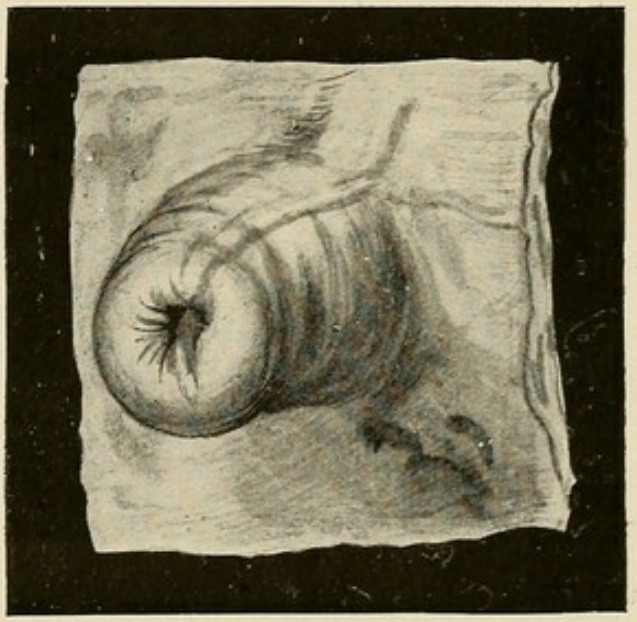


FIG. 72.—Invagination of a Meckel's Diverticulum. The process projected into the Ileum and led to a fatal Intussusception.

(*Royal Coll. of Surg. Mus*, No. 2718A.)

An admirable example of chronic intussusception of the appendix into the cæcum is reported by Messrs. Wright and Renshaw.‡ The child was aged two years and ten months, the symptoms had existed one month when the child was successfully relieved by operation. The condition had been suspected to be due to tuberculosis of the mesenteric glands.

Other examples of intussusception of the appendix have been reported.§

Dr. Rolleston‖ reports a case in which the mucous

* *Lancet*, June 12, 1897.

† Path. Soc. Trans., 1898, p. 108.

‡ *Brit. Med. Journ.*, June 12, 1897.

§ McGraw; *Brit. Med. Journ.*, vol. ii., 1897, p. 956. J. McKidd; *Edinb. Med. Journ.*, 1859. W. Chaffey; *Lancet*, 1888; quoted by McGraw.

‖ *Edin. Med. Journ.*, July, 1898.

coat alone of the vermiform appendix was prolapsed for half an inch into the cæcum. In the prolapse was a concretion.

(4) The severe colic often produced during the passage of undigested food through the intestine suggests that masses of such matters may frequently 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 after swallowing a number of cherry stones. Max Baur mentions a case in which the symptoms of intussusception followed upon the eating of a quantity of cherries together with their stones.§

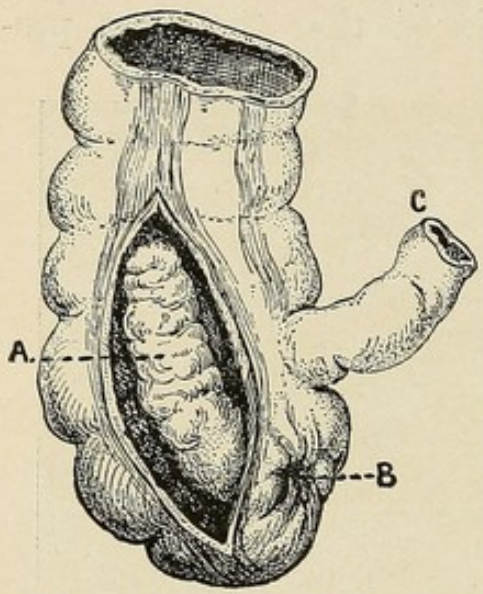


FIG. 73.—Invagination of the Vermiform Appendix.

A, the invaginated appendix; B, depression in cæcum at attachment of the appendix; C, ileum. (*Mr. Pitts' case.*)

In the case of a little girl upon whom I operated for intussusception I found a mass of chewed nuts in the bowel close to the invagination. 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

* No. 1170.

† Contrib. a l'Étude des Invaginations. Paris, 1879. Thèse.

‡ *Gaz. des Hôp.*, 1863, p. 298.

§ Berlin. klin. Wochen., 1892, p. 817. *See* also a case of Leichtenstern's Deutsch. Archiv. f. klin. Med., 1874, p. 381.

‖ Monograph, loc. cit.

of invagination developed suddenly while the child was being "jumped" in someone's arms.*

It has followed upon sudden and severe muscular movements,† has occurred after gymnastic exercises,‡ and after the violent coughing of whooping cough.§ Leichtenstern gives an instance in which intussusception appeared to be due to massage of the abdomen applied to relieve constipation. The intussusception of the jejunum depicted in Fig. 54 came on immediately after chloroform narcosis for osteotomy. The patient died in ten days.

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 stercoraceous 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. Thus Vierhoff** gives an account of intussusception occurring during an attack of purpura.

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 that a morbid state of the bowel had been induced which would readily lead to intussusception.

Among the rarer causes, real or apparent, of invaginations may be mentioned stricture of the ileo-cæcal valve, growths of different kinds attached to the valve,†† and malignant affections of the intestine. Growths which produce intussusceptions are, as a rule, innocent. Such growths are free and often polypoid. Carcinoma of the bowel, on the other hand, tends to make the intestinal tube rigid and to fix it to neighbouring parts.

* Rilliet and Barthez; Traité clinique et prat. des Mal. des Enfants, 1861, t. i., p. 806. *Lancet*, vol. i., 1877, p. 273. *New York Med. Record*, 1896, p. 73.

† *Lancet*, vol. ii., 1888, p. 315.

‡ Ibid., vol. i., 1893, p. 651.

§ Trans. Clin. Soc., 1889, p. 282.

‖ *Lancet*, vol. i., 1867, p. 362.

** St. Petersb. med. Wochens., 1893, p. 320.

†† Dance; Arch. Gén. de Méd., 1832, p. 177.

In the museum of St. George's Hospital* is a specimen of ileo-cæcal invagination from a child aged five months. The cæcum contains three growths about the size of a split almond, which proved on examination to be round-celled sarcomata. I removed by laparotomy the bowel containing an ileo-cæcal intussusception of small size and of very chronic type, which had associated with it a lympho-sarcomatous growth of the bowel.

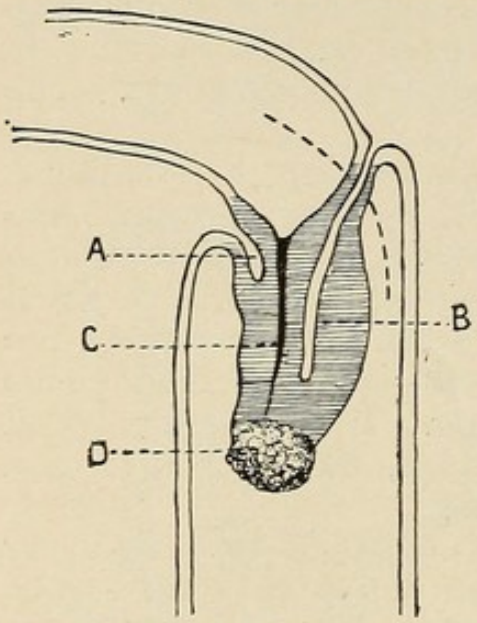


FIG. 74.—Double Lateral Invagination.

A, the smaller invagination; B, the larger invagination; C, apparent line of adhesion; D, nodule of epithelioma. The bowel was pervious in front of the invaginations, and also behind them, as shown by the dotted line. (*Dr. Dalton's case.*)

Actual carcinoma of the bowel is not very apt to lead to intussusception. In cancer of the rectum there is very often a species of prolapse of the bowel, so that the cancerous part appears to project into the lumen of the gut like a large cervix uteri. This condition is, however, not true invagination, but is the outcome partly of a peculiar mode of growth and partly of pressure from the loaded bowel above.

In the museum of the Royal College of Surgeons† is a specimen of intussusception of the rectum due to an epitheliomatous growth which projects from the wall of the bowel. The case is recorded in the twenty-third volume of the Pathological Society's Transactions (Fig. 71).

Excellent examples of the association of intussusception with malignant disease of the colon are reported by Mayo Robson ‡ and by Symonds.§ Bryant gives an account of three specimens showing this association, and also reports two cases, in women of the ages respectively of eighty-four and fifty, in which an intussusception of the lower part of the colon was associated with "a papillomatous growth" attached to the intussusceptum.‖

Fig. 74 shows a remarkable case reported by Dr. Dalton,** in which an epithelioma of the descending colon led to a double lateral invagination of the intestinal wall

* Sec. 9, No 80, i.
† No. 2722. *See* also specimens Nos. 2720 and 2721.
‡ *Brit. Med. Journ.*, vol. ii., 1895, p. 963.
§ Ibid., vol. i., p. 638.
‖ Med.-Chir. Trans., 1894, p. 169.
** Path. Soc. Trans., 1890, p. 122.

CHAPTER VII.

OBSTRUCTION DUE TO FOREIGN BODIES, GALL STONES, AND ENTEROLITHS.

1. **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 which may be considered capable of passing readily through the intestine. Among such are pebbles, stones, fruit stones, coins, bullets, Murphy's buttons, and the like. (2) Sharp-pointed bodies and substances of irregular shape which 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 last-named materials have either been swallowed as a matter of habit by dressmakers and others, or have been intentionally taken by lunatics and hysterical individuals.

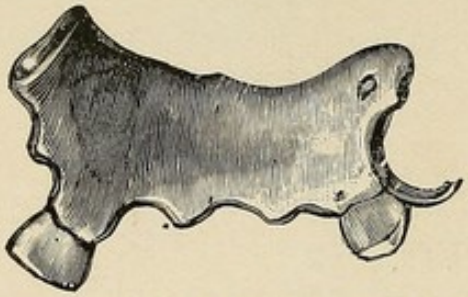


FIG. 75.—Vulcanite Tooth-plate, swallowed by a young girl and passed per anum in forty-two hours. Natural size.

(*Royal Coll. of Surg., Mus.* No. 2,440).

There is no doubt but that the majority of the foreign substances that are swallowed are in time passed by the anus.

Nothnagel* alludes to a case in which there were found in the evacuations of a lunatic, during the course of eight months, 157 pieces of glass, the longest being 6 cm. long, 102 portions of brass pins, 150 nails, three hairpins, fifteen fragments of iron and other foreign substances.

A specimen in the Royal College of Surgeons Museum † relates to the case of a boy of sixteen who swallowed fifty-three marbles for a wager. They could be heard rattling in his abdomen. Forty-six of the marbles were passed next day, and the remaining seven on the day after.

FIG. 76.—A Glass Drop of a Lustre swallowed by a boy six years of age and passed per anum in fifty-two hours. Natural size.

(*Royal Coll. of Surg. Mus., No.* 2444).

Most of the foreign bodies placed in the first of the above classes would be evacuated in the course of a few days, or even after twenty-four or forty-eight hours. Others would be retained for a week or a fortnight, or longer, without causing inconvenience.

The rate at which the foreign substance may pass through the alimentary canal is not always to be estimated by the size and shape of the body.

For example, the vulcanite tooth-plate shown in Fig. 75‡ was swallowed by a young girl after a fit of coughing, and passed per anum forty-two hours afterwards without having occasioned the slightest inconvenience. Yet from one end of the plate there projects a sharp gold hook. On the other hand, the glass drop of a lustre depicted in Fig. 76§ was

* Die Erkrankungen des Darmes., Vienna, 1896, p. 284.
† No. 2441 A.
‡ Royal Coll. of Surgeons Museum, No. 2440.
§ Royal Coll. of Surgeons Museum, No. 2444.

swallowed by a boy, and, in spite of its favourable outline as compared with a plate with teeth, was not passed per anum until fifty-two hours had elapsed.

Many of the foreign bodies belonging to the second of the above classes 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 Royal College of Surgeons Museum is a specimen (No. 2438) showing a dessert-spoon, seven inches long and with a bowl one inch and a half 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 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 brass 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. In the museum of the Royal College of Surgeons‖ is a specimen which shows the upper portion of the duodenum distended and blocked by a mass of pins which weighed nearly a pound. The patient, a woman of forty-one, died of incessant vomiting.

As a foreign body passes along the canal, it may cause

* Holmes's System of Surgery, vol. i., p. 910, 3rd ed. Lond., 1883.
† Med.-Chir. Trans., vol. xii., p. 32.
‡ *Lancet*, vol. i., 1870, p. 757.
§ Ibid., vol. ii., 1874, p. 574.
‖ No. 2379.

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 which 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 a fatal result. Moreover, even when they have been long retained, they may be safely discharged by the natural passages. I have had cases under my care in which a Murphy's button has been discharged after having been retained for many months. In one of Mr. Pollock's cases a plate of false teeth had been swallowed, and after remaining in the stomach for ninety-seven days was finally ejected by vomiting. Hashimoto* records a case where a tooth-brush had been extracted after fifteen years' retention in the stomach. It had induced an abscess. The impacted foreign substance is, however, very apt to cause some ulceration of the mucous membrane.

Thus a specimen in the Royal College of Surgeons Museum† shows a cæcum and ascending colon the seat of numerous large and most destructive ulcers. The patient, a lad of twelve, had suffered for sixteen months from severe pain in the abdomen, followed by vomiting which in due course became persistent. The abdomen was swollen. The patient became very emaciated and died of exhaustion. Imbedded in the ulcers in the cæcum were five cherry and damson stones, a piece of wood, and half a small button. Seven other fruit stones were found loose in the bowel.

The ulceration induced by a foreign body may readily lead to perforation and to fatal peritonitis. This circumstance is illustrated by the remarkable case of the "Human Ostrich."‡ The patient was a man of forty-two who had been in the habit of swallowing all sorts of foreign bodies "to gain a livelihood." He died of perforative peritonitis. There were two perforations in the ileum caused by sharp foreign substances. An artificial intussusception had been produced by a hook which had caught in the bowel wall and had dragged it inwards.

The terminal part of the ileum was blocked for eighteen

* Archiv f. klin. Chir., 1888, p. 169.
† No. 2442.
‡ *Brit. Med. Journ.*, vol. i., 1894, p. 963.

inches by foreign bodies, of which the subjoined is an inventory:—

Forty pieces of cork (cut bottle corks).
Thirty pieces of doubled tinfoil.
Nine pennies.
One iron ring (size of a penny).
Ten or twelve pieces of clay pipe-stems.
A leaden bullet.
A rubber ring from a lemonade bottle.
Three pieces of leather an inch square, string, cotton, newspaper.
A piece of leather, nine inches long, with a stout hook at each end (one of these hooks had been found in the perforation).
A piece of string about a foot long, with tinfoil and corks attached.
A few other smaller things.

From accounts given of other cases it is evident that 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 Royal College of Surgeons Museum is a specimen (No. 2445) from a boy, aged eleven, where many cherry and plum stones which had been swallowed were discharged through an external abscess. Fig. 77 illustrates a remarkable case in which an iron teaspoon, which had been swallowed five weeks previously, escaped through the parietes having produced a perforating ulcer of the colon.* 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.

The foreign body has even escaped through the bladder. In a case reported by Harrison† a man was troubled with the escape of fæcal matter and flatus from the urethra. In due course a portion of the femur of a rabbit was discharged with the urine, and after that the escape of fæcal matter ceased, and the patient made a perfect recovery.

* Mr. Rouse's case, *Lancet*, Sept. 9th, 1893.
† *Med. Press and Circ.*, vol. ii., 1883, p. 441.

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 which 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. In the museum of the Royal College of Surgeons* is a mass of

FIG. 77.—Passage of an Iron Teaspoon, which had been swallowed five weeks previously, from the Colon through the Abdominal Parietes. (Case by Mr. Rouse, *Lancet*, Sept. 9th, 1893.)

black human hair removed by operation from the stomach of a girl aged twenty. The mass weighed 5 lb. and 3 oz. The patient did well.

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 which 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 cocoa-nut fibre.‡

Dr. Maylard§ gives an account of a case in which

* No. 2381 A.
† Med.-Chir. Trans., vol. xxxv., p. 65.
‡ Path. Soc. Trans., vol. v., p. 145.
§ The Surgery of the Alimentary Canal. London, 1896, p. 337.

intestinal obstruction was brought about in a woman of fifty-five by eating a large quantity of gooseberry skins. I have seen a like condition follow the consumption of a very immoderate quantity of nuts.

The whole question of foreign bodies in the alimentary canal has been much simplified by the introduction of the Röntgen method. Many skiagraphs have been taken which show the presence of foreign substances of a metallic nature in the alimentary canal. The progress of a Murphy's button can be well followed by the X-rays.

2. **Gall Stones.**—The lumen of the intestine may be obstructed at certain points by a gall stone which 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. So far as the present subject is concerned, it will suffice to say that a gall stone may reach the intestine by one of three routes. It may pass down the common bile duct; it may pass from the gall bladder direct into the duodenum by means of a fistulous tract; and it may pass in like manner direct from the gall bladder into the colon.*

It is needless to say that a stone which will pass along the 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 which cause occlusion do not 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. A specimen in Charing Cross Hospital Museum (No. 864) illustrates this. Indeed, it appears to me, after examining a large number of cases, that at present decided evidence is lacking which would show that a biliary calculus which has passed along the bile duct is capable of causing obstruction symptoms when it reaches the intestine. In many of the reported cases of this supposed accident the condition of the gall

* Fistulous communications between the biliary passages and the duodenum are twice as common as are like communications with the colon.

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 two and a half inches by one inch and a half, and presenting a circumference of three and a half inches.† Examples of the evacuation of stones so large as 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 four and a half inches by two and a quarter inches lodged in the upper part of the jejunum;‡ one with a circumference of three and three-eighths inches impacted in the lower jejunum;§ one two inches in length and with a circumference of four inches, also in the jejunum;‖ and another an inch in length and with a like circumference impacted in the ileum.¶ Fig. 78** shows a stone two inches in length by one inch and a quarter in breadth blocking up 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 an 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

* Path. and Pract. Researches on Diseases of the Stomach, etc., p. 127, 3rd. ed. London, 1837.

† *See* case by Marshall; Trans. Glasgow Path. and Clin. Soc., 1893, p. 227.

‡ Mr. E. Pye Smith; Path. Soc. Trans., vol. v., p. 163.

§ Dr. Baly; ibid., vol. x., p. 184.

‖ *Revue Méd. de la Suisse Romande*, No. 2, 1882, p. 82.

¶ Dr. Murchison, Path. Soc. Trans., vol. xx., p. 219.

** Museum Royal Coll. of Surgeons, No. 2436.

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 five inches, and a diameter of about one inch and a half.

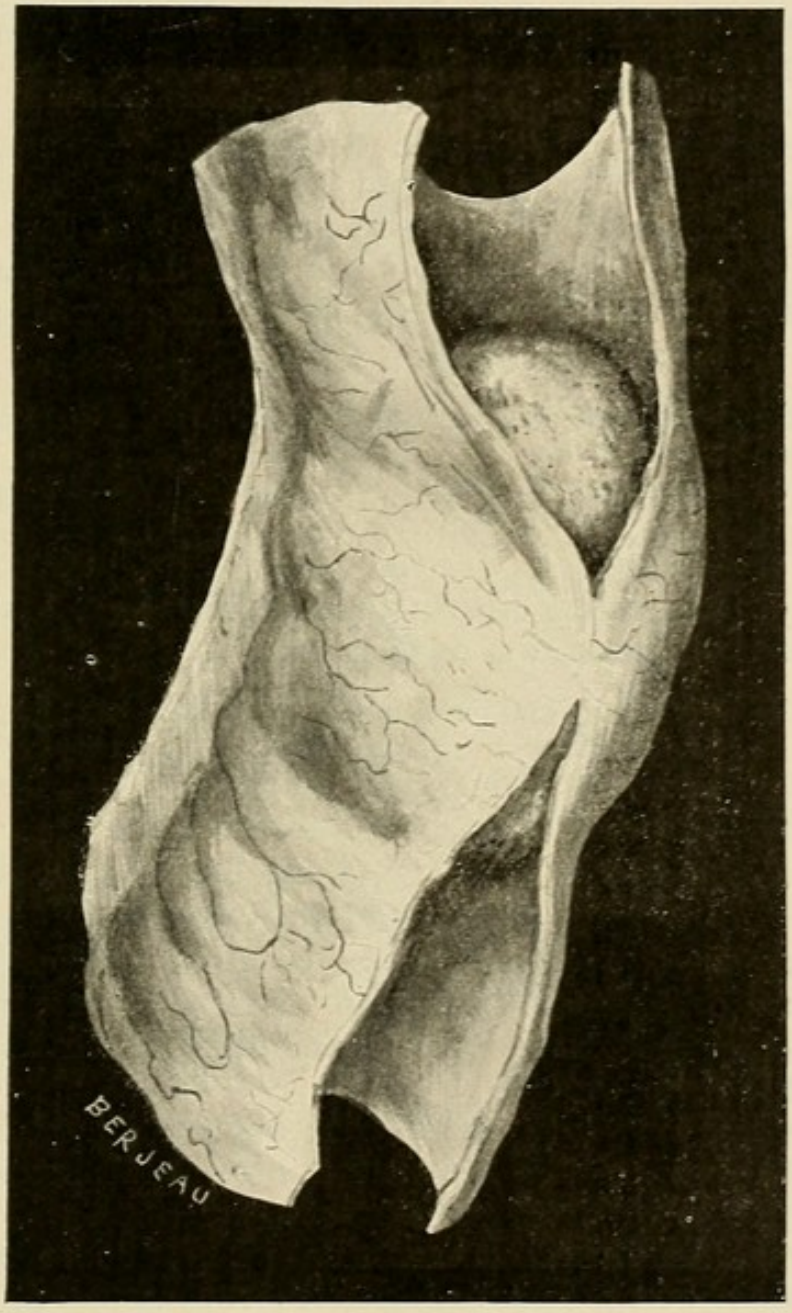


FIG. 78.—Gall Stone impacted in the Ileum.

The stone measured 2 inches by 1¼ inch, and has escaped from the gall bladder by ulceration into the duodenum. (*Royal Coll. of Surg. Mus.*, No. 2436.)

I removed from the ileum of an old lady a calculus with a diameter in its long axis of one inch and a half. Its nucleus was a small gall stone, and its large size was due to layers of magnesia and fæcal matter. The patient had taken carbonate of magnesia every day for many years

The concretion is in the museum of the Royal College of Surgeons.

On the contrary, obstruction of the bowels has been produced by gall stones of comparatively small size. Thus, in the museum of Guy's Hospital is a gall stone weighing only 55 grains which was the cause of fatal intestinal obstruction. Israel performed laparotomy in a case of intestinal obstruction, and found a gall stone in the lower ileum with a diameter of only 2 cm. It was assumed that the stone had caused a "dynamic obstruction" by spasm.

The point in the intestinal tube at which the stone lodges is most frequently in the lower 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

Courvoisier, dealing with a total of fifty-three cases, places the site of the obstruction as follows:

In the duodenum and jejunum	21·4 per cent.
In the ileum	65·4 „
At the ileo-cæcal valve	10 „
In the sigmoid flexure	2·4 „

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 nearly all the fatal cases of obstruction by a calculus the impaction has been in the lesser bowel.

Korte, however, reports a case of acute fatal intestinal obstruction due to the impaction of a gall stone in the colon of a woman, aged seventy-two.*

Although intestinal obstruction when due to gall stone is in nearly every instance due to the actual plugging of the gut by the stone, yet from a few reported cases it would appear that the calculus in its passage may produce the phenomena of volvulus of the small intestine. Two examples of this are alluded to on page 136.

3. **Enteroliths.**—Intestinal calculi or enteroliths may be divided into three classes.

(1) Concretions formed in great part of phosphate of lime,

* Berliner klin. Wochens., 1893, p. 690.

or of phosphate of magnesia, or of the triple 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, hair, 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.

Dr. Hector Mackenzie* reports the case of a woman of seventy from whose rectum a concretion was removed weighing 497 grains. It was irregularly cuboidal, and was about the size of the astragalus. It was almost entirely covered by large crystalline prisms. It proved on examination to be composed of ammonio-magnesian phosphate. The nucleus appears to have been formed by a broken fragment of an incisor tooth which she had swallowed sixteen years previously.

In Leichtenstern's list of such calculi are three whose respective circumferences are four and a half, seven and a half, and nine inches. Mr. P. H. Watson records one one inch and three-eighths in length and one inch and one-eighth in width. In cases where several stones exist they will usually be found to be faceted 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.

The precise circumstances which lead to the formation of these calculi are not yet fully understood. They are allied to the concretions found so often in the vermiform appendix. It is possible that in certain examples the salts which form the concretion are derived from the copious fluid which may result from chronic catarrh of the bowel. There is little doubt but that such catarrh forms a very

* Path. Soc. Trans., Lond., 1892, p. 70.

important factor in the production of the concretions found in the appendix. The pathology of such calculi is identical with that of the rhinolith, which is, without doubt, a product of a copious and long-continued catarrh of the nasal passages.

Into the composition of such concretions as those now under consideration fæcal matter enters largely. The section of a hardened mass of long retained fæces will often bear a suggestive resemblance to these undoubted enteroliths.

It is not always easy to separate these concretions from those which are described below as belonging to the third class.

One very distinctly stony concretion which I removed from the sigmoid flexure of a hypochondriacal man proved on examination to be composed solely of very inspissated fæcal matter. It was easily felt through the parietes before the operation, and until it was bisected it well merited the appellation of a "stone."

(2) Enteroliths of low specific gravity and of irregular form which 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, which 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 an orange.

Khalofoff† reports the following case: A woman, aged fifty, had suffered for many years from periodic attacks of abdominal pain attended by distension, vomiting, and constipation. Two hard globular movable tumours were discovered in the abdomen. Laparotomy was performed, and the two tumours—which were found lodged in the bowel—were removed. They proved to be very light enteroliths, measuring respectively 6 and 4½ cm. in diameter. They were found to consist of fine ligneous hairs or fibres of some tree with admixture of rye and oat scales. The patient had been habitually eating bad bread made with flour adulterated with some ligneous substance. She made a good recovery.

* Dr. Harley reports a case where twenty oat-stones had been passed at different times. They were small, were the colour of brown sandstone, looked on section like felt, and floated in water. Path. Soc. Trans., vol. xi., p. 87.

† Annual of the Universal Med. Sciences, 1891, vol. iii., C-40.

Closely allied with such enteroliths are certain concretions of indigestible matters which belong perhaps more properly to the list of "foreign bodies." (*See* page 190.) 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.†

(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 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.‡

The following case is recorded by Schroeder.§ A man, aged fifty-three, had suffered for many years from severe attacks of colic, attended by meteorism and obstinate constipation. One day he passed a hard concretion, and gradually lost all his symptoms. The concretion was small, and weighed 62 grains. It was composed of carbonate and phosphate of lime with a considerable admixture of red oxide of iron. The patient had had a long course of treatment by Marienbad-Kreuzbrunnen water, which contains chalybeates in the form of carbonate of iron.

In a case reported by Mentin‖ a patient had taken much

* Path. Soc. Trans., vol. xi., p. 87.

† Ibid., vol. xviii., p. 98. For other cases see *Brit. Med. Journ.*, March 29, 1884, p. 608.

‡ Path. Soc. Trans., vol. vi., p. 203.

§ Annual of the Universal Med. Sciences, 1892, vol. i., D-21.

‖ Ibid.

subnitrate of bismuth for persisting intestinal catarrh. At the post-mortem a bean-shaped body was found in the cæcum composed of 85 per cent. of subnitrate of bismuth and of 15 per cent. of organic substances. The concretion had given no trouble.

Hadden* reports the case of a girl, aged seven years, who suffered for several months from intestinal catarrh, for which she had been treated with chalk and with bismuth.

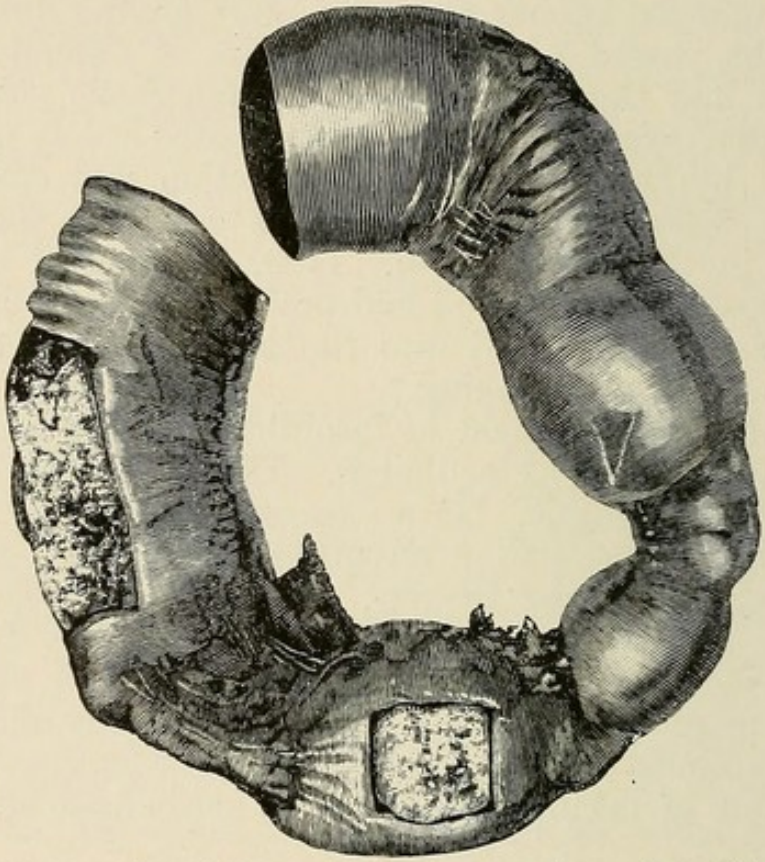


FIG. 79.—Obstruction of the small Intestine by a Concretion of Magnesia.
The wall of the bowel has been cut away in two places to show the concretion.

The child died, and at the post-mortem nineteen calculi varying in size from an orange pip to a large cherry were found in the transverse colon. They were composed of tricalcium phosphate, calcium carbonate, organic matter, and moisture.

Fig. 79 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

* Trans. Path. Soc., 1888, p. 131. † No. R 1.

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. For the eleven years that preceded the evacuation of the concretion she had simply suffered from constipation.

It may be convenient here to mention the subject of salol calculi. Salol is extensively used by many in cases of intestinal disorder, and its disposition to form calculous masses is now fully recognised. Some years ago in a case in which I had performed left colotomy for cancer of the rectum the nurse discovered in the fæcal discharge occasional hard substances, the largest of which was the size of the tip of the little finger. These masses were flat and showed no evidence of being rounded. They looked crystalline, were semi-opaque, and of a yellow colour. I could only compare them to pieces of amber. They smelt of salol, and I submitted them to a chemist, who said they were composed of salol, but in a form unfamiliar to him. The patient had been taking salol for some weeks.

A little later, in May, 1894, I had performed right colotomy for cancer of the ascending colon. The patient had taken much salol, and the same amber-like bodies escaped from the artificial opening in the cæcum. Both these patients had taken salol in the form of tabloids. The subject of salol calculi has been fully dealt with by Dr. Marshall in a recent communication.*

* *Brit. Med. Journ.*, July 10, 1897.

He gives the following cases:—Dr. Bradbury's case: A young lady had taken 10 grains of salol in a cachet once or twice a day for some months. At the end of six months she began to have attacks of colic, accompanied by vomiting and needing morphia. In one of these attacks she vomited a salol calculus weighing 1 gramme, and then stated that like masses had been frequently passed by the bowel. M. Girode, in a case of cholera in which salol had been given for two days before death, found in the stomach at the autopsy two masses of salol weighing 3 grammes. Dr. Brossard's case concerns a neurasthenic lady, aged forty-five, suffering from gastric dilatation, with paroxysmal gastralgia and hyperchlorhydria. Vomiting was frequent, and was sometimes accompanied by hæmatemesis. The patient refused lavage, and the treatment consisted in the administration of large doses of alkalies and a milk diet. The attempt at a milk diet produced febrile symptoms, and salol and calomel were therefore given. The salol was administered in 0·5-gramme (7½ grain) doses, and 4 to 5 grammes (62 to 77 grains) were given daily. After ten days (that is, after the administration of 40 grammes, rather more than 1¼ ounce), the patient, who was habitually constipated, presented severe symptoms of intestinal obstruction. Purgatives, large enemata, the continuous current, were repeatedly tried, but without effect, and the symptoms continued for thirty-six hours. Finally, a motion was passed, and thinking that a biliary calculus might have produced the pain it was carefully washed. About ten crystals, weighing altogether 4 grammes (62 grains) were found, the largest of which weighed 1·8 gramme. Similar small calculi occurred in the two following motions. They all consisted of pure salol.

Before concluding the present chapter it may be well to allude to the subject of the alleged blocking of the intestine by *means of intestinal worms or by intestinal casts.*

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 which can be felt in the occluding mass.

I can find no trustworthy illustration of this somewhat improbable form of intestinal obstruction. Heller, in his

* Du Traitement de l'Occlusion Intestinale par le Mercure métallique. Paris, Thèse, No. 340, 1879.

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."*

Nothnagel, in his recent work, "Die Erkrankungen des Darmes," is disposed to credit the reality of this form of obstruction, and alludes to the observations of Mosler and Peiper, who consider that ascarides, if present in sufficient numbers, may produce intestinal obstruction and volvulus.

With regard to intestinal casts, Dr. Harley† reports a case in a woman, aged twenty-eight, where symptoms of severe obstruction were caused by fibrinous concretions, four in number, which were finally discharged from the anus with immediate relief to a long continued train of distressing symptoms.

One of these masses measured three and a half inches by two inches. They were described as densely laminated and fibrous-looking on section, and to be composed apparently of "lymph."

It is probable that these masses were the skin-like casts of membranous colitis. In that affection "skins" are passed which may resemble tape-worms, or an entire tubular cast of the bowel may be voided which may measure inches or even feet in length. Usually these skins or casts are very thin, but some have been as much as one-fourth of an inch in thickness. They are sufficiently tenacious to be held up, are structureless, and consist of albumen. Sometimes these exfoliations are passed rolled up into solid balls, with or without fæces.

It may be questioned if these skins or casts ever in reality cause intestinal obstruction. The subjects of membranous colitis are, for the most part, chronic dyspeptics, with a marked tendency to constipation. They are liable to "attacks" marked by severe colic, flatulence, constipation, nausea and possibly vomiting. In due course it is noticed that "skins" are being passed, and relief of the more distressing symptoms is experienced. It is possible that the case described by Dr. Harley comes into this category.

* Ziemssen's Cyclopædia, vol. vii., p. 679.

† Path. Soc. Trans., vol. xi., p. 87.

CHAPTER VIII.

STRICTURE OF THE INTESTINE.

UNDER the general term "stricture of the intestine" should possibly be included all those morbid conditions of the bowel which have led to a definite narrowing of its lumen.

For purposes of convenience, however, and to avoid bringing together under one heading many perfectly distinct pathological processes, it is well that the term "stricture" be limited to a narrowing of the lumen brought about by changes in the coats of the bowel itself.

Thus, for example, one would exclude from the present category cases of stenosis of the bowel due to the contraction of inflammatory products in the peritoneum, and those instances of narrowing 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. (*See* pages 80 and 88.)

All strictures of the intestine may be divided into three classes:—

1. Cicatricial or simple stricture, due to cicatrisation after non-malignant ulcer of the bowel.
2. Cancerous stricture, due to deposits of carcinoma in the bowel wall.
3. Congenital stricture, due to defects in development, and possibly to other intra-uterine changes.

After the consideration of these three forms of stricture, it will be desirable to deal with the somewhat anomalous conditions described under the title of "Idiopathic dilatation of the colon."

I. 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 which 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 which produces the greatest amount of harm with the least amount of contraction is that which assumes an annular form; while the least harmful cicatrix is the one which is longitudinal in direction and which involves only a part of the circumference of the bowel.

It is convenient to divide the cicatricial strictures into three classes. (A) Those depending upon primary ulceration. (B) Those which are subsequent to lesions following strangulated hernia. (C) Those which 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.

(A) **Stricture after Ulceration.**—There is no doubt but that our knowledge of the ulcerative processes in the intestine is still very far from complete. The actual morbid appearances have been somewhat fully described, but the interpretation of what is found is not yet quite emphatic, and the clinical phases of ulceration in the bowel are still indistinctly defined. So far as the present subject is concerned, it is manifest that stricture is a comparatively rare—probably a very rare—result of ulceration of the bowel. Non-malignant ulcers of various kinds are quite commonly met with in the intestinal canal. In the great majority of instances, such ulcers heal and leave a cicatrix. Yet stricture of the bowel resulting from that cicatrix may be said to be quite rare. Narrowing of the bowel of a trifling degree will excite no clinical manifestations, and in speaking of stricture it is assumed that the narrowing produced in the bowel is such as to cause actual obstruction.

The narrowing of the lumen produced by a stricture may be intensified by peritoneal adhesions, by some bending of the stenosed gut, or by some infolding of the intestinal wall.

From the account of a case which I have alluded to in a subsequent section, dealing with the tuberculous ulcer (page 207), it would appear that chronic inflammatory thickening of the bowel wall may produce such narrowing of the gut as to cause obstruction.

The following forms of intestinal ulcer may be considered.

1. DUODENAL ULCER.—Ulcers of different kinds are described as occurring in the duodenum. They have been found associated, according to various writers, with Bright's disease, heart disease, septicæmia, and enteric fever. Tuberculous ulcers are very rare in the duodenum, although they are not entirely unknown in that part.

The duodenal ulcer associated with burns, and especially with extensive burns of the trunk, is met with chiefly in young subjects, and usually during the inflammatory stage of the burn. It is probable that a septic embolus leads to a hæmorrhagic infiltration, and that by the action of the gastric juice this is changed into an ulcer. There is no evidence that this ulcer has ever led to a stricture.

The simple ulcer of the duodenum has the same pathogeny as the simple ulcer of the stomach. It is more common in males than in females, and the average age is stated to be between thirty and forty. The ulcer is nearly always found in the first part of the duodenum, and on the anterior wall. It is very rare in the second part, and still rarer in the third. As a rule, the ulcer is single, and resembles the gastric ulcer in form and dimensions.

This ulcer may lead to severe and even fatal bleeding, to perforation, to subphrenic abscess, and to stricture of the duodenum. It may compress by its cicatrix the biliary papilla, and cause persisting jaundice. It may deepen and burrow into the gall bladder, the bowel, or even the aorta.

Owing to the large size of the duodenum and the fluid character of its contents, a stricture sufficiently narrow to cause symptoms of obstruction is certainly uncommon.

Dr. F. Lange* reports a very good example of stenosis of the duodenum due to the cicatrisation of an ulcer near the pylorus. The patient presented first the symptoms of ulcer of the stomach, and later those of stricture of the pylorus. She was cured by operation.

Another good example of this stricture is reported by Boas.†

In certain examples of non-malignant stricture of the duodenum it would appear that gall stones have caused the ulceration which led to the cicatrix.

* Annals of Surgery, vol. i., 1893, p. 588.

† Annual of the Universal Med. Sci., 1892, vol. i., D-11

Hochhaus* reports three cases of this association. In one the stenosis was close to the pylorus, in another close to the jejunum, while in the third case both duodenum and pylorus were involved.

2. Tuberculous Ulcer.—This ulcer is of common occurrence. It is, however, desirable to remember that every ulcer met with in the bowel of those who have died of

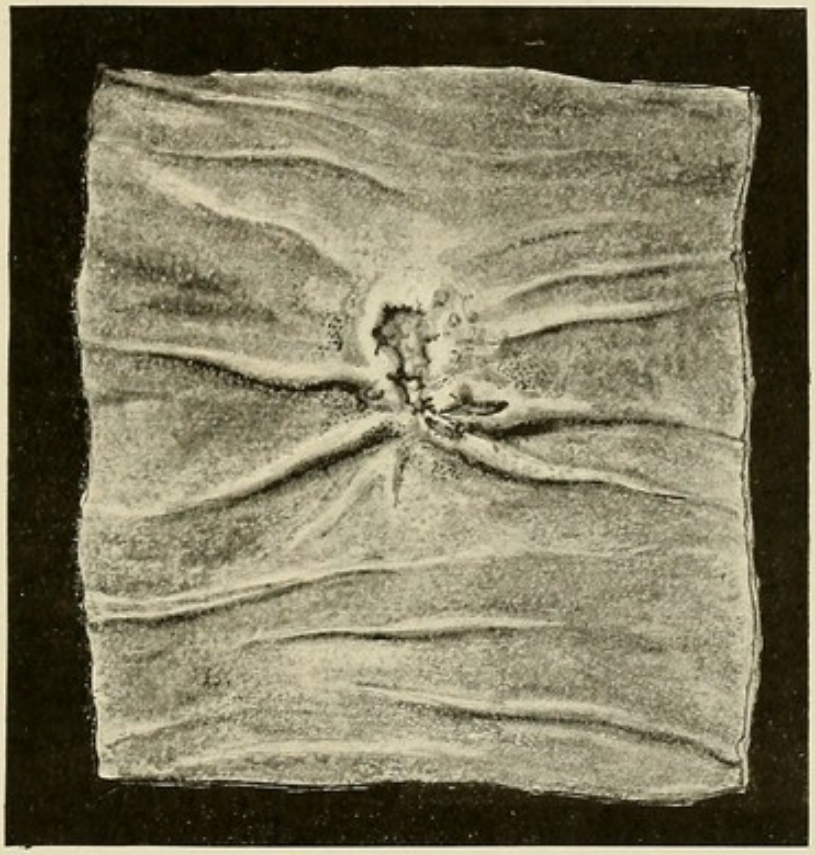


Fig. 80.—Tuberculous Ulcer of a Peyer's Patch in process of Healing.
(*Royal Coll. of Surg. Mus.*, No. 2544 A.)

tuberculosis is not, of necessity, tuberculous. Tuberculous ulcers are met with in all parts of the intestine, but are most common in the lower extremity of the ileum. They become more and more rare as the stomach is approached. They often involve a great extent of the bowel, and are apt to be multiple. They take origin in Peyer's patches and in the solitary glands. Fig. 80 shows a tuberculous ulcer in a Peyer's patch. Its base was studded with miliary tubercles. The patient had phthisis. Caseation is produced, and the breaking down of the unstable cheesy mass leads to the ulcer. The ulcers tend to extend transversely, and may in certain instances entirely encircle the bowel.

* Berliner klin. Wochenschrift, 1891, No. 17, p. 409.

Sometimes the extension is in the long axis of the intestine. In character the ulcer closely resembles such a tuberculous ulcer as may now and then be seen in the pharynx. The ulcers are at first small and round, and later tend to become large and irregular. The typical ulcer is excavated, has thick overhanging edges, and an uneven floor.

There may be considerable undermining of the mucous membrane.* Perforation is rare. Eisenhardt† found perforation in twenty-eight out of 566 cases of intestinal tuberculosis, examined post-mortem. Some stenosis as a result of cicatrisation of the ulcer is not uncommon, but it is certain that it very often fails to reach a stage sufficient to produce any symptoms. There are, however, many examples of quite dense and rigid tuberculous strictures.

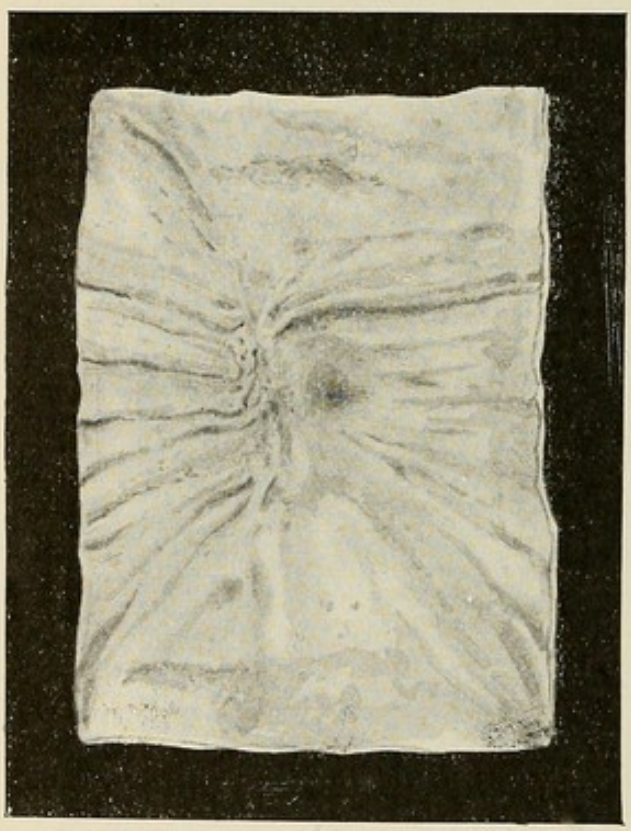


FIG. 81.—Healed Tuberculous Ulcer of the Ileum. (*Royal Coll. of Surg. Mus.*, No. 2544 B.)

The ulcer may heal in one part and progress in another.

The ulcer may lead to peritoneal adhesions and even to an intestinal fistula. A healed ulcer is shown in Fig. 81.

The strictures produced by the tuberculous ulcers are often multiple. Fig. 82 shows two annular strictures close together. Voehts‡ records a case in which the two strictures were six feet apart.

In a case by Dr. Handford,§ in addition to a dense tuberculous stricture of the rectum two inches long, there were two strictures in the small intestine.

Dr. Rolleston‖ describes a case with three strictures of moderate degree all situated in the colon.

* Path. Soc. Trans., 1898, p. 102.

† Ibid., 1888, p. 116.

‡ Ueber die Häufigkert und vorkommen der Darmtuberculose. Munich, 1891.

§ Annals of Surgery, 1893, p. 579.

‖ Path. Soc. Trans., 1888, p. 117.

In a case recorded by Dr. C. White* there were four dense strictures in the jejunum, and one in the ascending colon; the cæcum would only admit the little finger. The patient was a man of fifty-two.

In some of the recorded cases as many as five and seven strictures—all, as a rule, of quite moderate degree — have been found in the bowel at the same time.

Figs. 83 and 84 are from the case of an adult affected with phthisis, in whose ileum three tuberculous strictures were found. Fig. 83 shows an abrupt stricture of severe degree. Fig. 84 shows a stricture associated with much thickening and some persisting ulceration. I have recorded a case in a boy, aged fifteen, in which there was a hard and rigid stricture in the ascending colon which only admitted the tip of the little finger.†

Pease‡ operated upon a stricture of the ileo-cæcal valve, due to a tuberculous ulcer. Fig. 81 shows a healed tuberculous ulcer which had caused no stenosis. There is simply a pigmented radiating scar. The specimen was obtained from the body of a man, aged thirty-seven, who died of phthisis and whose small intestine showed many healed tuberculous ulcers.

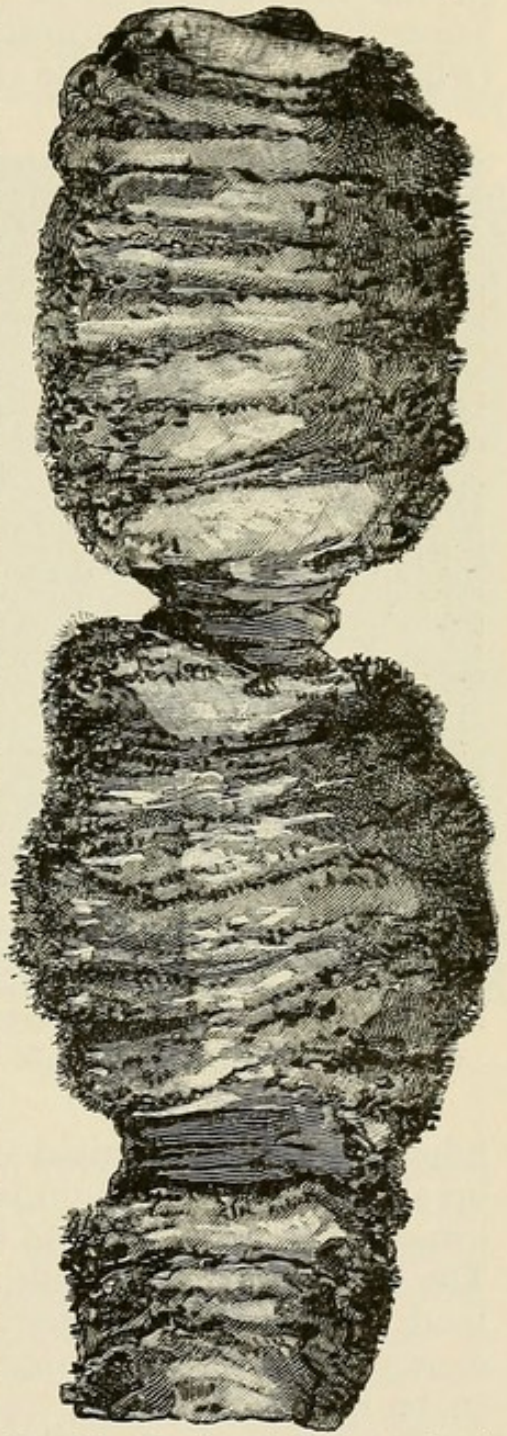


FIG. 82.—Portion of Jejunum showing two Strictures, the result of Tuberculous Ulceration.

The gut has been turned inside out so as to show the mucous surface.

The following remarkable case by Nothnagel§ may be mentioned in this place. The patient was a man of forty years, who, eighteen months before his death, was troubled by constipation and severe colic. The symptoms

* Path. Soc. Trans., 1890, p. 131.
† Ibid., 1888, p. 113.
‡ Bull. de l'Acad. de Méd., Dec. 30, 1890.
§ Die Erkrankungen des Darmes, Vienna, 1896.

became more and more marked, and two months before death a hard round tumour, the size of a walnut, was discovered in the ileo-cæcal region. It was believed to be cancerous. Laparotomy was performed, and the involved intestine (which represented the ileo-cæcal junction) was excised. The tumour was the size of a hen's egg and very hard. It had narrowed the lumen of the bowel to the size of a pencil. There was no ulceration. The microscope revealed no trace of a new growth, but showed that the mass was the result of chronic inflammation, and that scattered among it were a few tubercle bacilli. The patient survived the operation three weeks.

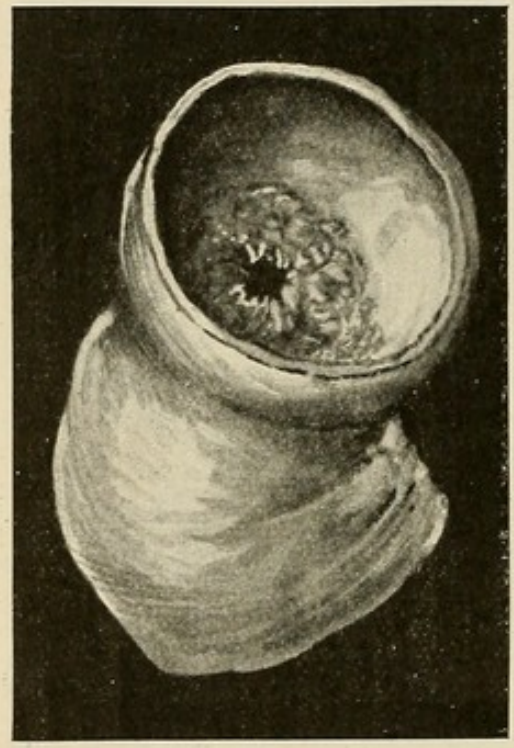


FIG. 83.—Tuberculous Stricture of the Ileum.

At the site of the stricture the diameter of the lumen of the gut is only a quarter of an inch.

(*Royal Coll. of Surg. Mus.*, No. 2521 B.)

König* reports five cases of tuberculous stricture treated by operation.

3. SYPHILITIC ULCER.—Excluding the rectum syphilitic ulcers of the bowel are rare. They may be met with in any part of the intestine, but, according to Rieder,† are most common in the upper part of the lesser bowel.

They are met with in both inherited and acquired syphilis, and depend upon the breaking down of gummatous deposits. In the small intestine they are said to be often located in Peyer's patches. The ulcers are often multiple, are rounded at first, and then tend to follow the transverse axis of the bowel. Fig. 85 shows a specimen of multiple ulcers of the colon assumed to be syphilitic.

It is said that syphilitic ulcers produce stenosis of the bowel. If any deductions can be drawn from the effects of tertiary syphilitic ulceration of the rectum this can be quite well understood. There is no doubt that a gumma in

* Deutsche Zeitsch. f. Chir., 1892, p. 62. *See* also cases by Sachs (Archiv f. klin. Chir., 1892, B. 43). Zahlmann (Hosp. Tidende, 1892, No. 36). Rentier (Bull. et Mém. de la Soc. de Chir., 1896, No. 7) and the author (*Lancet*, Jan. 4, 1896).

† Annual of the Universal Med. Sciences, 1893, vol. i., D-31.

the wall of the gut may lead to a stricture without causing any ulceration of the mucous membrane.

Fig. 86 shows a case of stricture of the ileo-cæcal valve assumed to be due to syphilis.

4. TYPHOID ULCER.—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.†

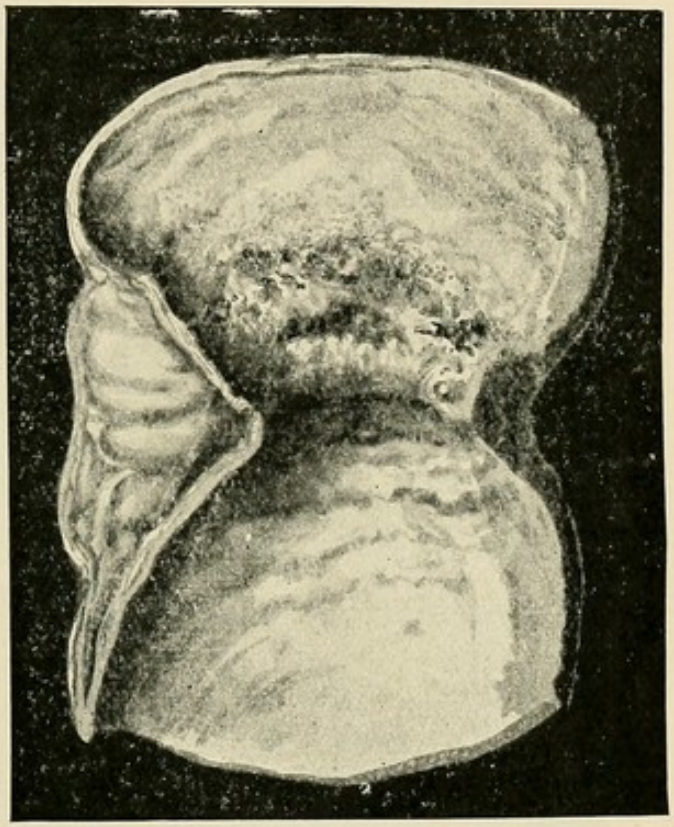


FIG. 84.—Tuberculous Stricture of the Ileum.
(*Royal Coll. of Surg. Mus.*, No. 2521 C.)

* *See* Hoffman'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.,

5. Dysenteric Ulcer.—The ulcers left by dysentery are occasional 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 involved. The dysenteric ulcer shows

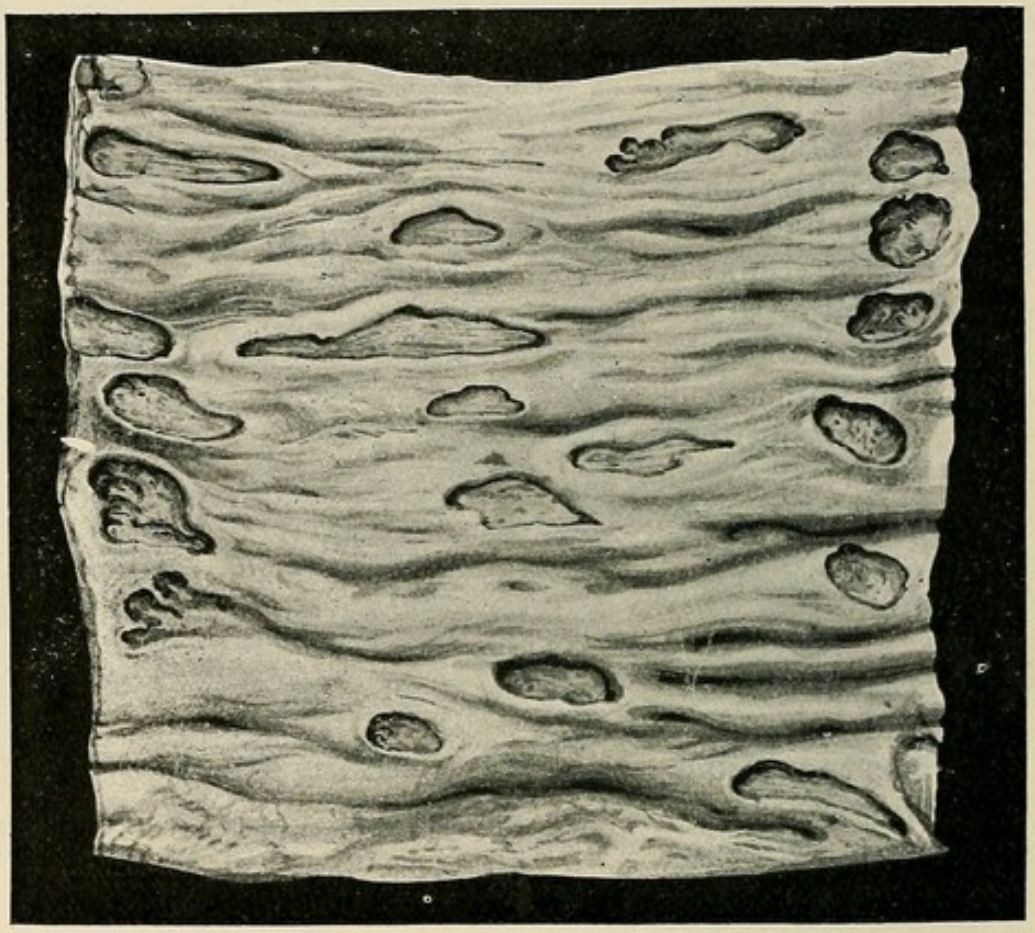


Fig. 85.—Syphilitic Ulcers of the Colon.

The long axes of the ulcers are transverse to the axis of the bowel.
(*Royal Coll. of Surg. Mus.*, No. 2491 A.)

infinite variations. It may be small and shallow, or large, irregular and deep. It may assume almost any outline. Fig. 87 shows dysenteric ulcers of the lower part of the colon, some of which are healing. 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

p. 152. Case by Dr. Larguier des Bancels; Thèse de Paris, No. 142. 1870 p. 86.

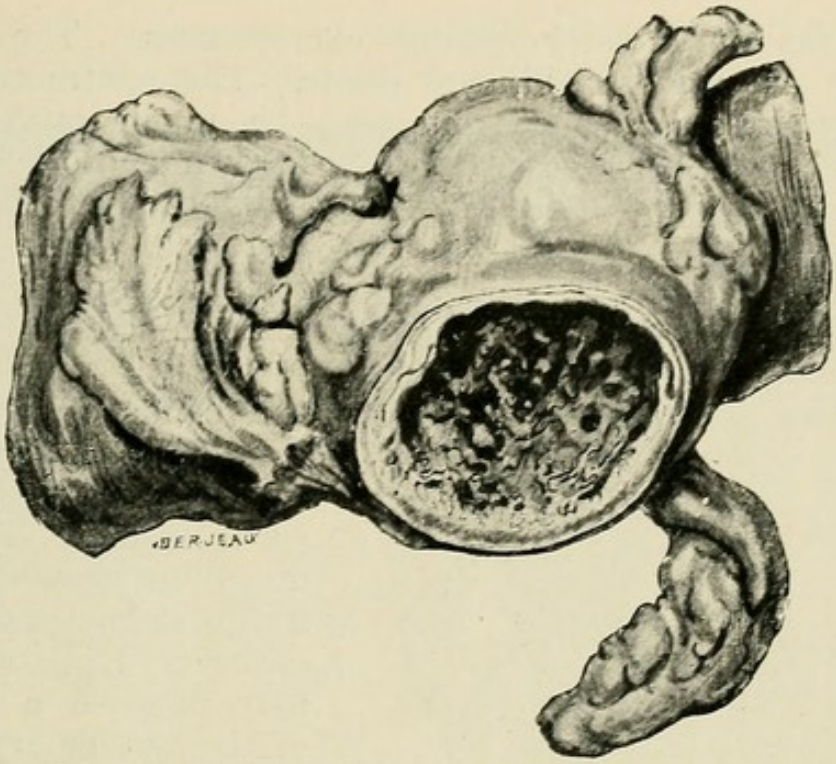


FIG. 86.—Syphilitic Stricture of the Ileo-cæcal Valve.
(*Royal Coll. of Surg. Mus.*, No. 2522 A.)

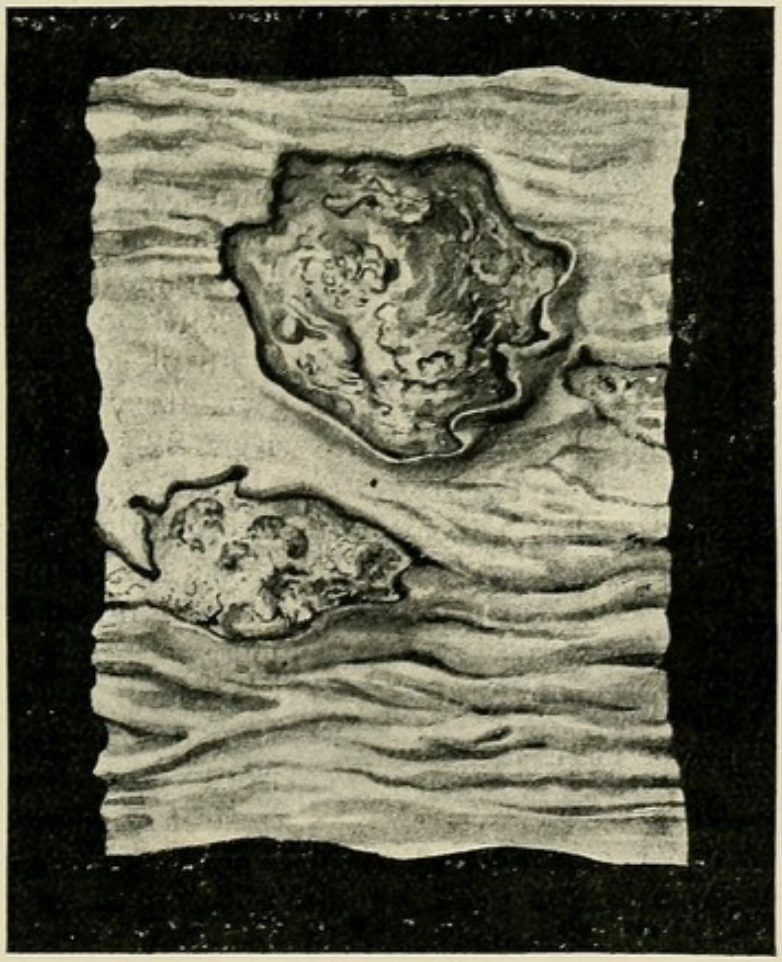


FIG. 87.—Dysenteric Ulcers of the Lower Part of the Colon.
(*Royal Coll. of Surg. Mus.*, No. 2482.)

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 which 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 which so often mark the dysenteric cicatrix. An example of stenosis after dysentery is shown in Fig. 88.* 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

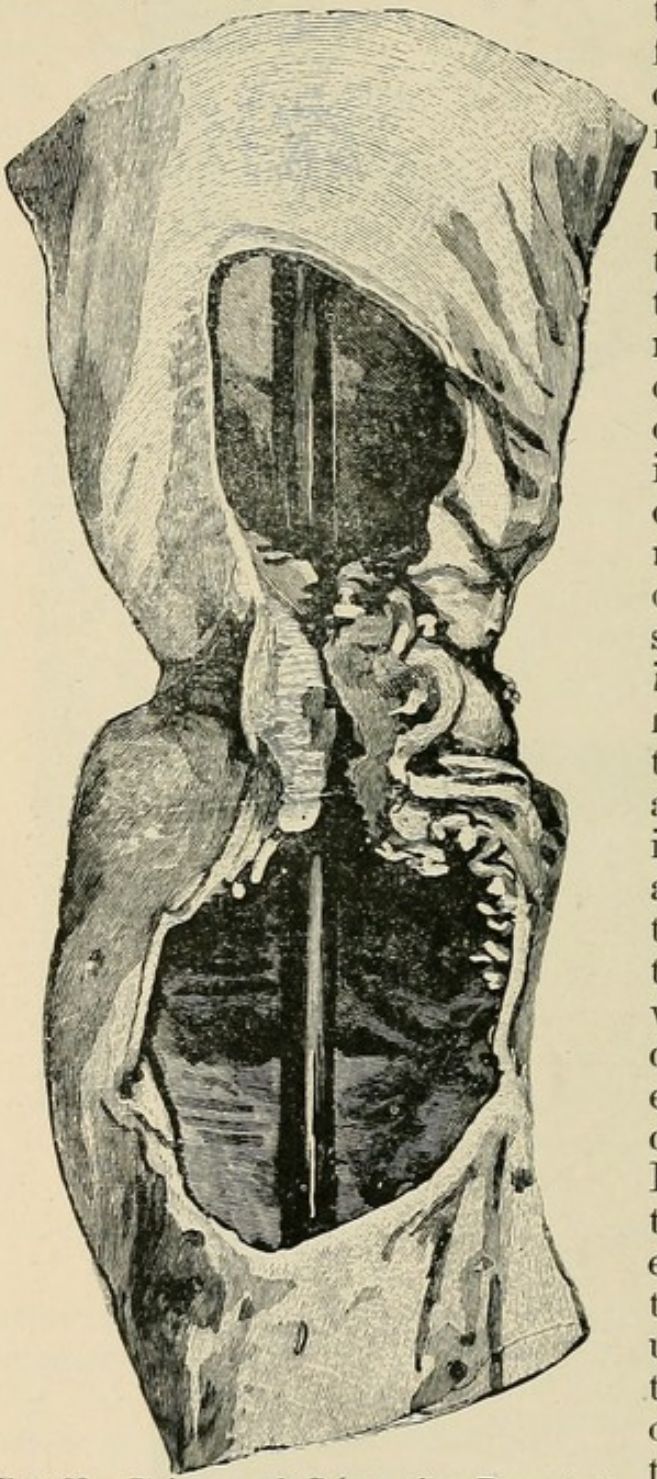


FIG. 88.—Stricture of Colon after Dysenteric Ulceration.

* St. Bart.'s Hosp. Museum, No. 1987. *See* also No. 1986.

† St. Thomas's Hosp. Museum, No. Q 141.

example of extensive contraction after dysentery, and I have found several museum specimens which are, I think,

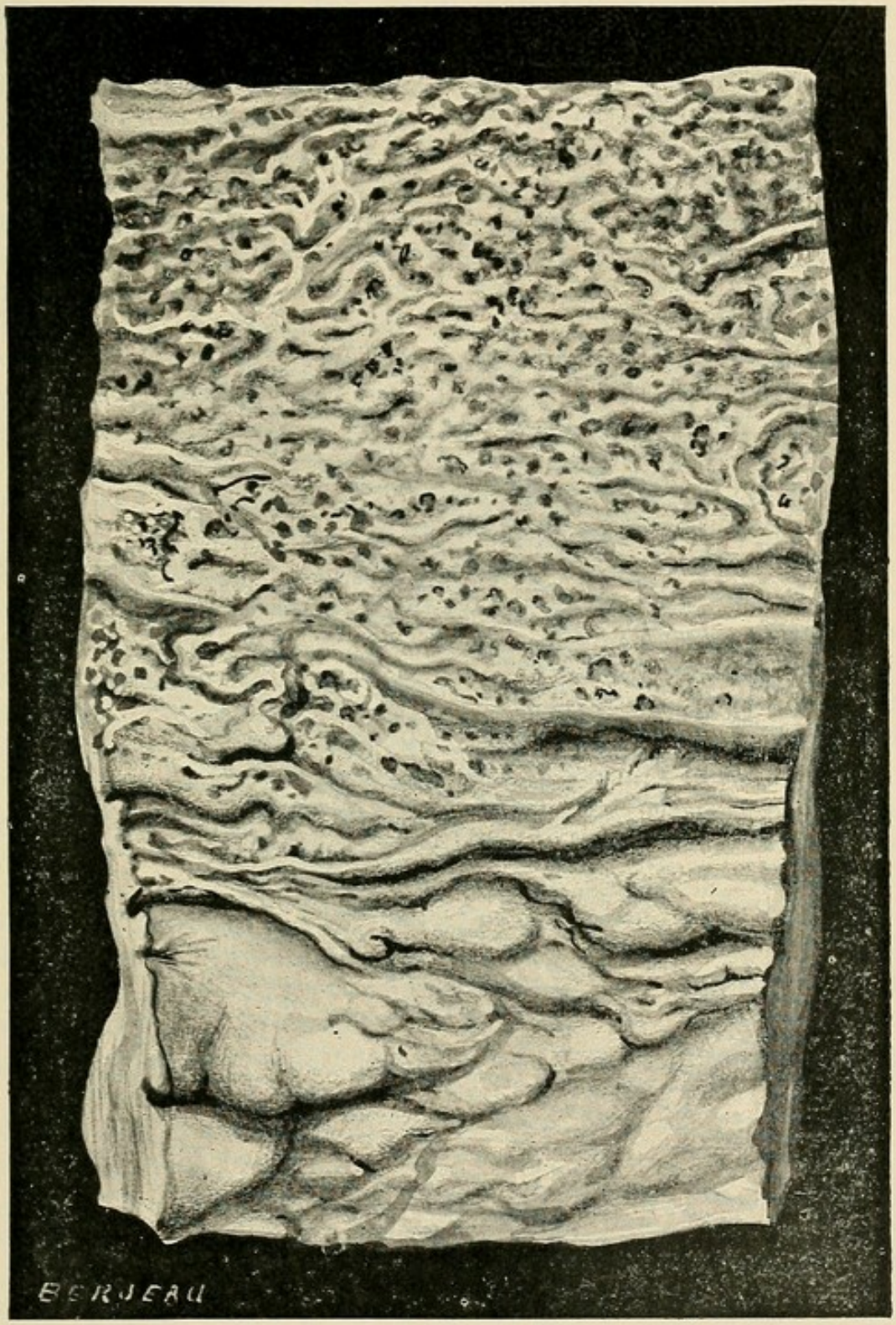


FIG. 89.—Extensive Follicular Ulceration of the Sigmoid Flexure above a Carcinoma of the Rectum.

(*Royal Coll. of Surg. Mus.*, No. 2466 B.)

susceptible of the same interpretation. Dysenteric strictures are often met with in the rectum, sigmoid flexure, and

descending colon. They occur, also, at both the hepatic and the splenic flexures.

6. Follicular Ulcer.—These ulcers are much more common in the large intestine than in the small. They commence in the solitary follicles, and produce small round ulcers with sharply cut edges. The ulcers are multiple, and are often so extensive that the gut is honeycombed by them. They vary in size from a hempseed to a pea, and may produce extensive ulcerated surfaces by fusion. This condition is usually met with in association with other intestinal disease, such as dysentery, typhoid fever, or colitis. Fig. 89 is from a case in which the sigmoid flexure above a cancer of the rectum showed extensive follicular ulceration. It is questionable if this variety of ulceration leads to notable stenosis. When in the lesser bowel the ulcers are usually in the lower ileum.

7. Catarrhal and other Ulcers.—In the condition known as "ulcerative colitis" there may be very extensive destruction of the mucous membrane. Ulcers are formed, which are at first small and round and then become large and irregular, with their long axes at right angles to the long axis of the bowel. The prognosis in ulcerative colitis is grave, and there is little direct evidence to show that the condition leads to an actual stricture.

As an instance of multiple stricture of the lesser bowel following extensive ulceration of an unknown character, may be quoted a well-described case by Dr. Sharkey in the Pathological Society's Transactions for 1884.

In the excellent article on Diseases of the Colon in Dr. Clifford Allbutt's "System of Medicine," there are accounts of the "vascular ulcer," the "hæmorrhagic ulcer," and the "trophic ulcer." So far as I am aware, the ulcers described under this name have no known connection with the present subject.

Returning to the intestine and examining the simple strictures of that tube, which may be ascribed to cicatrisation after ulcer, one is impressed with the comparative valuelessness of any classification of ulcers. In some instances, there is no doubt that the stricture has followed a dysenteric or tuberculous ulcer, or there are reasons for supposing that it is due to a syphilitic ulcer; but certainly, in the majority of cases, the conclusion as to the origin of the stricture is purely negative. Fig. 90 shows a very pronounced stricture of the ileo-cæcal valve, but the nature of the stricture and the character of the ulceration which led to it are matters of pure speculation.

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 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 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

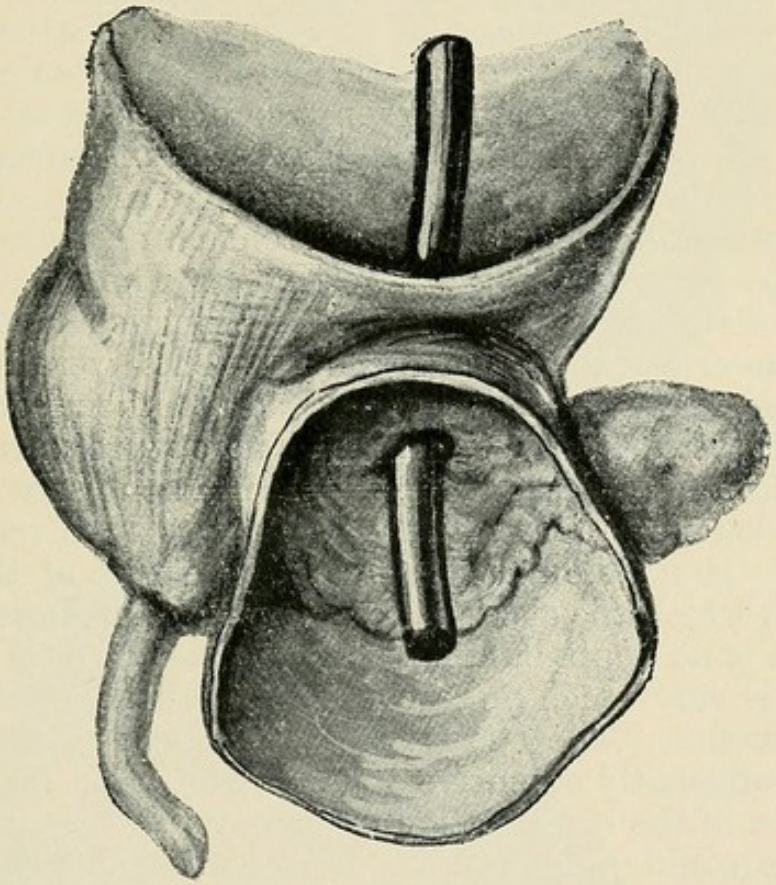


FIG. 90.—Stricture of the Ileo-cæcal Valve. A quill is passed through the Stricture. Outside the Bowel is an enlarged Lymphatic Gland.

(*Royal Coll. of Surg. Mus.*, No. 2551.)

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 fore-finger, or be, on the other hand, so small as hardly to 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 the recorded cases that I have collected there are very few examples of multiple simple stricture of the large intestine.

In the specimen from which Fig. 91 was taken there was, in addition to the stricture of the ileo-cæcal valve, a stricture of the ascending colon. In another 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 eleven recorded cases of cicatricial stricture of the lesser bowel there were six instances of single stricture and five 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 five cases of multiple stricture present certain striking characters which 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, four, or more 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.

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 appears to be about as 6 to 1.

I have met with many recorded instances of stenosis of the ileo-cæcal valve subsequent to the cicatrisation of ulcers. In some of the cases the ulcers appear to have spread from the ileum, and in other examples from the colon. In the remaining cases the valve alone seems to be involved. The degree

* M. Marignac; Bull. de la Soc. Anat., 1877, p. 519.

† Dr. Bristowe; Path. Soc. Trans., vol. xx. p. 180. The nature of the cicatrices was unknown.

‡ As a good example of the series, *see* Kœberle's famous case, in which he resected with success two metres of ileum; Bull. et Mém de la Soc. de Chir. de Paris, 1881, p. 99. (*See* also St. Thomas's Hosp. Museum, No. Q 127 and No. Q 129, and also *Lancet*, May 24, 1884.)

of stenosis in these instances varies. In some 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 two examples it was entirely obliterated.† In this instance the

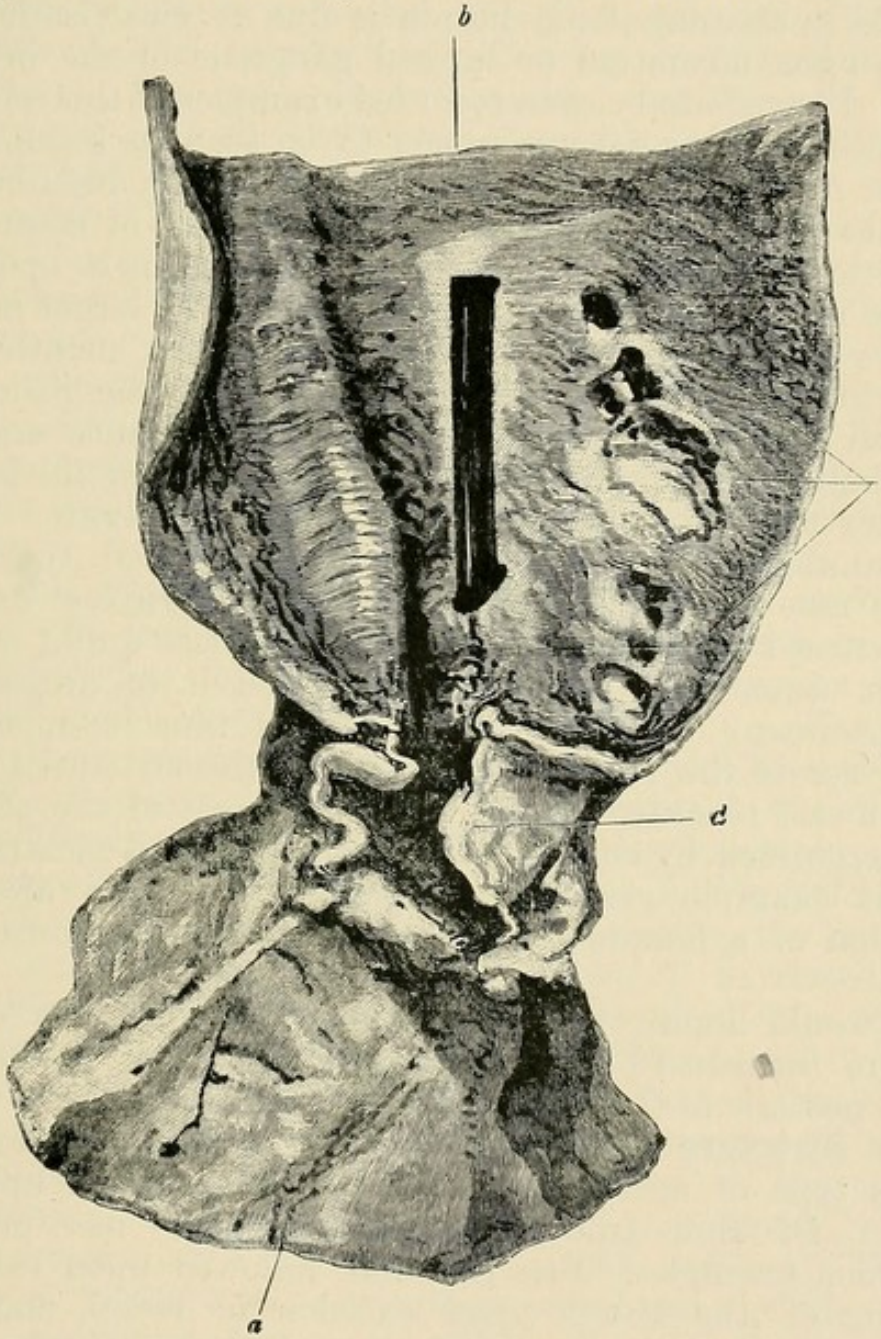


FIG. 91.—Stricture of the Ileo-cæcal Valve.

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.

ileum and cæcum communicated by means of a fistulous opening, and the closure of the valve proved a matter of comparatively little importance.

* Path. Soc. Trans., vol, xxi., p. 171.

† Berlin. klin. Wochens., No. 26, p. 393, June, 1879; and Path. Soc. Trans., 1889, p. 107.

Examples of stricture of the ileo-cæcal valve are shown in Figs. 86, 90 and 91.

(B) **Stricture After Strangulated Hernia.**—The stricture which 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 eleven 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 taxis or operation, varying from a few days to "some years." The larger number of cases have been noted between one and six months after the reduction of the hernia. In nine cases the ileum was involved; in two the jejunum. In one instance one inch and a half of the bowel was 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 case two strictures are described.† 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 valvular fold of mucous membrane passed across the lumen of the gut at the strictured part.

In a case recorded by Dr. N. Pitt the seat of the stricture was surrounded by considerable thickening and cicatrisation. In this example symptoms appeared five days after the reduction of a femoral hernia which had been down seven days.¶

It would appear from an account of examples of this stricture furnished by Garré** and Maas†† that it is usually due to necrosis of the mucous layer of the gut.

(C) **Stricture After Injury.**—The commonest example of this type of stricture is that due to operation upon the bowel. Of this trouble modern surgery has provided numerous examples. Stricture has followed upon extensive suturing of the bowel, upon excision of bowel, and upon the operation of short circuiting, or lateral anastomosis. I have recorded an instance in which the operation of short circuiting performed in the sigmoid flexure with the largest

* *Med. Times and Gazette*, vol. i., 1872, p. 363.

† *Brit. Med. Journ.*, Oct. 9, 1897, p. 951.

‡ Bull. et Mém. de la Soc. de Chir. de Paris, 1880, p. 706.

§ Path. Soc. Trans., vol. iii., p. 95.

‖ Middlesex Hosp. Museum, No. 114, viii.; *see* also Guy's Hospital Museum, No. 2507 (36).

¶ Path. Soc. Trans., 1891, p. 119.

** Beiträge z. Klin. Chir., 1892, vol. ix., p. 187.

†† Deut. Med. Wochen., 1895, i., p. 365.

size of Murphy's button led to a stricture which would scarcely admit the little finger. It is needless to say that the majority of the examples of stricture due to operation are provided by the lesser bowel.

I find records of some six cases * of stricture which were evidently due to cicatrisation, following accidental injury to the bowel. The patients were males, and the ages ranged from twenty-four to sixty-five. In four cases the jejunum was involved, and in two the ileum. Symptoms of obstruction appeared between four weeks and four months of the receipt of the injury. In each instance the lesion consisted of a violent blow or fall on the abdomen, or the patient was ridden over. In none of the examples was there a wound.

In one case reported by Pouzet the stricture would hardly admit a probe, and was narrow and ring-like. In another instance the stricture was represented by a contraction which occupied no less than six inches of the jejunum.

In this type of stricture adhesions are not uncommon I have not included under this heading cases in which a stricture has followed as a result of ulceration due to impacted gall stones † or foreign bodies.

An Unclassified Specimen.—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, unique.

A drawing of the specimen is shown in Fig. 92.

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 normal on section, save for a little 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.

* Reference may be made to the following :

Pouzet quoted by Nothnagel; Die Erkrankungen des Darmes. Vienna, 1896.

Path Soc. Trans., vol. iv., p. 156.

Bull. de la Soc Anat., 1877, p. 86.

Mygind; Annual of the Univers. Med. Sci., 1892, vol. iii., C-66.

Guy's Hosp. Reports, 1858.

Edin. Med. and Surg. Journ., vol. xliv., p. 281.

† *See* Path. Soc. Trans., 1858, p. 365.

Of the nature of the obstruction in this case it is difficult to speak. It is certainly not a stricture in the proper sense.

The gut, 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

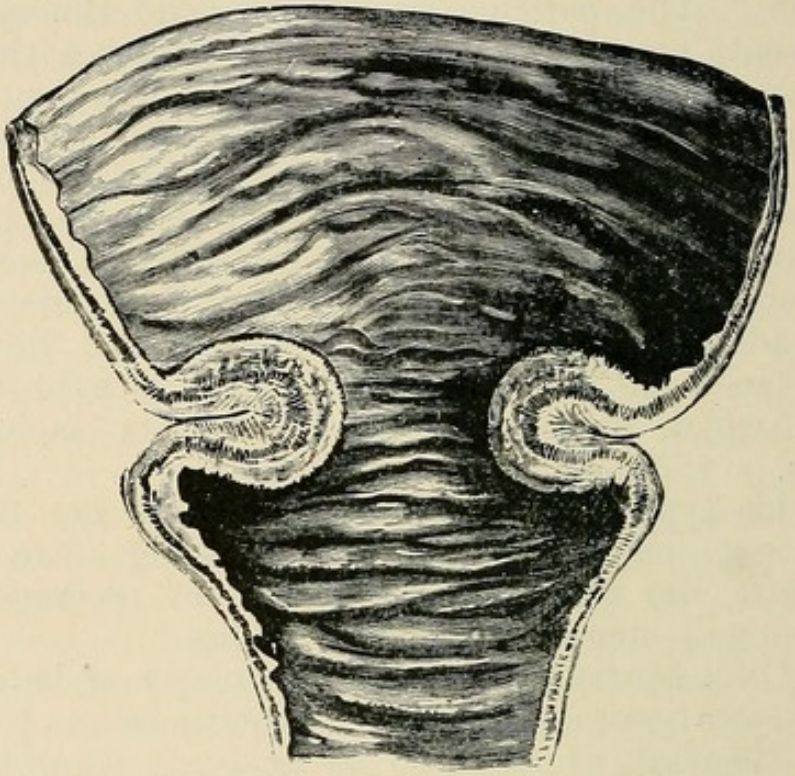


FIG. 92.—Stenosis due to in-turning of the Intestinal Wall, the result of Mesenteric Gland Disease.

that the little local peritonitis excited had spread from the disordered lymph glands. Above the stenosed part is a considerable pouch.

II. 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. The metastatic form need not be considered here.

Carcinoma may occur in any part of the intestinal canal from the pylorus to the anus.

There was a time when a great many different forms of cancer were described as occurring in the bowel. Accounts were furnished of scirrhus cancer, of encephaloid or medullary cancer, and of villous cancer.

The evidence is now practically conclusive which shows

that primary cancer of the intestinal canal conforms to one type only—that of cylindrical-celled epithelioma, or cylindroma.* This form of carcinoma may undergo colloid changes, and thus it happens that "colloid cancer" is met with in the bowel.

Cylindrical epithelioma of the bowel does not present itself under a uniform aspect. It assumes many forms and appearances, and has thus given rise to the belief among the early pathologists that many different varieties of cancer were met with in the bowel.

This exclusiveness in the matter of cancer in this situation is rendered more marked by the fact that metastatic deposits of carcinoma very rarely occur in the intestine. When they do occur they seldom cause obstruction.

The bowel may be invaded by malignant disease, which has spread to it from a carcinoma in a neighbouring organ, but the circumstance is uncommon. For example, Mr. McCarthy reports a case of cancer of the splenic flexure in which the disease had spread to the bowel from a primary growth in the stomach. Intestinal obstruction had been produced.†

Into the microscopical character of the epithelioma of the bowel it is unnecessary to enter in any detail.

This subject has been most exhaustively treated by Harrison Cripps, Hauser, and many others.

The morbid changes commence in the cylindrical cells of Lieberkühn's glands, and a new growth appears in the deeper parts of the mucous membrane which reproduces in a more or less exact manner the glandular tissue of the bowel. The growth consists of glandular recesses lined with columnar cells, and embedded in a stroma of connective tissue. In the very earliest stages it is not possible to distinguish the carcinoma from an adenoma of the bowel. Very soon, however, the glandular epithelium makes its way through the limiting membrane of the gland, and through the muscularis mucosæ and runs riot in the submucous layer, and spreads as it likes among the muscular coats of the bowel. Even in these unfamiliar districts the growth retains its likeness to glandular tissue, a likeness made a little indistinct by exuberance of unrestrained growth and by concomitant decay. It is this masquerade of a normal structure among unaccustomed tissues, this hideous mimicry of the simple gland which constitutes cancer.

* An early assertion of this fact was made by M. Haussmann; Cancer de l'Intestin. Thèse de Paris, 1882. No. 228.

† Med.-Chir. Trans., 1872.

The progress of the growth is marked by rapid spreading in some parts, by degeneration in others, by contraction, by ulceration, by sloughing, by hæmorrhage, these being the circumstances which attend all cancerous growths.

If the progress be rapid and the cell elements be excessive, the growth is soft. If, on the other hand, the cells be—for any reason—less in evidence, and the supporting stroma be conspicuous and well developed, then the growth is more or less hard.

For some little time the tumour extends beneath unbroken mucous membrane as a nodule or flattened and irregular disc. The mucous membrane soon, however, gives way, and the growth is exposed, to exhibit as it wills its peculiarities of ulceration, of sloughing, or of bleeding.

If the neoplasm increases rapidly and steadily a prominent tumour is formed, which may in time even block up the bowel. If, on the other hand, the growth is slow, no actual tumour is produced, but an ill-defined, flattened patch of malignant tissue is found to be creeping around the bowel.

Most usually, the numerous hordes of hurriedly-formed cells undergo degeneration, and the connective tissue falls in upon the spaces which they have occupied, with the result that the growth becomes hard and fibrous and unyielding, and by its contraction forms in the bowel wall an annular stricture.

While the central part of the growth is producing a stricture the outskirts may be growing luxuriantly, so that the rigid ring and the soft and rounded tumour may be met with side by side. (*See* Fig. 93.)

It thus happens that epithelioma may be met with in the bowel under at least three different aspects—viz. as a rounded nodule, as a flattened plaque involving only a portion of the circumference of the bowel, and as an annular contracting deposit, which surrounds the bowel like a ring.

These three conditions may represent stages of the same growth. It may appear at first as a distinct submucous nodule, then as a flattened plaque, and lastly as a stricture of an annular type.

The commonest form, however, under which epithelioma of the intestine presents itself to the surgeon is that of the 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.

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

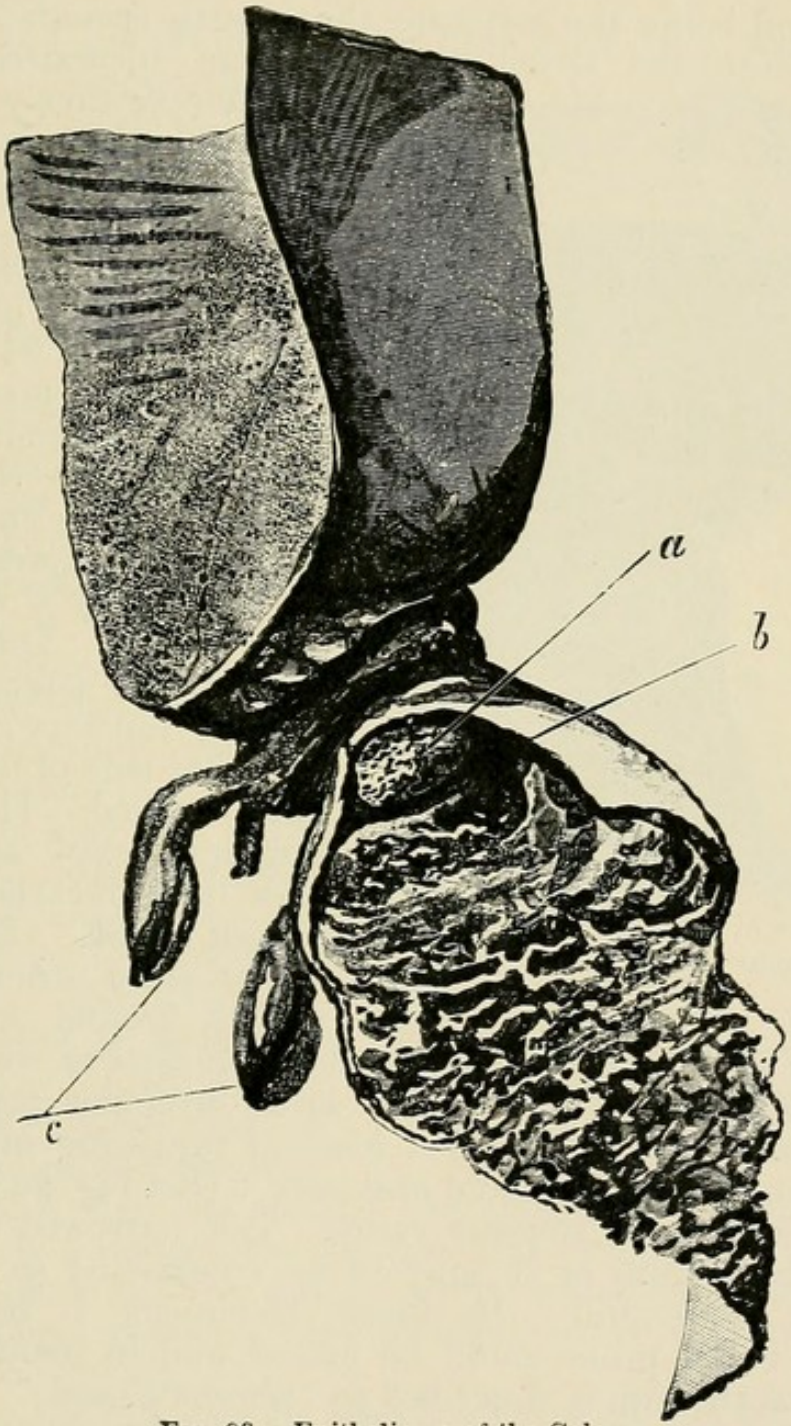


FIG. 93.—Epithelioma of the Colon.
a, tumour; *b*, site of lumen of bowel; *c*, appendices epiploicæ.

in width, comparatively little of the gut, as measured along its long axis, being involved. The peritoneum about the stenosed part is often thickened; the bowel is not infrequently adherent, and now and then distorted or bent upon itself.

If the dilated gut above the narrowed strait be cut across, a bird's-eye view of the stricture can be obtained.

The gut narrows abruptly and the stenosed part looks like the waist of an hour-glass. The inner surface of the hard ring is usually ulcerated and ragged or sloughy-looking. Above and below the stricture the growth spreads out upon the uncontracted bowel. It forms an ulcerated surface, raised, spongy-looking, and often comparatively smooth. This terminates in a pronounced edge which stands up above the normal mucous membrane as a raised, rounded, everted and hardish margin. Nothing can be more characteristic (Figs. 94 and 95.)

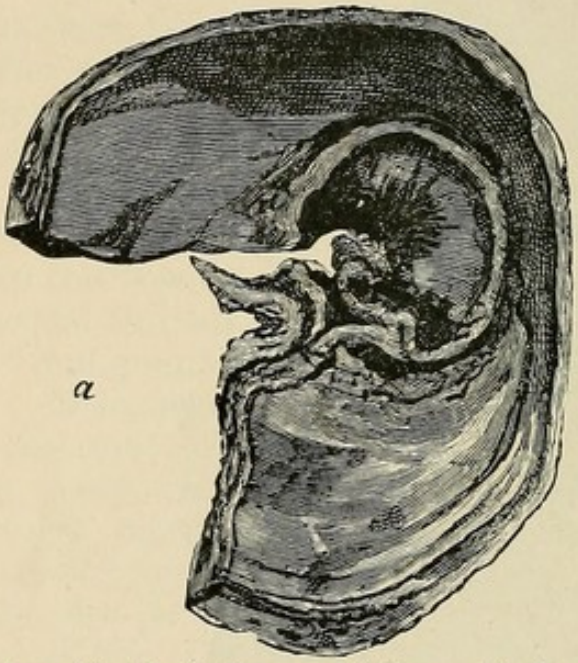


FIG. 94.—Epithelioma of Colon. Bird's-eye view of the Interior of the Bowel.

At *a*, a triangular piece of the intestine has been cut away.

There are many variations of this condition. In some instances the whole of the disease may be so limited that it could almost be covered by a wide wedding ring. The gut is pinched in suddenly and yet the mucous membrane on either side of it is apparently normal. This condition may exist and yet a wide tube like the colon be almost closed. (Fig. 95.)

In other examples the growth around an annular stricture may be quite considerable and involve some inches of the bowel. It may appear as an irregular patch or as a nodule or nodules or as a kind of fungating mass. The ulceration may be deep and excessive. (*See* Fig. 96.)

The degree of stenosis varies. The narrowed part may admit the thumb or it may be so constricted as barely to admit a goose-quill. In many specimens I have seen, nothing but a probe could be passed, and in many reported specimens the gut is described as "almost closed." As these conditions are quite common in the colon, some idea of the immense power of contraction of the growth is to be obtained.

Indeed the tendency of malignant disease within the bowel is distinctly to produce very narrow and very rigid strictures, strictures which persistently contract. There is evidence that now and then the narrowed passage is opened

up by extensive sloughing of the growth, but if the patient survive it is almost sure to close up again.

There is no doubt but that in all epitheliomata of the bowel early ulceration is a rule to which there are few exceptions.

It is not always by a ring-like band that the gut is narrowed. The growth may infiltrate the bowel wall over a considerable area, with the result that the intestine for one or more inches is converted into a solid tube with but a moderately narrowed lumen.

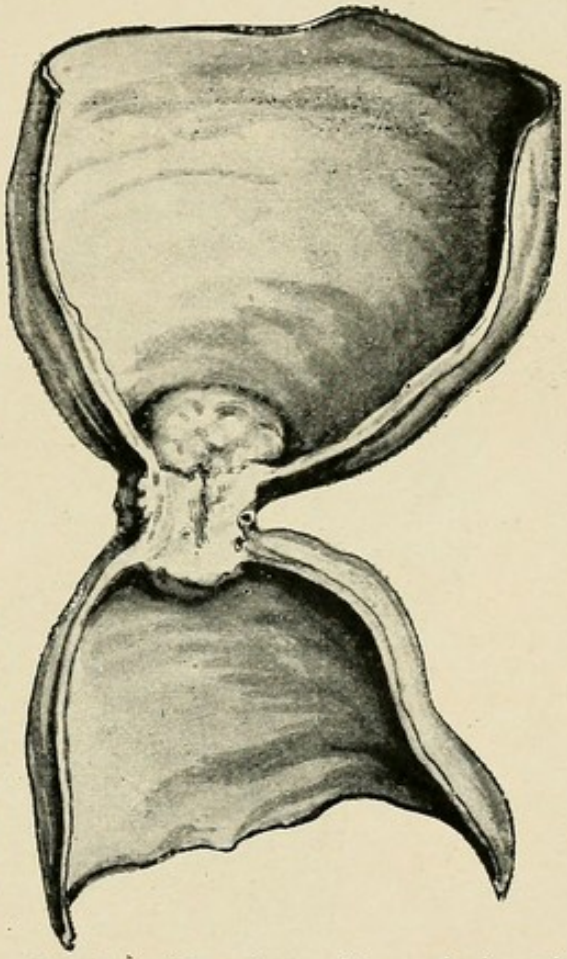


FIG. 95.—Almost complete occlusion of the Colon by a very small Carcinoma. (*Royal Coll. of Surg. Mus.*, No. 2532).

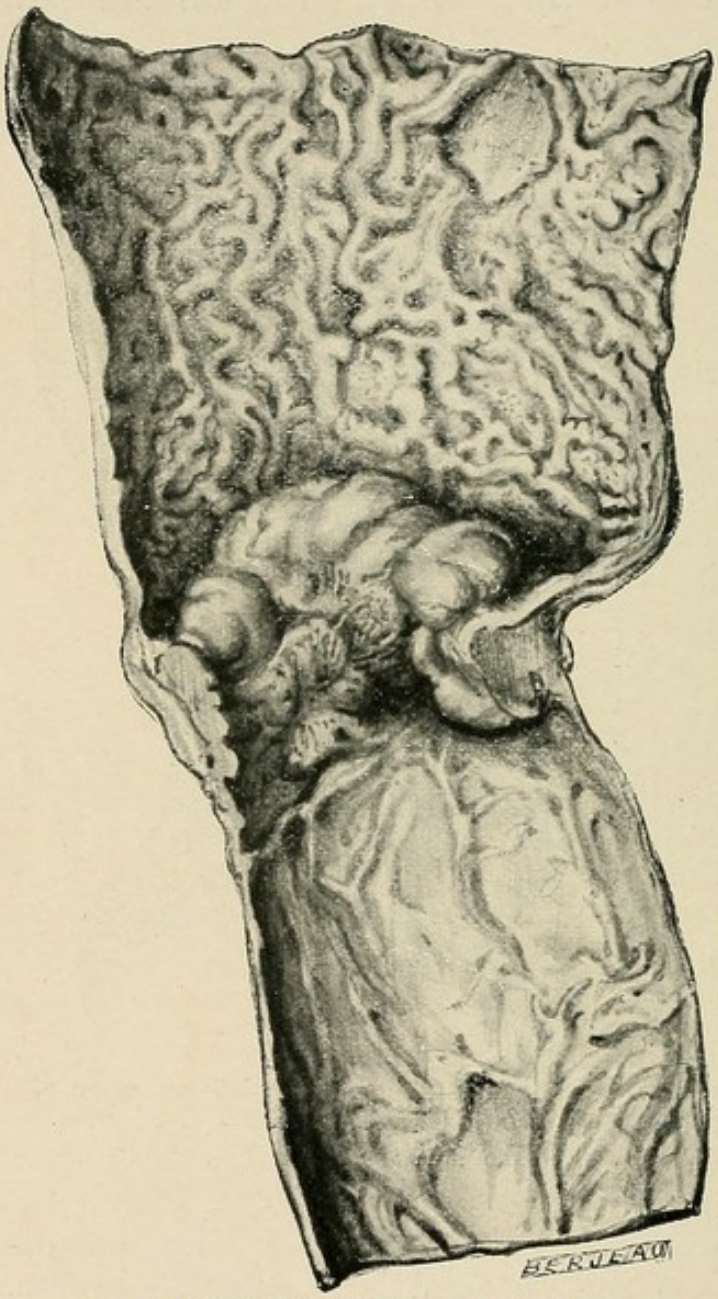
In a certain series of cases it cannot be said in a precise sense that the bowel is actually constricted. In these examples the growth appears as a rounded or irregular tumour, which is much softer than the smaller and contracting growths, and which may more or less completely plug the lumen of the gut. Such a tumour may even hang from the bowel wall as a polypoid excrescence. This condition was met with in a case reported upon by Dr. Dalton* and already alluded to in the chapter on intussusception.

Now and then the growth has appeared as a huge cauliflower mass bulging into the gut and occupying its lumen. In other instances the cancer is represented by an indistinct mass rendered shapeless and nondescript by ulceration and extensive sloughing.

Finally the gut may be closed neither by the contracting of the growth nor by its exuberant budding out into the bowel, but stenosis may depend upon the bending or twisting of the intestine at the seat of the malignant growth. This condition may be due to peritoneal adhesions or to the extension of the growth into the tissues beyond the bowel, or to the traction of some organ to which the diseased gut has

* Path. Soc. Trans., 1890, p. 122.

become attached. I have found the intestine much bent upon itself owing to the contraction of an epithelioma which had invaded only a part of the circumference of the bowel, or to the unequal shrinking of a growth which had described the circuit of the tube.



F 6.—Cylindrical Epithelioma of the Transverse Colon, forming an Annular Stricture.

In the gut above the growth is a circular ulcer, the floor of which is formed solely of the serous membrane. (*Royal Coll. of Surg. Mus.*, No. 2529, A.)

The association of intussusception with cancer of the bowel has been dealt with on page 183.

When an epithelioma of the bowel has undergone colloid changes an appearance is produced which is so characteristic that it can scarcely be mistaken.

One of the most admirably described examples of colloid cancer of the bowel has been given by Dr. A. Kanthack.*

The patient was a lad of seventeen. He died twelve months after the onset of symptoms of intestinal obstruction. These symptoms appeared with such acuteness that a right lumbar colotomy was performed ten days after the first symptom had made itself evident. During these ten days nothing was passed by the rectum.

The following is an abstract of the appearances presented at the post-mortem examination :—

* Path. Soc. Trans., 1897, p. 99.

"The visceral and parietal peritoneum was studded all over with small nodules of new growth which presented a colloid appearance. In the region of the ascending colon there was a mass of new growth, exceedingly dense in parts but soft and colloid or myxomatous in others. . . . The growth had involved the cæcum considerably, and had spread along the bowel as far as the hepatic flexure and the gall bladder, the walls of which were infiltrated by it. There was almost complete obstruction of the lumen of the bowel. There were no secondary deposits in the lungs or liver. . . . The growth involved the first five or six inches of the ascending colon, the cæcum and ileo-cæcal valve, and the lower four inches of the ileum. The whole circumference of the intestine was infiltrated by the growth, which, when fresh, had a markedly colloid or myxomatous appearance, the main mass being situated about five inches above the ileo-cæcal valve. At this point the lumen of the gut was almost completely occluded. Near the cæcum the growth had assumed considerable dimensions, and the wall of the ascending colon on section presented here a nearly circular nodule of new growth about one inch in diameter; it was firm outside, but had undergone colloid changes in the centre. The mucous membrane covering the growth was deeply ulcerated. The cæcum had been converted into an almost solid mass with a lumen of about the size of a slate pencil. The wall of the ileum was about one-third of an inch thick. The growth had affected all the coats of the bowel. The most striking feature was the colloid or myxomatous character of the growth."

The microscopic examination showed that the tumour was a columnar-celled carcinoma which had become colloid.

Carcinoma of the intestine is met with as a solitary growth. To this rule there are exceedingly few exceptions. Dr. Pye Smith* records a case in which there were two cancerous strictures in the duodenum, one close to the pylorus and one three inches lower down. There were secondary deposits in the liver. Symonds† reports a case where, in addition to a cancerous stricture in the sigmoid flexure, there was a second stricture in the ascending colon, which had caused death.

Weichelsbaum‡ records an instance in which, in addition to numerous polypi in both the large and small intestine, there were three separate deposits of cancer: one in the cæcum, another in the transverse colon, and a third in the rectum.

Among the complications of carcinoma of the bowel, the following may be mentioned:—

The lymphatic glands become implicated; but their infection is slow, and in cancer of the colon it is often very slow. In malignant disease of the lesser intestine gland implication appears earlier than it does in like trouble in the colon. In not a few examples of cancer of the colon I have

* Path. Soc. Trans., 1894, p. 36. *See* also cases of probable multiple stricture due to c rcinoma detailed by Dr. Carrington in Path. Soc. Trans., 1886, p. 244.

† *Brit. Med. Journ.*, 1893, vol. i., p. 638.

‡ Annual of the Universal Med. Sci., 1895, vol. i., D–57.

failed to find any infected glands in cases which have lasted for many months.

Secondary deposits are met with as in carcinoma elsewhere. In cancer of the bowel, the organs affected are most usually the liver, the peritoneum, and the lung—the liver especially and most commonly.

The growth is often complicated by peritoneal adhesions of varying density, which may bind it down, bend or distort it, or fix it to some neighbouring organ or to the abdominal parietes. The sigmoid flexure has been found adherent to the cæcum. I have known the adhesions around a cancer of the colon occlude a coil of small intestine which had become involved in the adhesions, although not invaded by the primary growth. Over and over again, however, carcinoma of the bowel will run its whole course without causing adhesions of any kind, and, indeed, adhesions of any degree are exceptional.

The malignant disease may occasionally spread from the bowel and invade adjacent parts, and in rare instances the spread of the growth beyond the limits of the bowel may be quite considerable.

The cancerous growth may invade the bladder, and a fistulous communication be established between that viscus and the bowel, or an opening may be made into the vagina.

A fistulous opening may be effected into a neighbouring coil of intestine. For example, in a case recorded by Mr. R. Johnson* a carcinoma of the transverse colon had effected a communication with the ileum.

In a case reported by Jonchères† a communication was opened up between the colon and the stomach. Two specimens of such communication are in the museum of the Royal College of Surgeons (Nos. 2531 and 2531A. Carcinoma of the bowel may lead to an abscess outside the bowel walls. This abscess may assume considerable proportions, and may burrow extensively. In one case under my care an abscess starting from a cancerous growth in the sigmoid flexure made its way through the sacro-iliac articulation and appeared on the buttock.

I met with an instance of epithelioma of the cæcum in which an extensive abscess—supposed to be due to disease of the appendix—was the first sign of the malady. The abscess starting from an epithelioma of the bowel may extend in more directions than one, and may be evacuated at several points which may be at some distance from one

* Path. Soc. Trans., 1889, p. 110.

† Annual of the Universal Med. Sci., 1895, vol. i., D 57.

another. Through these sinuses fæcal matter may be discharged. In a case of cancer of the rectum in which a colotomy had been advised by me and declined by the patient an abscess formed, which in due course discharged above Poupart's ligament. Fæcal matter escaped from it, and in time all the motions were passed through this natural colotomy opening to the great relief of the patient.

I have seen one instance or so in which the amount of pus in the abscess has been trifling, but the suppurating cavity has been so distended with gas as to form a huge gaseous tumour, tympanitic in all parts and liable to variations in size. Dr. Dickinson* has recorded a case in which a gaseous tumour connected with a cancer of the sigmoid flexure was of quite enormous size, and appeared early in the course of the disease. In all these examples of gaseous tumour there is a communication with the lumen of the bowel, and an incision into the cavity is usually followed by an escape of fæces.

In the place of a definite abscess there may be a diffuse and foul cellulitis, with subcutaneous emphysema, sloughing, and rapid death from septicæmia.

The general effects of a stricture of the bowel upon the intestine above it have already been dealt with on page 16.

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 forefinger; 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 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. 82 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 only to 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

* Path. Soc. Trans., 1882, p. 161.

of that gut which 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, 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 had 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

* Dr. Platt; *Lancet*, vol. i., 1873, p. 42.
† Dr. Peacock; Path. Soc. Trans., vol. xiii., p. 137.
‡ St. Bart.'s Hosp. Museum, No. 2017.

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 are so arranged that a volvulus is produced, or the extremity of its loop contracts adhesions which may serve further to narrow the lumen of the bowel.

THE SITE OF THE NON-CONGENITAL STRICTURE OF THE BOWEL.—Strictures, whether due to cicatrisation or to cancer, are more common in the colon than in the small intestine.

Stricture of either variety may be found in any part of the intestinal canal.*

In the small intestine, stricture due to cicatrix is more common than that due to carcinoma.

Twenty-six cases of stricture of the small intestine, which I collected some years ago, are thus distributed:—

10	due to cancer.	
16	due to cicatrisation	2 after injury. 4 after hernia. 10 after ulcer.
26		

In the colon (excluding the rectum) stricture due to carcinoma is much more common than the non-malignant stricture.

Fifty-two cases of stricture of the colon, including the ileo-cæcal valve, but excluding the rectum, are thus distributed:—

33	due to cancer.
16	due to cicatrisation.
3	nature not defined.
52	

If the rectum be excluded, the most common seat of stricture of the colon is the sigmoid flexure, and the commonest form of stricture there is cancer.

Indeed, 60 per cent. of all strictures of the large intestine (excluding the rectum) are met with in the sigmoid flexure. After this, in order of frequency, come the descending colon, the cæcum, the transverse colon, and, last of all, the

* Whittier has collected thirteen cases of "malignant disease" of the duodenum (Trans. of the Assoc. of Amer. Phys., 1889, p. 292). For cancer of the smaller intestine *see* cases by Morton (Trans. Path. Soc., 1893, p. 89) and Riegel (Med. Chron., 1891, p. 127). Hawkins gives examples of cancer of the ileo-cæcal valve (Path. Soc. Trans., 1891, p. 132); Stimson (Annals of Surgery, 1896, p. 186) and Kelynack (Path. of the Verm. Appendix, p. 136) give examples of carcinoma of the vermiform appendix.

ascending colon. The flexures of the bowel are favourite sites. In 101 consecutive cases of cancer of the large intestine occurring at University College Hospital, the seat of the disease was as follows: Rectum and sigmoid flexure, 94; descending colon, 1; splenic flexure, 2; transverse colon, 1; hepatic flexure, 2; ileo-cæcal valve, 1.*

Maylard has collected fifty cases of cancer of the colon, which he finds distributed as follows: Sigmoid flexure, 13; descending colon and splenic flexure, 10; transverse colon and hepatic flexure, 4; ascending colon, 4; cæcum, 13, and ileo-cæcal valve, 6.†

III. The Congenital Stricture.—The cases which are considered under this heading are varied, since a congenital stricture may be found in any section of the intestine. When the stricture is complete—as it so frequently is—the condition is consistent only with life of very short duration, and is amenable only to but very imperfect surgical treatment. When the stricture produces merely a narrowing of the bowel, the clinical phenomena are identical with those which attend other and more common stenoses of the intestine, and the treatment of the two states is the same.

From the account which follows I have excluded any reference to congenital defects in the rectum and anus. These abnormalities include the most common and the most easily recognised varieties of congenital atresia of the alimentary canal. Custom has very properly relegated them to the domain of "rectal surgery."

I have dealt on page 19 with the congenital rectal diverticulum.

Congenital Stricture of the Duodenum.—Congenital stricture of the duodenum is most common in the "second part" of that intestine and just above the entrance of the common bile duct. It is in this position that the congenital duodenal diverticulum is found, and there can be little doubt but that both the pouch and the stricture depend upon developmental defects associated with the hepatic diverticulum (*see* page 55). The same association of a diverticle and a possible stricture is noticed in the ileum at the point of origin of the vitelline duct (*see* page 52).

The stricture may be of any degree. The gut may merely be narrowed and no symptoms be produced. There may be a septum or diaphragm across the lumen of the gut which will show no evidence of its existence from the outside.

* Raymond Johnson; Path. Soc. Trans., 1889, p. 113.
† The Surgery of the Alimentary Canal. London, 1896.

This septum will be composed of the mucous and circular muscular coats of the bowel. The longitudinal muscular fibres take little or no part in its production. The septum may be quite complete, and so produce an absolute occlusion of the lumen of the gut, or it may present a perforation in the centre of its disc, which perforation may vary from a mere pin-hole to an aperture large enough to allow the contents of the stomach to escape without hindrance.

In other cases the bowel wall may be pinched in until the lumen is greatly narrowed* or entirely occluded.

The gut at the seat of the stenosis may be reduced to a solid cord no wider than a No. 12 catheter, and may be found interposed between two segments of apparently normal intestine.

In fact, the gut at this point may be interrupted by a septum, may be narrowed or may be completely obliterated. Anderson† records a case in which one inch of the duodenum close to the pylorus was entirely absent, the stomach above and the bowel below each ending in a *cul-de-sac*. Hobson‡ also gives an instance in which the duodenum an inch from the pylorus ended in a *cul-de-sac*, free from all direct connection with the rest of the small intestine.

Porak and Bernheim§ report an instance in which the pylorus was much contracted, and beyond it the duodenum was represented by a blind pouch, which ended opposite to the pancreas.

Less frequently the stenosis is just below the entrance of the common bile duct. In one little patient I saw, in consultation with Dr. Champneys,‖ the bowel was occluded by a complete and well-formed septum placed immediately below the biliary papilla. In this instance the duodenum above the septum was so dilated as to be as large as the stomach. (*See* Fig. 97.) The child had lived five days.

Another place in which the duodenum may be the seat of congenital defects is at the duodeno-jejunal bend. Here, as is well known, the bowel suddenly becomes free, and here, in the human subject at least, considerable changes and adjustments of the peritoneum occur during the process of development. The intestine at this particular spot may be merely narrowed, or its lumen may be completely obliterated and the gut reduced to a narrow and solid cord, or the

* *See* case by Emerson: *New York Med. Journ.*, 1890, p. 153.
† *New York Med. Record*, 1889, p. 329.
‡ *Brit. Med. Journ.*, vol. i., 1893, p. 637.
§ Annual of the Universal Med. Sciences, 1892, vol. ii.
‖ Path. Soc. Trans., 1897, p. 79.

bowel may end in a *cul-de-sac* separated entirely from the coils of lesser intestine beyond it.

Ducros has collected eleven examples of congenital stenosis at this part of the bowel.

The *symptoms* in these cases of congenital stricture will obviously vary according to the degree of the stenosis.

If there be any passage at all, the symptoms may be but little marked, and, if they assume any prominence, will resemble those of obstruction of the pylorus. When the obstruction is complete, the child dies as a rule within five

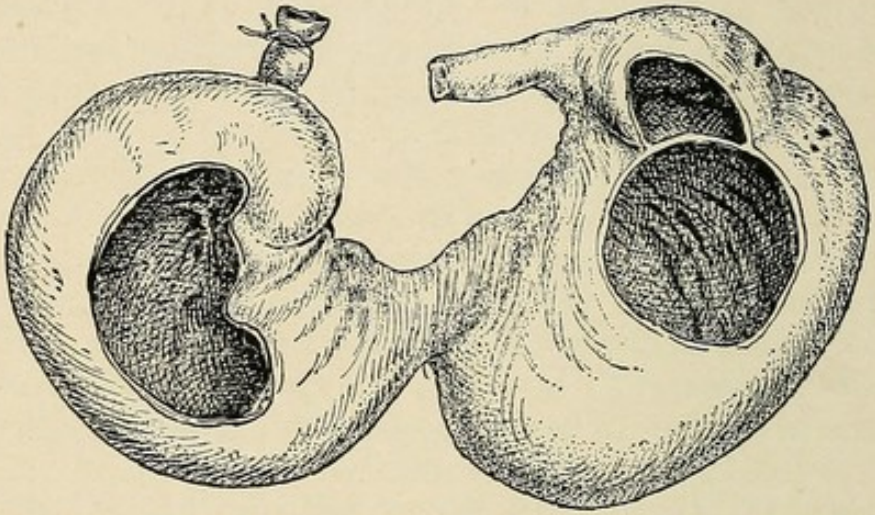


FIG. 97.—Congenital Occlusion of the Duodenum by a Transverse Septum.

A ligature is tied round the gullet. The stomach is normal save for some dilatation of its cardiac end. The commencement of the duodenum is enormously dilated. (*Trans. Path. Soc.*, 1897.)

or six days. For the first twenty-four hours there may be no symptoms of any kind, and the infant may take nourishment well. Then sickness commences, and in time all that is taken is rejected. If the obstruction be above the entrance of the common duct, no bile appears in the vomit; if it be below, bile is present, and often in large quantity. Meconium is passed. Very soon there is obvious dilatation of the stomach, and the contraction of this viscus gives rise to colicky pains, as evidenced by the child's cries and the drawing up of its legs. Between these attacks the child may sleep comfortably. By the fourth day I have been able to see very distinctly through the parietes the contractions of the dilated stomach moving from left to right. Jaundice is usually absent, unless some secondary disturbance has been induced. The child emaciates and sinks into a state of collapse. In the majority of the cases death has taken place on or before the fifth day.

So far as we know at present, no *treatment* is of any avail.

Of all operations in surgery none are more disastrous than abdominal sections in quite young infants. So far as my experience goes, these operations when performed within a few days of birth only hasten death. It may be claimed that they hasten it mercifully. It will be apparent from the account just given that in a very large proportion of the cases the defect is of such a kind that it could only be remedied by an operation of great length and great complexity, and an infant of a few days old who has been incessantly vomiting is not a subject for a measure of this kind.

Congenital Strictures of the Jejunum and Ileum.—Congenital defects are much more common in the ileum than in the jejunum. In the ileum they are most usually discovered in that segment of the gut with which the vitelline duct is connected. The association of Meckel's diverticulum with stricture of the ileum has been already pointed out (page 52). In not a few of the recorded cases a fibrous band representing the remains of a vitelline duct has been found attached to the strictured part in the ileum, but as a rule the contraction is unattended by any such relic.

Whether the stenosis be situated in the ileum or the jejunum, the appearances which may be presented are the same in the two sections of the gut.

The bowel may be occluded by a complete and simple diaphragm composed of the mucous and circular muscular coats. This may be associated with a perfectly normal appearance of the bowel externally, or with a little constriction at the site of the diaphragm. The diaphragm may present a central perforation of varying dimensions. In the specimen shown in Fig. 98 the diameter of the perforation was a quarter of an inch. The part involved was the ileum, thirty-six inches from the cæcum, and the patient was a man of sixty-two, who had exhibited no signs of intestinal embarrassment.*

The stenosis may take the form of a regular contraction of the bowel, which may narrow the lumen of the gut to a mere pin-hole, or may obliterate it altogether. The bowel at the narrowed place may be reduced to the appearance of a solid cord, which may be an inch or more in length. This cord may be in reality solid and fibrous, and the continuity of the intestine be entirely destroyed. On the other hand, the cord-like section may be sufficiently pervious to allow the intestinal contents to pass. Fig. 99 shows this last-named condition. The specimen was taken from a boy of eight, who had a history of long-standing abdominal illness,

* Hudson: Path. Soc. Trans., Lond., 1889, p. 98.

and who died of perforative peritonitis. The stricture was in the ileum, thirty-eight inches above the cæcum. The gut for three-quarters of an inch was so strictured that it would barely admit a probe. The bowel above was dilated and greatly hypertrophied. Five polypi were found in the bowel on the distal side of the stricture.*

Finally, the bowel at the defective spot may be entirely obliterated, and the gut above and the gut below may end each in a *cul-de-sac*, and no structural connection between the two may be discoverable.

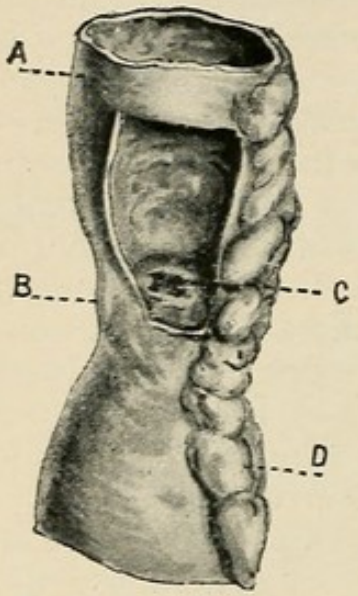


FIG. 98.—Membranous Diaphragm in the Lower Ileum (*Mr. Hudson's case.*)

A, small intestine; B, slight external narrowing of gut; C, diaphragm; D, mesentery.

Congenital strictures of the small intestine are very often multiple. I have met with an instance in which the gut was more or less completely obliterated in six places. Certain of the sections of bowel between the occluded points were quite isolated, and looked like independent closed tubes. Rolleston† mentions a case in which three diaphragmatic obstructions were discovered in the body of a man, aged twenty-five, who had presented no intestinal troubles. The highest of these diaphragms was in the jejunum, two feet from the duodenum. The aperture in it would barely admit the tip of the little finger. Turner‡ reports a curious condition found in an infant who died of intestinal obstruction four days after birth. One inch of the middle part of the jejunum was completely isolated and shut off from the parts above and below by membranous diaphragms. The occluded section of the intestine contained a little mucus only. Among the numerous cases which have been recorded the following may be selected as presenting points of special interest. Mr. W. Thomas§ gives an instance in which laparotomy was performed for complete obstruction in an infant five days old. At the autopsy the jejunum was found to end in a blind extremity thirty-two inches from the pylorus.

In another instance the jejunum a few inches from the

* Hudson; Path. Soc. Trans., Lond., 1889, p. 99.
† Path. Soc. Trans., Lond., 1891, p. 122.
‡ Ibid., 1887, p. 145.
§ *Brit. Med. Journ.*, Nov. 13, 1886.

duodenum was found to end in a *cul-de-sac*, and a considerable gap existed between it and the continuation of the bowel. In this case the infant lived ten days.*

In a case reported by Mr. E. Willett† laparotomy was performed upon an infant three days old for obstruction, which had been absolute since birth. The child died in ten hours. The intestine was entirely occluded at the commencement of the jejunum. The greatly dilated duodenum descended behind the peritoneum and behind the colon into the pelvis. It had been opened in the operation which had been carried out in the right iliac region. In another example mentioned by Mr. Willett the occlusion was about the junction of the jejunum and ileum, and so great was the distension of the bowel above the obliterated part that it was considerably larger than the stomach.‡

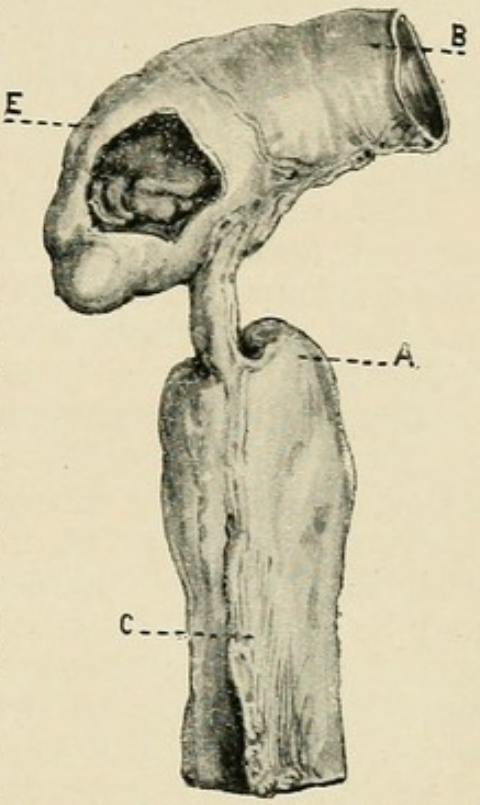


FIG. 99.—Congenital Stricture of the Ileum. (*Mr. Hudson's case.*)

A, proximal end of bowel; B, distal end; C, mesentery; E, dilated gut containing polypi.

Those cases of stenosis which are found in the lower ileum are probably dependent upon an imperfect or too thorough obliteration of the omphalo-mesenteric duct. The examples of occlusion elsewhere, and especially the multiple strictures, are incapable at present of satisfactory explanation. It has been suggested that the diaphragms, which are so common, are due to faulty development of the valvulæ conniventes, but the explanation is no more than plausible.

The mysterious affection described as intra-uterine peritonitis is brought forward to explain these congenital stenoses, but, as a matter of fact, even less is known of the peritonitis than of the strictures.

The *symptoms* in these cases will vary according to the degree of the obstruction. From the instances above given it will be seen that perfect health is consistent with a

* *Edin. Med. Journ.*, 1892, p. 840.

† Path. Soc. Trans., Lond.. 1894, p. 80.

‡ *See* cases reported by Therenuri (Deut. Zeits. f. Chir. 1877); Holmes (Surgical Diseases of Children, p. 180); Craig (*Edin. Med. Journ.*, vol. xxvii., p. 146); Davies-Colley (Path. Soc. Trans., vol. xxix., p. 115); and Goodhart (ibid., vol. xxxi., p. 114).

stricture which would barely admit the tip of the little finger, and that life may be continued for many years with a stricture which at death will scarcely admit a probe. In the examples which fall short of complete obliteration the symptoms are those of stricture of the small intestine, and the treatment is identical with that carried out in that affection. With regard to complete obliteration of the lumen of the bowel, death usually takes place about the fifth day, although life has been extended for double that period.

The remarks which have been made respecting the surgical *treatment* of complete congenital obstruction of the duodenum apply also to this condition. Laparatomy has been many times performed, but, so far as I am aware, it has been in every instance unsuccessful.

Congenital Stricture of the Colon.—Congenital stenoses of the colon above the rectum are quite rare. As already stated, defects in the development of the rectal segment of the bowel are the most common of the congenital troubles met with in the whole alimentary canal. The entire rectum may be absent. Anderson reports a case in which an infant passed meconium through the umbilicus. It lived twenty-three days, and at the autopsy it was found that the colon, which was otherwise normal, terminated at the left iliac crest in a conical *cul-de-sac*.* The rectum and sigmoid flexure were quite unrepresented.

In cases in which the rectum is entirely absent the colon may open into the urethra or bladder. Hurd gives an instance in which a child lived for fifteen months, passing all its fæces per urethram.†

Hale White‡ refers to a specimen in which the colon was completely occluded by a membranous septum nine inches above the anus.

Dodd§ records a case in which the ascending and transverse colon were throughout but little larger than an ordinary lead pencil. The infant lived twelve weeks, exhibiting all that time the symptoms of intestinal obstruction.

Dr. Hobson‖ reported the following case. A male child—born prematurely at seven months—died three days after birth, having presented during these few days the phenomena of intestinal obstruction. The examination of the abdomen revealed "universal adhesions in the form of delicate, easily-torn bands. The whole of the large intestine and the

* Trans. Path. Soc., Lond., 1891, p. 128.
† *Boston Med. and Surg. Journ.*, 1885, p. 294.
‡ Allbutt's System of Medicine, vol. iii., p. 975.
§ *Lancet*, vol. i., 1892, p. 1299.
‖ Path. Soc. Trans., 1885, p. 217

small intestine for about sixteen inches above the cæcum presented the appearance of a solid tube averaging about one-fourth of an inch in diameter, pale, and stuffed with semi-solid matter. Above this portion the intestine suddenly expanded to a size which would be above the normal for so young an infant." At a point in the narrowed part of the intestine a break in the continuity of the gut occurred. The gap measured twelve inches, and the gut above and below was supported by the same fold of mesentery. The specimen is in the museum of Guy's Hospital.

In the museum of the London Hospital is a specimen (No. 1239) in which the colon just beyond the ileo-cæcal valve is constricted. Beyond the constriction the colon is represented by a blind sac one inch and a half long. The infant from whom the specimen was obtained lived four days.

The *symptoms* produced in these cases and the *treatment* adopted call for no particular comment. The matter, so far as the terminal part of the colon is concerned, is fully discussed in the many works which deal with the surgery of the rectum.

The subject of congenital narrowing of the sigmoid flexure or rectum is further alluded to in the special section on idiopathic dilatation of the colon (page 242). It is there attempted to be shown that certain, at least, of the examples of idiopathic dilatation of the colon are due to congenital narrowing of the lower part of the large intestine. An illustrative case is given to demonstrate this proposition.

Other Congenital Malformations of the Bowel.—The majority of these are of little practical interest. There may be complete transposition of the viscera, including the intestine. I encountered such a condition once when removing an ovarian tumour.

Very considerable segments of both the small and the large intestine may be absent, the condition being obviously inconsistent with life and utterly irremediable.

Mr. Anderson* reports the case of a child who lived twenty-three days and in whom there was an absence of both sigmoid flexure and rectum. The ileum, however, opened at the umbilicus, forming a natural artificial anus.

The colon may be provided with a mesocolon as complete as the mesentery, with which it is continuous. The cæcum may be found in such instances free within the abdominal cavity. This condition plays a part in the production of certain forms of volvulus. (*See* page 133.)

* Alluded to on p. 238.

The cæcum may be found in the left iliac fossa, or near the umbilicus, or under the liver, or midway between the liver and the right iliac fossa. It may often be met with in the pelvis. In a case reported by Tirard* the cæcum was found attached by a distinct omentum to the fissure for the gall bladder, the gall bladder itself lying between its two layers. The colon, starting from the cæcum, passed to the left iliac fossa; it then made a sharp bend over to the right iliac fossa, whence it passed abruptly into the pelvis to end at the anus. In a case described by Fowler† the cæcum was found to be placed behind the liver.

Lockwood‡ gives an account of a descending colon which was double.

The sigmoid flexure is liable to great variations as to length and position. I have dealt with the chief of these in my Hunterian Lectures on the "Anatomy of the Intestinal Canal and Peritoneum in Man" (London, 1885).

An interesting account of certain variations in this part of the bowel is given by Melsome in the Proceedings of the Anatomical Society of Great Britain.§

The condition of the sigmoid flexure which predisposes to volvulus is described in the chapter on that form of intestinal obstruction (page 127).

A quite remarkable case of congenital malposition of the colon is described by Dr. Florence Boyd.‖ The patient was a woman, aged thirty-nine, who had suffered from a severe degree of indigestion for six years.

While under treatment in the New Hospital for Women she was seized with abdominal pain attended with great distension of the belly, and later with vomiting, which, however, never became a distressing symptom. The distension was most marked in the cæcal region. The bowels acted irregularly and with difficulty. Before the onset of this attack there had been periods of distension of the abdomen, associated with marked tenderness in the epigastrium and visible movements of the dilated colon.

Laparotomy was performed on the eleventh day, but the patient died in thirty-six hours. A mass which had been felt in the abdomen before the operation proved to be made up of much thickened mesentery containing some enlarged glands. A little small intestine was found to be compressed

* *Lancet*, vol. ii., 1892, p. 1131.
† Annals of Surgery, 1894, p. 160.
‡ *Brit. Med. Journ.*, 1882, vol. ii., p. 574.
§ *Journ. of Anat. and Phys.*, 1892–3, p. xxx.
‖ *Lancet*, July 3, 1897.

beneath the tightly-drawn mesentery. This was released, but without relief to the symptoms.

The post-mortem examination was made thirty-six hours after death. On opening the abdomen, the most prominent objects were the much-distended cæcum and the ascending colon, extending from the pelvis along the right side of the abdomen (Fig. 100). Towards the left, part of the transverse colon was seen, and nothing else was visible but coils of small intestine, some being deeply congested. The cæcum could be lifted out of the pelvis, and was quite free, being, as well as most of the ascending colon, surrounded entirely by peritoneum. The free cæcum, ascending colon, and the greater part of the small intestine had made a complete revolution from left to right, and from behind forwards. Continuous with the lower and left edge of the mesentery was a short, well-marked ascending mesocolon. The stomach was of an hour-glass shape, and extended far down into the abdomen. On following it down, the pyloric end was found to pass downwards in front of, then upwards and behind, the right end of the transverse colon (Fig. 101), the two viscera thus constricting one another. The duodenum was next examined; the second and third parts bore the normal relations to the right kidney and pancreas, but the first part, owing to the faulty position of the pylorus, was too long, and ascended vertically in front of the second part (Fig. 101). The jejunum turned as usual sharply forwards and to the right. The mesentery appeared at the upper border of the right end of the transverse colon in front of the junction of the stomach and duodenum (Fig. 101), and to the outer or right side of the colon. The small intestine was now removed. For twelve feet of its extent it was not injected; the remainder was of a purple colour, and the mesentery of this part (the part involved with the cæcum in the

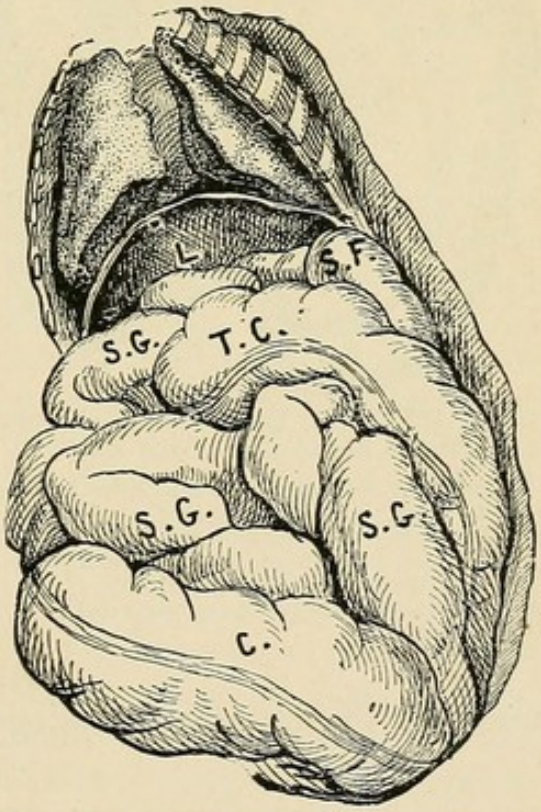


FIG. 100.—Mrs. Boyd's case of Congenital Deformity of the Colon.

View on opening the abdomen:—L, liver; S G, small gut; C, cæcum; T C, transverse colon; S F, splenic flexure.

volvulus) was thickened and contained swollen glands, which formed the firm mass felt. There was a constriction just beyond the dilated hepatic flexure of the colon (Fig. 101). The transverse colon here passed in front of the vertically placed pyloric end of the stomach, and then from above down behind the stomach to gain its normal position with regard to the greater curvature. As the colon thus hooked round the stomach its calibre was diminished, and this was the cause of the chronic obstruction.

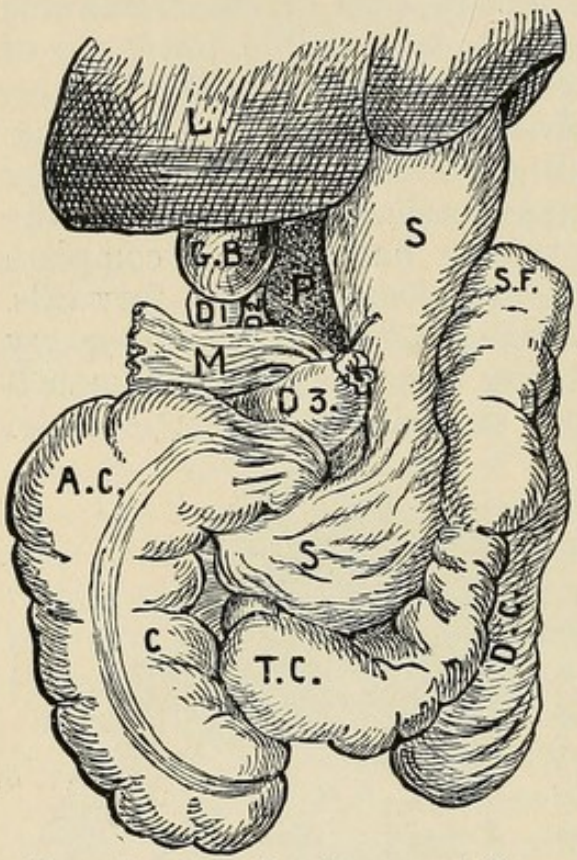


FIG. 101.—Mrs. Boyd's case of Congenital Deformity of the Colon.

View after removal of small intestine :— L, liver; G B, gall bladder; S, stomach; D_1, D_2, D_3, 1st, 2nd and 3rd parts of duodenum; C, cæcum; A C, T C, D C, ascending, transverse and descending colon; S F, splenix flexure; P, pancreas; M, mesentery.

Regarding the case generally, it would appear that at least two distinct conditions were present, viz. an interlocking of the transverse colon and the stomach and a volvulus of the cæcum and lower part of the small intestine.

The former position is explained by Dr. Boyd by "an abnormal intertwining of the stomach and the primary intestinal fold at a very early period of development."

The latter condition represents a form of volvulus which is rendered possible when the colon on the right side is free and has a liberal mesocolon.

The specimen is in the museum of the Royal College of Surgeons.

IDIOPATHIC DILATATION OF THE COLON.

Of late years there has crept into medicine the term "idiopathic dilatation of the colon." This term has been applied to certain morbid conditions in which a few common clinical manifestations appear to have given expression to varied and possibly diverse pathological states. Whatever may be the structural changes which give rise to this dilatation of the bowel, the clinical phenomena included under the term are more or less definite and unvaried. The main

features are these. The colon, and especially the lower part of it, is enormously dilated. It is tympanitic and distended with gas to a degree that in some instances almost surpasses belief. The patient suffers from certain mechanical effects of this distension, and notably from shortness of breath, palpitation of the heart, œdema of the legs, and possibly albuminuria. The patient may be unable to move, and the difficulty of breathing may be such that the face and extremities become livid. Marked constipation is usually a conspicuous feature, while vomiting and troublesome hiccough are not uncommon. The particular term "idiopathic dilatation" is based upon the assumption that the distension of the bowel is not due to any obstruction in its lumen. It is therefore necessary to exclude from the present category all cases of dilatation of the colon due to volvulus, to the impaction of fæcal masses or foreign bodies, to the lodgment of concretions, and to the existence of stricture of any type. In like manner would be excluded examples in which the colon or rectum has been narrowed or occluded by the pressure of a tumour having its origin without the bowel wall.

In dealing with this present subject, it will be well to inquire, first of all, into the circumstances in which portions of the alimentary canal become dilated in the absence of any obstructive cause, and, in the second place, to consider what conditions may underlie certain of the reported cases of "idiopathic dilatation of the colon." With regard to the first matter, it may be said at once that any part of the alimentary tube may become dilated without there being the least obstruction in its lumen. At one time it was supposed that whenever the stomach was dilated there was some obstruction at the pylorus which prevented the escape of the gastric contents and allowed the organ to be dilated by the gaseous products of decomposition. In like manner, in marked tympanites of the bowel it was loosely assumed that the bowel was distended with gas, which could not escape owing to some obstruction in the distal part of the canal. These assumptions have long since been shown to be without foundation. Obstruction in the lumen of the intestine is not the most ready means of inducing meteorism. Interference with the innervation and blood-supply of the gut will cause a much more speedy tympanites (page 13). In animals, the ligaturing of the main mesenteric vein is followed by quite intense meteorism; and one of the most extreme examples I have seen of tympanites of the small intestine in the human subject was due to thrombosis of the superior mesenteric vein.

From a clinical point of view, it is desirable to recognise most fully that distension of any portion of the alimentary canal may be entirely dissociated from any obstruction in the lumen of the tube. Certain phases of "idiopathic dilatation" immediately suggest themselves. One of the most interesting is provided by the condition known as "ballooning of the rectum." Here, on introducing the finger into the anus, the rectum is found to be apparently dilated to its utmost. It may be dilated in the same way as one speaks of the iris as dilated, but it is certainly not distended; and the term "ballooning," which suggests extreme inflation with gas, is entirely misleading. The ballooned rectum is not distended with gas, but its condition is due to some phase of paralysis. If two fingers be introduced into such a rectum so to allow gas to escape, the ballooning remains the same. It is the muscular wall of the gut which is at fault and not its contents. On the other hand, if the patient be anæsthetised the ballooning vanishes. This ballooning is met with in many conditions. It is often associated with stricture of the lower colon, with tumours about the pelvic brim, with conditions indeed which may, through pressure, affect the innervation and blood-supply of the terminal part of the gut. I have met with a very marked example of "ballooning" in an old man, who was suffering from what proved to be a fatal attack of subacute perityphlitis. Those who are concerned with the physiology of idiopathic dilatation of the bowel may well commence with the study of ballooning of the rectum.

Idiopathic dilatation of the colon of moderate degree is well seen in what may be termed masked peritonitis. Indeed, a little inflammatory focus within the abdomen (and without the pelvis) is a common cause of persisting dilatation of bowel. As an example of masked peritonitis, I may take such a case as the following. An abdominal section—such as the removing of a diseased vermiform appendix—is performed. For a day or two all goes well, and then appear the phenomena of masked peritonitis. There is great distension of the epigastric region due apparently to dilatation of the transverse colon. The patient is very frequently sick and can retain little or nothing in the stomach. He has obstinate and often most persistent hiccough. There is no pain or next to none, no tenderness of the abdomen, and no board-like hardness of the abdominal muscles. The abdomen may be perfectly soft in all parts, there is no rise of temperature, the bowels respond to enemata and to such an aperient as calomel; but the dilatation of the colon, the irritability of the stomach, and possibly the hiccough persist. After the bowels have acted,

there is some little diminution in the epigastric distension; but it is only temporary. The symptoms may last for many anxious days and at last end in recovery. It may be mentioned that in this condition no drug answers so well as strychnia administered hypodermically.

As regards the stomach, it is needless to say that certain forms of dilatation of that organ are described in which there is no evidence of any obstruction of the pylorus. There is a good deal to suggest that some forms of rapid dilatation of the stomach may depend upon nerve influences which have their starting-point in some infective or inflammatory process. In one of the two fatal cases of "acute gastric distension" described by Dr. Fagge, a sloughing abscess was discovered behind the duodenum after death. Acute dilatation of the stomach of the ordinary type is said by Dr. Clifford Allbutt only to occur as the sequel of certain acute and debilitating diseases such as acute rheumatism, active forms of pulmonary tuberculosis, malignant endocarditis, and septicæmia. I have seen acute dilatation of the stomach follow upon severe and extensive contusion of the abdomen from which the patient ultimately recovered and in which there was no evidence that there was at any time an obstruction of the pylorus.

So far, then, it may be safe to say that in certain portions of the alimentary canal extensive dilatation may occur which is independent of any obstruction in the lumen of the tube. To such forms the somewhat vague term "idiopathic" may, with a scarcely less vague reason, be ascribed.

When we turn to the series of clinical cases which are collected under the title of "idiopathic dilatation of the colon," it is evident that we have to deal with conditions which are much less ephemeral than the casual states of distension to which allusion has just been made. An examination of this collection of cases at once raises the question as to how far they are accurately described by the term "idiopathic." Certain of the reported examples are, as Dr. Hale White* has pointed out, apparently instances of extreme fæcal accumulation. In a case under the care of Dr. Bristowe,† for example, the patient, a girl aged eight years, had had no action of the bowels for seven weeks before her admission into hospital. She had always been the subject of constipation, and at her death the entire colon was found to be enormously distended with fæces to a point within two

* Clifford Allbutt's System of Medicine, vol. iii., p. 968.

† *Brit. Med. Journ.*, vol. i., 1885, p. 1085.

inches of the anus. In another case * selected by Dr. Hale White the patient was a man, aged twenty-eight years, who had been always constipated and who had had several attacks due to fæcal accumulation. The distension of his abdomen was enormous, and there was œdema of the legs, penis, and scrotum. The colon had a diameter of from six to eight inches, and contained no less than fifteen quarts of fæcal matter.

When the other cases come to be examined, it is at once evident that they can be divided into two classes. In one series of cases the patients are adults, are mostly males, and are over fifty years of age. In the other series of cases the patients are children, and symptoms of abdominal trouble have been more or less apparent from birth.

These two classes of cases must be dealt with separately.

1. **The Cases in Adults.**—As an illustration of a case coming under this heading the following may be selected. It will be observed that it conforms to the description above given.

Mr. Berry † reports the case of a man, aged seventy-three, who was admitted into St. Bartholomew's Hospital in a dying condition.

"For many years he had been subject to chronic constipation. Three years before his death an attack of intestinal obstruction had yielded to a smart purge, and from that time his bowels had given him little trouble until nine days before his admission. Since that time there had been no action of the bowels. Vomiting had begun on the day before admission; on admission he was in a state of collapse. An exploratory laparotomy showed that the peritoneal cavity contained free gas and fæces, and a large rent was found in the sigmoid flexure. Death occurred a few hours later. At the *post-mortem* the cæcum and the whole of the colon down to the sigmoid flexure were found to be unaffected and not distended. The rectum was quite natural, no stricture of any kind being found in it. The sigmoid flexure, however, was enormously distended, resembling in shape and size an inverted and distended stomach. It extended upwards into the left hypochondriac and epigastric regions, and was attached by old adhesions to the liver and spleen Its wall was much thickened, evidently by hypertrophy; the inner surface showed several shallow ulcers; in several places the wall was gangrenous and perforated. The two ends of the sigmoid flexure were normal in size and position. The rectum was not involved in the distension, and nowhere was there any trace of stricture or other cause of obstruction."

Another case, with somewhat different features, is one recorded by Dr. Money and Mr. S. Paget.‡

* Dr. Peacock's case; Transactions of the Pathological Society of London, vol. xxxiii.

† Path. Soc. Trans., Lond., 1894, p. 84.

‡ Clin. Soc. Trans., Lond., 1888, p. 103

The patient was a man of fifty-three, a confirmed drunkard. For some months before his death distension of the abdomen had made its appearance, and had steadily increased. When seen shortly before his death, the abdomen was enormous, and had a circumference of no less than five feet. It was everywhere resonant, and free from pain and tenderness. He had œdema of the legs and albumen in the urine. His breathing was embarrassed. His bowels had always acted regularly, although they were somewhat constipated some few weeks before his death. He was for a time relieved by puncturing the abdomen, but he died finally from exhaustion following delirium tremens, complicated by extensive bronchitis. The dilatation was limited to the colon and practically to the sigmoid flexure. This portion of the bowel presented the appearance of two large sacs, each far bigger than any ordinary dilated stomach. These sacs and the rest of the colon contained much gas, and much fæcal matter of the consistence of ordinary gruel. There was considerable hypertrophy of the walls of the dilated colon. No mechanical obstruction of any kind was discoverable in the bowel below the distended section. There was cirrhosis of the liver. The kidneys were granular. The disposition for the dilated sigmoid loop to become folded upon itself so as to present an appearance as of two sacs is not uncommon. Dr. Gee * reports a case of distension of this part of the colon, in which the bowel presented as two huge sacs placed vertically side by side, and occupying the whole of the front of the abdomen.

In an example of "idiopathic dilatation of the colon," described by Dr. Herringham and Mr. Bruce Clarke † the patient, a man of seventy-eight, is described as being of a very constipated habit, but "for the last six months he had had little or no trouble ; the bowels had been opened regularly without more than an occasional mild aperient."

His death, which was due to perforation of the distended sigmoid flexure, was preceded by absolute constipation extending over eight days.

From the consideration of the other reported examples of this affection it would appear that it is much more common in men than in women, and is most apt to be met with after middle life. There may or may not be a history of constipation, or a history of actual fæcal obstruction. The dilatation of the colon is of slow development, and in time becomes

* St. Bart's. Hosp. Reports, vol. xx., p. 19.
† *Brit. Med. Journ.*, 1894, vol. ii., p. 1240.

quite excessive. Examination shows that gas is the chief cause of the distension. The dilated bowel becomes hypertrophied. The enlargement of the colon may be such as to cause alarming palpitation and shortness of breath, and pressure upon the iliac veins may lead to œdema of the scrotum and lower limbs.

The dilated colon is apt to become the seat of catarrh, and its mucous membrane to be ulcerated. Now and then diarrhœa has set in before death

Some patients, as in Money's case, have died from causes not directly and solely due to the condition of the bowel, but the majority have succumbed to perforation of the gigantic coil.

The pathology of this affection can as yet only be dealt with in a speculative manner.

The so-called sigmoid flexure forms, as is well known, a large loop, which conforms very closely to the outlines of a capital omega.

In certain subjects of chronic constipation the loop is found elongated and the two extremities of the omega are brought very close together. Through the narrow strait bounded by these two extremities of the bowel the vessels and nerves of the loop pass.

The loop, if at all loaded, is very apt to hang down into the pelvis. If unequally loaded, it is not difficult to see that it may become a little twisted on itself, and the effect of such twisting, trifling as it may be, would concern most directly the root of the loop, the spot at which the vessels and nerves were entering. It would require no very aggressive interference with these structures in the narrow strait of the sigmoid mesocolon to produce marked effect upon the bowel. Pressure upon the veins returning from the loop would tend to produce some slight engorgement, and following upon that some meteorism. In another chapter of this work attention is drawn to the part played by the circulation in the production of meteorism (page 13), and in the cases now under consideration the enormous distension to which the bowel is subject is found to be mainly due to gas. Disturbances about the root of the loop would be apt also to affect the nerves entering the bowel, and it would seem as if the sigmoid flexure were peculiarly susceptible to nervous influences. It is a part of the intestine easily examined through the parietes, and in certain irritative conditions, such as colitis, it stands out with remarkable distinctness as a contracted tube.

I have been able to feel more than a foot of it, presenting

to the touch almost the impression of a solid rope. In cases of stricture of the rectum the contraction or dilatation of the omega loop often becomes very apparent, and its irritability conspicuous.

It has been suggested by more than one writer that the affection now under consideration is comparable to those states of dilatation of the stomach which are not associated with any mechanical obstruction at or about the pylorus. It is the opinion of many that these forms of the dilated stomach are commonly due to catarrh, and there are circumstances in connection with the reported cases of idiopathic dilatation of the colon which render the existence of a previous catarrh of the bowel very probable.

The marked hypertrophy of the wall of the distended colon, however, is difficult to interpret. It strongly suggests an obstacle in the bowel just beyond the dilated part which the muscular coat of the gut has been struggling to overcome.

It may be that a frequently overloaded omega loop can become so twisted upon itself as to produce some obstruction in its lumen without at the same time causing any acute symptoms.

Those patients—among the present series—who have been the subjects of long-abiding constipation, and who have had definite obstructive attacks, may very probably illustrate this method of causation.

I think that the future will show that a careful examination of cases *post-mortem* will reveal some mechanical obstruction in the tube, and that the evidence that the dilatation is idiopathic will become less and less convincing. The following case is probably more to be regarded as a type than those which have been already described. It is reported by Dr. Hichens.*

The patient was a young man aged twenty years. From the day of his birth to the day of his death he suffered from constipation, and his bowels were apparently never opened without recourse to artificial means. For the first week of his life he was exceedingly ill, passed nothing but blood and "water" by the rectum, and was not expected to live. After the first week he began passing fæcal matter, but the motions were never those proper to an infant, consisting almost entirely of scybala, and they were passed with much pain and screaming. The motions, such as they were, were not obtained without previous half-ounce doses of castor oil, which often had to be repeated two or three times in the course of twelve hours before the bowels acted. As the child grew the bowels were only opened by drugs, and with increased difficulty, and at the age of twelve months the mother began to have recourse to half-pint enemas of soap and water. Later enemas of a

* *Lancet*, Oct. 29, 1898.

whole pint had to be given, and very often had to be repeated two or three times before the bowels were opened. The after-history of the case is merely a repetition. The bowels used only to be opened at intervals of ten days or a fortnight, and only after repeated enemas. A very large scybalous motion was then passed, generally succeeded by several loose motions, spread over the next two or three days. The patient very often felt slightly sick before the bowels were opened and was very much collapsed afterwards, so much so that he often had to go to bed for the rest of the day. His abdomen was always greatly distended, so that he could never button the bottom button of his waistcoat or the top button of his trousers. Five days before death he was seized with pains all over his body and slight swelling of the legs, and in consequence he hurried home. He was treated by a medical man who thought that he had rheumatic fever. The night before he died he passed a fairly large motion. On the morning of the next day he was seized with a severe pain over the heart for which the præcordial area was rubbed with liniment, which gave him considerable relief, and shortly afterwards he went to bed feeling fairly comfortable. During the following night he suddenly got out of bed for some unknown reason and fell down dead.

At the necropsy there was enormous general distension of the abdomen. On reflecting the parietes, the abdominal cavity was found to be occupied by a tense shining viscus, presenting the appearance of a sac rising out of the pelvis and passing under the ribs, where it doubled on itself and returned to the pelvis again. On closer inspection, this proved to be an enormously distended sigmoid flexure. Some little distance above the junction with the rectum the viscus showed a distinct constriction. The remaining abdominal viscera were entirely concealed by the sigmoid flexure, which pushed the liver upwards and backwards, compressed the lungs, and rotated the heart upwards and outwards. On removing the sigmoid flexure and laying it open, it was found to contain an enormous amount of gas, and also a large quantity of semi-liquid fæces of the consistence of pea-soup. The total length of the sigmoid flexure when it was opened and laid flat was twenty-two and a half inches. Fourteen inches from its upper end was a large cicatrix formed by an almost healed ulcer, probably stercoral in origin, which had caused the constriction above mentioned. The circumference of the flexure above the ulcer was fourteen inches, at the ulcer it was seven and three-quarters inches, and below the ulcer it was ten inches. The wall of the bowel was greatly hypertrophied. There was a little rotation of the bowel upon itself.

2. **The Cases in Children.**—With regard to the cases of "idiopathic dilatation of the colon" in children, it appears to me that they have even less claim to the title "idiopathic" than have the instances just disposed of.

The evidence obtained from the perusal of these cases very strongly suggests that the great majority of them at least depend upon a congenital narrowing of the lower extremity of the large intestine. Later (page 254 *et seqq.*) I have given an account of a small child who exhibited in a marked degree the features of "idiopathic dilatation of the colon," as shown by the enormous distension of the abdomen, the obstinate constipation, the hypertrophy of the lower part of the colon,

and the practical failure of all purgative measures. The case, indeed, may be taken as a quite typical example of the trouble described under this questionable title. The patient was treated by operation, and the whole of the bowel below the transverse colon removed together with the anus. The child made an easy recovery. The examination of the bowel, however, made it evident that the distension was not "idiopathic," but was due to a congenital narrowing, regular and uniform in degree, of the lower end of the colon. Indeed, the rectum and sigmoid flexure were found to be defective in length, and to be represented by a narrow and contracted tube of uniform calibre.

On turning to the recorded cases, one finds that such a condition has been noticed as a congenital defect in other parts of the intestine, and the narrowing has been found to involve now and then a considerable extent of bowel.

Dodd,* for example, gives an account of a male infant who lived for twelve weeks, suffering all that time from much intestinal distress. The necropsy showed that the ascending and transverse parts of the colon were throughout but little larger than an ordinary lead-pencil. In another instance Atkin† discovered the rectum and colon of a child, who lived for two days, to be no larger than an ordinary quill.

On reviewing the recorded cases of "idiopathic dilatation of the colon" in children, the following particulars call for attention. Osler‡ narrates the histories of three cases occurring in young children. One was a boy, aged ten years, who was thin, but who presented an enormous abdomen. He had attacks of abdominal pain with vomiting. Peristaltic movements were visible through the parietes. Frequent washing out of the bowel with a long tube led to some slight relief. Laparotomy had to be performed. There was no stricture; the sigmoid flexure was eighteen inches in circumference; the cæcum was half this size, and the bowel progressively increased in size from the cæcum to the sigmoid flexure. The distended bowel was folded upon itself, but not so as to cause any obstruction. An artificial anus was established. In another case a boy, aged three years, who had been troubled with constipation from birth, presented after death an enormously dilated colon, which held fourteen pints of water. The greatest dilatation was about the sigmoid flexure. Death

* *Lancet*, June 11, 1892, p. 1299.
† Ibid., Jan. 31, 1885, p. 203.
‡ Archives of Pediatrics, 1893, p. 111.

had been due to acute colitis. The third case was that of an infant, aged seven months, whose abdomen was much distended, and whose bowels never acted unless an injection was given. If the injection was not administered daily, the swelling of the abdomen increased, and the child vomited.

Walker* records the case of a child who died from emaciation and exhaustion at the age of eleven years. Since a few weeks after birth enlargement of the abdomen had been noticed, and this continued to increase as the child grew up. There was persistent constipation. At the necropsy the transverse and descending colon measured twenty-three inches in circumference, and looked "like a large leg and thigh." The commencement of the cæcum and the distal end of the sigmoid flexure are described as normal. The diaphragm was so pushed upwards that its dome was only two and a half inches from the supra-sternal notch.

Formad† gives an account of a man, aged twenty-nine years, whose abdomen was so enormous that he was exhibited under the title of the "balloon man." The condition was congenital, and death was due to sudden syncope. The colon was as large as that of an ox. Marked constipation had been the symptom during life.

Rolleston and Haward‡ record the case of a boy, aged twelve years, who had suffered from distension of the abdomen and very troublesome constipation since he was two months old. On one occasion the bowels had not acted for nine weeks. The boy when seen was much emaciated, the abdomen was of enormous size, and through the thinned parietes peristaltic movements could be seen. The abdomen was in all parts tympanitic. He had repeated obstructive attacks, and in one of these he died. The colon was found at the necropsy to be of normal size. The distension mainly concerned the descending colon and sigmoid flexure (Fig 102). The rectum is said to have been of normal dimensions. The colon was much hypertrophied. Rolleston and Haward refer in their paper to certain other cases of "congenital idiopathic dilatation of the colon."

Instances of early death—within eighteen months of birth—in cases associated with extreme dilatation of the colon are given by Hirshsprung§ and Oestreich.‖

* *Brit. Med. Jour.*, vol. ii., 1893, p. 230.
† Annual of the Universal Medical Sciences, vol. i., 1893.
‡ Transactions of the Clinical Society of London, vol. xxix., p. 201.
§ Annual of the Universal Medical Sciences, vol. i., 1893.
‖ Berliner klinische Wochenschrift, 1893, p. 852.

All these cases have certain very striking features in common. Distension of the colon and obstinate constipation have been noticed practically from birth; the distension has been extreme, and has mainly involved the lower sections of the colon; the wall of the dilated bowel has been greatly hypertrophied; movements of the hypertrophied coil have been visible through the parietes; relief of the bowel has been effected almost solely by enemata. Certain secondary conditions, such as catarrh and ulceration of the distended gut, with possible tearing of its walls in extreme cases, have been noted. All the cases, except perhaps one in which an artificial anus was established, appear to have ended fatally. The general circumstances of these cases do not seem to be consistent with the idea of an "idiopathic dilatation of the colon." The very prominent feature in every example of the trouble has been some obstruction in the lower part of the large intestine. The conditions presented are not comparable with those met with in idiopathic dilatation of other parts of the alimentary canal to which attention has been directed. In the case which is here reported there was a distinct, even, and extensive congenital narrowing of the lower extremity of the colon. The symptoms produced were most typical and entirely agreed with those detailed in the reported examples.

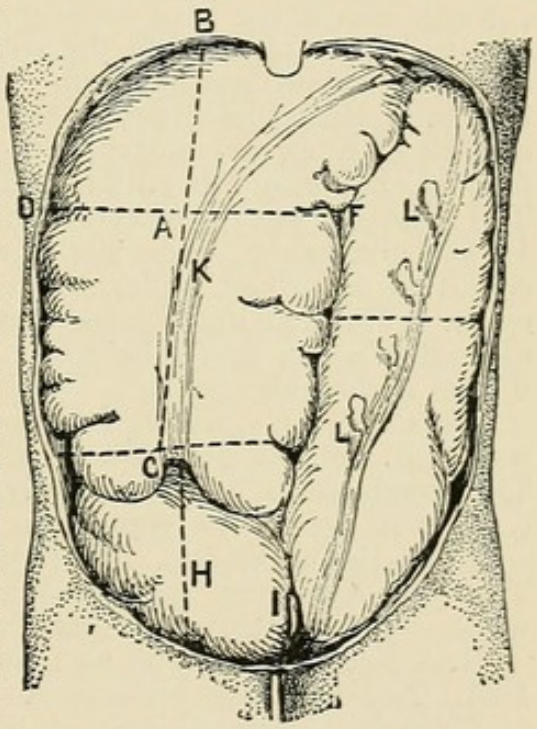


FIG. 102.—Idiopathic Dilatation of the Colon. (*Rolleston and Haward's case.*)

A, descending colon; H, cæcum; I, appendix: C, sigmoid flexure; L L, appendices epiploicæ. B to C measured 10 inches, D to F measured 5½ inches.

I venture to think that there is strong evidence to support the suggestion that most cases of "idiopathic dilatation of the colon" in young children are due to congenital defects in the terminal part of the bowel, that there is in these cases an actual mechanical obstruction, and that the dilatation of the bowel is not idiopathic. The marked hypertrophy of the distended gut suggests in the most emphatic way that there is an obstruction to be overcome, and such hypertrophy is quite inconsistent with the conception of an "idiopathic" dilatation of the bowel.

Dr. Cheadle,* in dealing with this subject, points out that some dilatation is an almost constant accompaniment of chronic constipation in children. He alludes to the case of a boy, five and a half years old, who suffered from excessive dilatation of the colon, with constant vomiting and cyanosis. The transverse colon was punctured, and the distension was relieved. Under suitable treatment the patient made a complete recovery; the distension did not reappear, and the bowels in time acted spontaneously without aperient medicines.

The following is the case under my care to which allusion has been made (page 250):—

A little girl, aged five years and nine months, was brought to me on January 5th, 1897. She was the daughter of perfectly healthy parents, was living in a country district under favourable conditions, and had been all her life the subject of the most anxious and careful attention. She was suffering from severe constipation, which was becoming almost insurmountable, and which was attended by frequent attacks of intestinal obstruction. The child was frail and delicate-looking, her face was pallid, and she was thin almost to emaciation. The abdomen was of enormous size, and was distended like a balloon. It was everywhere uniformly tympanitic, and exhibited precisely the condition described under the title of idiopathic dilatation of the colon. Through the thinned parietes an enormous coil of intestine, evidently colon, could be seen. It appeared to occupy almost the whole abdominal cavity. It was the seat of certain visible peristaltic movements, which, however, were occasional only. The tongue was foul, and the breath was offensive. The appetite was excellent. The bowels never acted naturally, and a motion was only obtained by passing a rigid tube some ten inches beyond the anus and then administering an enema. There was considerable pain in the abdomen. The anus was very small, and a digital examination of the rectum without an anæsthetic was quite impossible.

The history given was as follows:—The child was born in March, 1891. Two days after birth vomiting commenced, and continued off and on for several days; the bowels ceased to act; and some distension of the abdomen became evident. Aperient medicine had no effect, and relief was ultimately obtained by enemata. Like attacks, marked by vomiting, absolute constipation, and distension of the abdomen, occurred in July, August, and September of the same year. At the end of 1891 there was a very severe attack, in which the patient's life seems to have been in danger. The distension of the abdomen became excessive and permanent, the bowels only acted after enemata, and when enemata failed vomiting and increased distension appeared until relief was obtained. Aperient medicines proved to be valueless, and were finally quite abandoned. Massage and other measures were tried, but without effect. In August, 1894, relief of the bowel was attempted by means of enemata given through a long rigid tube passed some ten inches into the bowel. This measure was so successful that for ten months the child had only two or three obstructive attacks, although the distension of the abdomen persisted and remained very considerable. In July and November, 1895, there were severe and alarming attacks of intestinal obstruction, which finally yielded to enemata by means of the

* *Lancet*, Feb. 5, 1898, p. 399.

long tube. Up to this time there had been comparatively little complaint of abdominal pain. In 1896 the child began to suffer from cramping pains in the abdomen which increased in severity as time went on, and which were evidently due to disorderly peristaltic movements in the now much hypertrophied bowel. Gurgling and bubbling sounds could be heard in the abdomen, and sounds as of the dropping of water. The attacks of obstruction became more frequent, and were of longer duration. The distension of the abdomen became enormous, and when the distension was at its maximum the child was unable to move. Enemata—no matter how administered—were now losing their effect, no aperients could be tolerated, and the condition of the child when she came under my notice was certainly very deplorable.

I performed laparotomy on January 13th, 1897, opening the abdomen in the median line below the umbilicus. There immediately presented a gigantic coil of colon which looked and felt like the adult stomach and which appeared to fill up the whole of the abdomen. This coil was at once emptied of its gas through a small incision. The wall of this intestine was smooth and much thickened by hypertrophy, and the actual diameter of the collapsed loop was eight inches. It was this coil which had practically alone caused the distension of the abdomen. Further examination showed that the lower part of the bowel corresponding to the rectum and sigmoid flexure was represented by a straight, solid-looking tube about the size of an adult's forefinger and some eight or nine inches in length. This tube was without sacculation, and its longitudinal muscular coat was very marked. It was of uniform diameter. It was provided throughout with a short mesocolon. There was scarcely a trace of fat within the abdomen, and as a result the blood-vessels of the intestine were easily identified. The left colic artery, much increased in size, went to the dilated loop of the colon, while the sigmoid branch of the inferior mesenteric artery ran to the narrowed tube below the dilatation. The junction between the dilated gut and the narrow tube was quite abrupt. I enlarged the little opening I had made into the colon, and introduced the finger to examine the interior of the great pouch. Its walls were smooth, and a flap-like fold of mucous membrane occupied the orifice that led into the narrow tube. This opening readily took the forefinger. The fold of mucous membrane may have contributed to certain of the obstructive attacks, and may explain the retention of certain enemata. In examining the parts, however, it appeared more probable that the attacks of obstruction were due to bending or kinking of the bowel at the point where the tube and the great sac joined. The length of the narrowed part of the bowel corresponded to the length of tube which experience had shown was necessary to produce any emptying of the great pouch. The even contraction of the lower part of the bowel may have been in some degree due to the constant use of this tube. I passed a gum-elastic tube of large calibre through the anus, and along the narrowed rectum well into the interior of the dilated bowel. The tube measured twelve inches. I had some hope that if it could be kept in position for a time the distension would be relieved, and a more normal action of the bowels would be possible. I closed the opening I had made into the descending colon, but brought the suture line into the centre of the parietal wound so that an artificial anus could be established at any moment. This fixing of the bowel would, I hoped, tend to prevent it from becoming kinked or bent. The wound in the parietes was then closed in all but its central parts.

For some days the abdomen remained free from distension and the

child from pain. Some fæcal matter was passed, but in due course the gum elastic tube became blocked and could not be freed ; another tube could not be properly introduced, the child felt the worry of a foreign body in the bowel, and at the end of seven days the use of the tube was abandoned, and an artificial anus established in the centre of the median wound. Through this artificial opening all the motions were passed for the next nine months. Practically nothing came by the rectum. The distension was relieved, and the child was free from the continued spasmodic pains. There was, however, some difficulty in keeping the artificial anus open, as there always is with such openings when made as the present one was made. This necessitated the introduction for so many hours each day of a bent rubber tube which kept the orifice quite patent, but which occasioned the child a good deal of distress. In October, 1897, I resolved to attempt the excision of the colon from the splenic flexure to the anus, as this appeared to afford the only possible prospect of giving complete relief to what was still a distressing condition.

The second operation was performed on October 29th. By means of an elliptical incision in the skin I isolated and removed the artificial anus, entering the abdomen on each side of the opening. The orifice in the colon I closed by a series of substantial sutures. I found that the gut, which had at one time been so enormously distended, was now of more moderate dimensions, and its point of junction with the narrow tube which represented the lower part of the colon was still abrupt. The narrowed tube had shortened somewhat as the result of removing the distension. The dilatation of the colon extended up to the splenic flexure. Beyond that point the colon was practically normal, although it had evidently been to some degree distended and still showed some hypertrophy of its walls. The colon on the right side was normal, and the whole of the greater bowel had a very free mesocolon. Having found that I could bring the left extremity of the transverse colon to the anus, I isolated and ligatured the left colic artery, and, having clamped the bowel, divided it at the splenic flexure. I then isolated the sigmoid artery and the superior hæmorrhoidal vessels and ligatured them. The absence of fat in the retroperitoneal tissue rendered this proceeding very simple. At the same time I ascertained that the distribution of the middle and right colic arteries was normal. I then excised the gut representing the descending colon, the sigmoid flexure, and the upper part of the rectum. I divided the bowel low down in the pelvis below the entrance of the superior hæmorrhoidal artery. A few bleeding points made manifest by the excision required ligatures. The child was now placed in the lithotomy position, and, having made an elliptical incision around the evidently narrowed anus, I proceeded to remove the anus together with the lower and remaining portion of the rectum. The separation of the rectum from the slender vagina was a somewhat tedious matter. The middle hæmorrhoidal vessels were secured and the lower end of the rectum removed without difficulty. I returned to the abdominal cavity and brought the transverse colon down to the anus, where I secured it by a series of close sutures. The gut was conducted into position by four pressure forceps which were passed into the abdomen through the hole in the perineum. The operation was concluded by closing the wound in the abdomen without drainage.

The child made a speedy and excellent recovery. No sedative of any kind was needed, as little pain was complained of. She was once sick. The only complication was represented by some suppuration

between the new rectum and the vagina. This was no doubt due to accidental infection of the tissues while drawing the transverse colon into place. As soon as the child began to run about again this discharge ceased entirely. The bowels began to act without any difficulty, and in the course of some months the child had control over the new anus.

It is quite clear that in this particular instance the dilatation of the colon was due to a congenital narrowing of the lower extremity of the bowel, as represented by the segment supplied by the inferior mesenteric artery. This narrowed part exhibited no structural change. The specimen is in the museum of the Royal College of Surgeons of England. Little idea of the immense degree of dilatation of the colon can be gathered from the preparation as it now appears. The junction of the narrowed portion with the dilated part is not so abrupt as it appeared to be before the intestine was removed. At this point of junction there is no mechanical obstruction and no disease of either mucous or muscular coats. In mounting the preparation the structures which formed the anus have been removed.

This is, I believe, the first instance in which this condition has been treated by a radical operation.

Treatment.—The treatment of the so-called "idiopathic dilatation of the colon" may be considered generally, and with reference to both classes of case.

1. The digestion must be attended to, and the diet carefully regulated, with the idea of allowing as little débris as possible to reach the colon.

2. Every attempt must be made to secure a regular action of the bowels. In effecting this end aperients, and especially saline aperients, may be of service, but it is not unusual to find that they are often unavailing. The chief measure of treatment will consist in the frequent washing out of the colon. This is most conveniently done with an irrigator raised to some height—say three feet—above the bed, and the patient at the time should be made to occupy the knee and left shoulder position if possible.

Massage, electricity, and strychnia have all been of value in promoting an action of the bowels. Salol or β naphthol may be of service in diminishing flatulence.

The passing of the long tube has now and then led to the emptying of the distended loop, and enemata given with a long firm tube have answered when others have failed, but, on the whole, the long tube is not efficient. The difficulty of passing it is very considerable, the point to which it reaches is uncertain, and just as the tube is supposed to have reached the descending colon, its extremity may appear at the anus owing to its having been doubled upon itself.

3. Of operative measures there is little to commend tapping or aspiration of the bowel.

In most instances in which it has been employed, it has

resulted—as may have been supposed—in only temporary relief. The tappings have been repeated many times over, but with no more than a few hours' relief to the distension. As the dilated bowel is often ulcerated, and perhaps deeply ulcerated, the little operation is not without danger.

In Dr. Cheadle's case, the dilated colon was punctured, and after suitable treatment, a complete cure followed, but cases such as these are rare.

In cases which have resisted other measures an artificial opening into the colon should be made. It need only be of small size to allow, in the first instance, of the escape of gas. Every attempt should be continued to enable the patient to make use of the rectum.

When actual intestinal obstruction exists, there is nothing to be done but to make at once a free opening into the colon. That opening may or may not be closed according to the circumstances of the case.

As all these cases of "idiopathic dilatation of the colon" have, with only a few solitary exceptions, ended in death, and as the dilated bowel is very apt to give way, this somewhat forbidding operation should not be too long delayed.

In a few instances, a radical operation may be possible, in the form of an excision or an anastomosis. For such cases no rules can be laid down. I have already given an instance in which a liberal excision of the colon led to complete recovery.

CHAPTER IX.

OBSTRUCTION DUE TO TUMOURS GROWING FROM THE BOWEL WALL.

Cancer of the bowel, which has been fully described in the section on stricture of the intestine, may form a definite tumour, which may project into the lumen of the tube, and cause obstruction. Such a method of obstructing the bowel is, however, not common in cancer, and as the matter has been dealt with in the section named (page 220), carcinoma may be excluded from the "tumours" which are now to be described.

The tumours considered in this chapter comprise a variety of innocent neoplasms, together with lymphadenomata, and sarcomatous tumours.

They are all comparatively uncommon, they but seldom cause an obstruction in the bowel, and they are of but little clinical interest.

The innocent tumours may first be considered.

1. **Adenomata.**—These grow from the mucous membrane, and have their origin in the follicles of Lieberkühn or in Brunner's glands. They present on section a number of tubes, passages, and spaces, all lined with columnar epithelium and supported by connective tissue which 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 features of the growth in some part depend, the laxer tissues forming soft, and the denser structures firm, polypoid masses. They vary in size from a pea to a walnut. Some few have been described as as large as a pear. 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 seem that the line of demarcation between them and the cylindrical

epitheliomata is often faint, and that one species of growth may shade off into the other. This very especially applies to the rectum (*see* an excellent case by Dr. Handford; Path. Soc. Trans., 1890, page 133).

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." Others appear as sessile nodules.

These adenomata have been found in all parts of the intestine, but 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.

In appearance the adenomata are red and soft like vascular mucous membrane. Some are smooth upon the surface others have a cauliflower-like or papillomatous surface.

FIG. 103.—Polypus-like projections from the Mucous Membrane of the Colon. Great thickening of the mucous membrane (*Royal Coll. of Surg. Mus.*, No. 2455 A).

An excellent description of a case of multiple polypi of the small intestine is given by Kanthack in the Pathological Society's Transactions, 1897, page 83.

Some intestinal "polyps" have contained muscular tissue.

In Guy's Hospital Museum is a "polyp" of the ileum, which contains a central mass of fat. It is supposed to have had its origin in the invagination of a Meckel's diverticulum. In Handford's case, above alluded to, the colon contained 170 polypi.

To those growths from the mucous membrane of the bowel which assume a marked papillary character, the name of papillomata, or polypoid vegetations, has been given. Such growths are rare, are most common in the rectum and lower colon, and are very apt to be multiple. Luschka reports the case of a woman aged thirty, whose whole colon was studded with thousands of these so-called vegetations.

That these growths may become epitheliomatous has been fully demonstrated.

They often appear to occur in certain families. I have seen a brother and sister affected with this condition.* They are fully described in works on Diseases of the Rectum; also reference may be made to an excellent résumé in Maylard's "Surgery of the Alimentary Canal," page 603. Multiple papillomata have been met with in the duodenum.

Fig. 103 shows numerous polypoid projections from the surface of the colon, attended with great thickening of the mucous membrane.

A valuable account of a case of multiple papillomata of the colon in a man aged twenty-eight is given by Dalton.†

2. **Congenital Cysts.** — Rokitansky and others have described cases where *multilocular cysts filled with serum* were found partly embedded in the intestinal wall.

Letulle gives an account of a case of this kind in which from 300 to 400 cysts were discovered.

Roth found a cyst lined with ciliated epithelium.‡

Dr. Sainsbury § describes a case in a girl, aged eleven, who died from typhoid fever. In the commencement of the ascending colon a cyst, the size of a duck's egg, was discovered. It was connected with the ileo-cæcal valve. The outer wall was formed of mucous membrane, and the lining or inner wall of serous membrane (*see* page 272).

* *See* cases quoted in St. Bart.'s Hospital Reports, 1887, p. 225; and 1890, p. 299.

† Path. Soc. Trans., 1893, p. 85.

‡ Virchow's Archiv, Bd. 86, p. 371.

§ Path. Soc. Trans., 1887, p. 146. *See* also case in Path. Soc. Trans., 1885, p. 213.

Buchwald* describes the case of a boy who died of obstruction. The autopsy revealed two cysts in the wall of the jejunum. Accounts of cysts in the rectum are furnished by Prideaux,† Adams,‡ and others.

In a few instances *dermoid cysts* have been met with in the colon and rectum. In a case reported by Mr. Clutton,§ a pedunculated dermoid cyst growing from the sigmoid flexure protruded at the anus. It measured three inches in its longest diameter. It was covered with hair, and resembled a child's scrotum. It contained fat, fibrous tissue, bone and hair nine to ten inches in length. The patient was a girl between eight and nine years of age, who suffered from straining and tenesmus. The dermoid had suppurated, and, some time before the operation, pus was discharged by the rectum. Dr. Port‖ has recorded a case which very closely resembles the one just described. The patient was a girl of sixteen, who suffered much from tenesmus. A dermoid cyst ultimately protruded at the anus, and was removed. The tumour contained, in addition to bone and hair, a canine tooth.

3. **Fibromata.**—Fibrous tumours have been met with in the bowel, growing from the submucous tissue. They usually appear as polypi, and are most common in the rectum. They have also been met with in the colon and ileum. Hale White¶ describes a fibrous polyp of the jejunum, which caused a fatal intussusception. The recorded cases vary from an instance in which a little fibroma, the size of a pea, was found in the cæcum,** to a case in which a polyp composed of connective tissue was found in the rectum, which was the size of a fœtal head, and weighed nearly two pounds.†† In a few instances a polypoid mass, composed of myxomatous tissue, has been found in the rectum.

4. **Fibro-myomata.**—Tumours composed of unstriped muscular tissue or of a mixture of such muscle with fibrous tissue are met with in the bowel. They tend to become polypoid, and are assumed to have their origin in the muscular coat. These tumours have been mostly met with in the rectum. McCosh‡‡ records the case of a man

* Annual of the Universal Med. Sci., 1888, vol. i., p. 357.
† *Lancet*, 1883, vol. ii., p. 633.
‡ *Lond. Med. Record*, 1881, p. 881.
§ Path. Soc. Trans., 1886, p. 252.
‖ Ibid., 1880, p. 307. Another case is recorded by Denzil, Archiv für klin. Chir., 1874, p. 442.
¶ Path. Soc. Trans., 1890, p. 121.
** Dr. Percy Kidd; Ibid., 1885, p. 210.
†† Mr. Bowlby; Ibid., 1883, p. 106.
‡‡ Annals of Surgery, 1893, p. 41.

of thirty-four, who for years had had increasing difficulty with the bowels. The fæces passed were either fluid or were flattened out into ribbons. A fibro-myoma was discovered growing from the rectum, and was removed. It was the size and very much the shape of a large cocoa-nut. A tumour described as a myoma growing from the small intestine appears to have led to fatal hæmorrhage.*

5. **Lipomata.**—These growths spring from the submucous layer, take a polypoid form as a rule, and are often multiple. Sometimes they may attain considerable size.†

General Account of Benign Polypi.—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 inch and a half 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, a pear, or a cocoa-nut. 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 come the ileum and colon. They are rare in the jejunum and still rarer in the duodenum. As regards the small intestine, the favourite site is in 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 instances of this. 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 size and become quite numerous without affording any evidence of their existence. Thus, in two cases of very large polypi of

* Dr. Mercer; Annual of the Universal Med. Sci., 1889, vol. i., D-15.

† A specimen of a lipoma will be found in the Lond. Hosp. Museum. No. Ae 45. *See* case of lipoma of sigmoid flexure by Voss; *Lond. Med. Record*, 1881, p. 200.

‡ M. Fernet; Bull. de la Soc. Anat., 1863, p. 296.

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-quarters inches by one inch and a half.* 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.

Now and then innocent tumours of the rectum have caused actual chronic intestinal obstruction, the bowel being more or less completely blocked by the growth.

Dr. Foxwell† describes the case of a large myxo-fibromatous polyp three times the size of a chestnut, which was discovered post-mortem in the body of a woman of twenty-eight. During life it had caused the symptoms of pyloric obstruction.

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 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

* Path. Soc. Trans., vol. i., p. 95.

† *Lancet*, vol. i., 1889, p. 1239.

of the 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.*

6. **Lymphadenomata.**—Many examples of lymphadenoma, or lympho-sarcoma, in the intestine have been recorded. The neoplasm appears in the adenoid tissue of the bowel, and may attain considerable dimensions. It is remarkable that in spite of the great size the growth may reach, obstruction of the intestine is very rare. The lymphoid growth may be found in any part of the alimentary canal. It may be found scattered about through the stomach and the whole length of the intestine. It is much more common in the small intestine than in the large, and is, indeed, rare in the colon alone.

Among eighteen recorded cases the distribution of the lymphoid growth is as follows:—

Stomach, small intestine and colon . . .	5 cases.
Stomach and small intestine	1 case.
Small intestine and colon	3 cases.
Small intestine	8 „
Colon	1 case.
	18

The ileo-cæcal region is a part very conspicuously affected, and it is in this region that the growth is apt to reach its largest proportions.

In the bowel it would appear that lymphadenoma when it occurs is usually primary.

"Cases of lymphadenoma of the intestinal tract," writes Dr. Newton Pitt,† "seem to fall into two great groups—those in which the growths commence in the mucous and submucous coats, and form tumours projecting into the lumen of the bowel; and those in which the growth forms a diffused sheath, extending along the subserous surface, and but occasionally reaching the mucous and submucous coats. They seem to correspond to the two groups of lymphoid tissue: the follicles and lymphatics of the

* Bull. de la Soc. Anat., 1875, p. 195.
† Path. Soc. Trans., 1889, p. 80.

mucous membrane, and the lymphatics of the muscular and subserous coats.

"The former do not alter the calibre of the bowel, and but rarely ulcerate. Their seats of election appear to be the lymphoid areas of the vermiform appendix, the ileo-cæcal valve, Peyer's patches, and the solitary follicles of the small intestine [Fig. 104]; more rarely the duodenum, the cardiac end of the stomach, and the tonsils. The œsophagus and large intestine have entirely escaped in some cases.

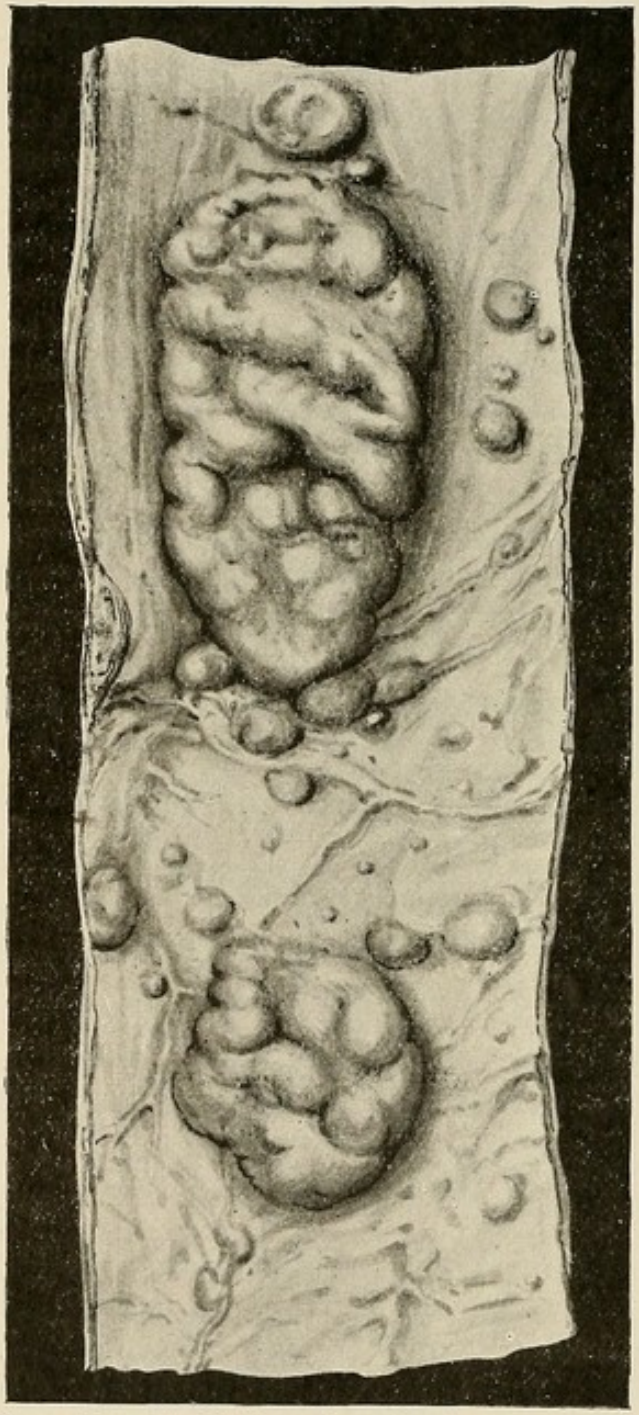


FIG. 104.—Small Intestine showing Lymphadenoma of Solitary Glands and Peyer's Patches.

(*Royal Coll. of Surg. Mus.*, No. 2523 A.)

"In the latter group the growth forms a sheath, which invades the muscular coat, paralyses it, and hence leads to dilatation; the growth where it reaches the surface of the bowel is apt to ulcerate, probably because its vascular supply is more defective than in the first group of cases where the muscular coat is uninjured. In most cases of this group we find the growth has spread from the mesenteric glands. It does not especially affect the solitary and agminated glands. Severe diarrhœa is a prominent symptom." Dr. Newton Pitt has collected seven recorded cases illustrating the first group and eleven illustrating the second.

In the first group of cases the growth is apt to be scattered irregularly about the bowel in the form of soft,

whitish, succulent nodules, or plaques, reaching in places to very large masses of new growth.

Intestinal obstruction is very rare. Indeed, in only one of the recorded cases * is this condition mentioned.

Dr. Carrington reports an instance in which a lymphadenomatous mass weighing no less than half a pound occupied the cæcum, and yet no symptoms of obstruction were produced, nor, indeed, was special attention directed to the abdomen during life.†

So far as the clinical manifestations of lymphadenoma of the bowel are concerned, the trouble is somewhat more common in males than in females.

Most of the patients have been adults between twenty and forty. A few cases have been met with in children. The extremes of age in the recorded cases are respectively four and fifty-four years.

The general symptoms have shown much variation. There is usually distinct impairment of health with wasting anæmia and diarrhœa.

Digestive disturbances are common, associated with colic, distension of the abdomen, and possibly ascites. Enlargement of the tonsils has been noticed in some cases, and enlarged glands in others. Hypertrophy of the spleen may be met with, and masses of enlarged mesenteric, or retroperitoneal, glands may be detected. Very often no definite tumour is discovered. In not a few of the cases there have been no abnormal abdominal symptoms. The progress of the cases is rapid, and death is very apt to occur within twelve months of the onset of the mischief.

7. **Sarcomata.**—Sarcoma of the intestine is less common than is lymphadenoma, the relative proportion of the two neoplasms being given by some authors as about 1 to 3.

The sarcoma may be primary or secondary. It may be spindle-celled or round-celled. It may be met with in any part of the alimentary canal, but—if the rectum be excluded—the growth is much more common in the small intestine than in the colon. In the colon, indeed, it is very rare.

The growth, as a rule, has its origin in the submucous tissue.

It may appear as a sessile or polypoid tumour. In such case, it is usually of the spindle-celled type, and is of slow growth. More often the sarcoma takes the form of a diffuse infiltration of the bowel, the growth in such case being commonly round-celled (Fig. 105).

* Dr. Coupland; Path. Soc. Trans., vol. xxviii., p. 127.

† *Brit. Med. Journ.*, vol. ii., 1883, p. 773. *See* also Ziemssen's Encyclopædia of Medicine, vol. xvi., p. 837.

The intestinal canal may be converted by the diffused growth into a rigid tube. The lumen of the affected tube is usually dilated. It may, however, be contracted, although contraction sufficient to cause intestinal obstruction is quite uncommon.

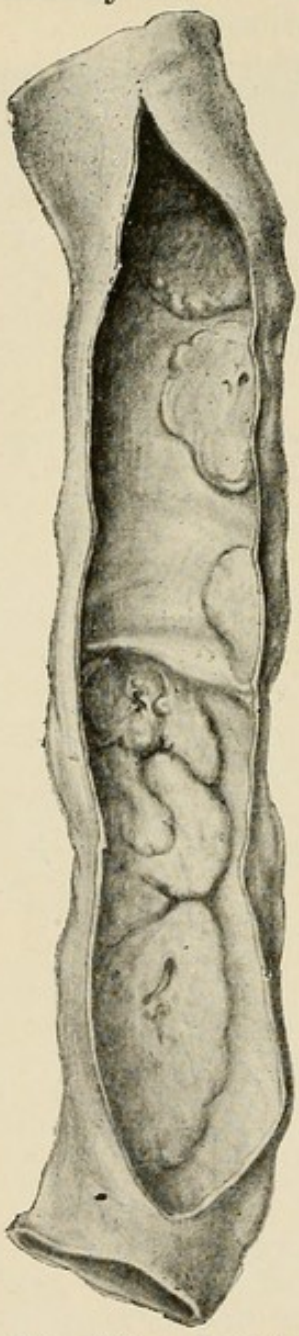


Fig. 105. — Lympho-Sarcoma of the Ileum implicating Peyer's Patches.

This specimen may perhaps more properly be called a lymphadenoma. (*Royal Coll. of Surg. Mus.*, No. 2523 B.)

Most of the patients have been between thirty and forty years of age. In fourteen cases collected by Madelung,* the extremes of age were respectively four years and fifty-two years.

The clinical manifestations are hardly to be distinguished from those which attend lymphadenoma.

There are malaise, increasing weakness, increasing pallor and wasting, irregularity of the bowels, dyspepsia, loss of appetite, flatulence, mild colic, possibly fever and possibly intestinal obstruction. A definite tumour is often to be made out. In a case of sarcoma of the duodenum reported by Dr. Rolleston,† the symptoms closely resembled those of ulcer of the stomach.

The progress of the disease is rapid, and death may be expected to take place within nine months.

In one case, the patient is reported to have lived for one year and nine months.

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 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.

It would appear that sarcomata of the rectum are very often of the melanotic type.‡

* Centralblatt für Chirurgie, 1892, p. 617.

† Path. Soc. Trans., 1892, p. 67.

‡ *See* cases by Heaton, Path. Soc. Trans., 1894, p. 85; Lange, *New York Med. Journ.*, 1887, p. 274; and cases quoted by Cooper and Edwards in their work on Diseases of the Rectum.

CHAPTER X.

OBSTRUCTION DUE TO THE PRESSURE OF 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 malignant 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 of the gut 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 pressure 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 or movable spleens.†† The duodenum especially may be compressed by tumours growing

* *Journ. de Med. Chir., etc.* Bruxelles, 1867. *See* also the two cases detailed at the end of this chapter.

† Mr. Gay; Path. Soc. Trans., vol. iii., p. 108.

‡ Le Dentu; Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 661. Mr. Heath; Path. Soc. Trans., vol. xvi., p. 107. M. Verneuil; Bull. de la Soc. Anat., 1870, p. 411. Cropf; Annual of the Universal Med. Sci., 1893, vol. iii., C–55; and Ricard; Ibid., 1892, vol. iii., C–61.

§ *Brit. Med. Journ.*, vol. ii., 1882, p. 1152.
Path. Soc. Trans., vol. iv., p. 230.

¶ Cases quoted by Leichtenstern, loc. cit., p. 573.

** Path. Soc. Trans., vol. v., p. 302.

†† Case quoted by Duchaussoy.

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 22 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 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.

* Mr. Nathan; *Med. Times and Gazette*, vol. ii., 1870, p. 238.
† *London Med. Gazette*, 1846.
‡ De l'Occlusion Intestinale, p. 47. Liége, 1871.
§ Path. u. Therp. d. bewegl Niere, 1866.
‖ Cases by Lavater and Kellenberg, quoted by Leichtenstern.

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 forty-eight hours 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.

The following interesting case, reported by Mr. Colby,*

* *Brit. Med. Journ.*, March 26, 1898.

provides a good example of this type of intestinal obstruction:—

A boy, aged seven years, was seized on February 8th with sudden pain in the abdomen, which was severe and lasted three hours On February 9th he had a similar attack. On February 11th some calomel was given, but was vomited. On February 12th two olive oil injections were given, with no result. On the evening of the same day a castor-oil and glycerine enema was given, and produced only a few hard lumps. This injection was repeated on February 13th.

On February 16th vomiting set in. The vomiting was "fæcal." When admitted into the hospital at 5 p.m. on February 16th he had the facial appearance of abdominal trouble, with a quick pulse, and a dirty but moist tongue. The abdomen was flaccid and not distended. Peristaltic intestinal movements were everywhere visible. Per rectum a swelling was detected, projecting into the bowel. This swelling so much resembled an intussusception that water was injected by means of a siphon: this injection was followed by the disappearance of the rectal swelling. The patient was seen again at 10 p.m., when the rectal lump had returned, so the boy was put under an anæsthetic; it was now more obvious that the swelling felt in the rectum was outside the bowel. Consequently, the abdomen was opened in the middle line below the umbilicus. On inserting the fingers through the opening thus made an elastic swelling of the size of a small cocoa-nut was brought out of the wound. This proved to be a cyst in the mesentery of the small gut. The cyst had compressed a loop of small intestine, which was closely united to the cyst wall and flattened out against it. An attempt was made to dissect out the cyst, but was not persisted in, and as much as possible of the wall of the cyst was removed. His recovery was uneventful.

The cyst wall when distended was mottled on the surface like a crumpet, and microscopically was composed of fibro-cellular tissue, with a large quantity of unstriped muscle. The contents measured ten ounces of a pale pink fluid, whose specific gravity was 1023, and contained a large quantity of albumin and cholesterin.

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.

In some of the chronic cases, it would appear that the production of the obstruction symptoms is a little complex.

As examples of this, I would cite the two following cases, which have occurred to me in private practice. One was that of a lady of forty-one, who had been in bed for two months with symptoms of mild chronic intestinal obstruction. She had had six children; menstruation was regular. She was thin, and the abdominal wall was lax and attenuated. She

was in no way neurotic. Her troubles had followed upon an indefinite condition of ill-health, and had been ushered in with a violent attack of pain in the pelvis. The bowels were very confined, scybala were passed, there were nausea and loss of appetite, and an occasional rise of temperature towards the latter end of the case. There was some flatulent distension of the abdomen, and visible coils of bowel were to be seen in movement. These movements were attended by colic, which was more or less persistent, but never severe. Menstruation was attended with considerable pain in the left side of the pelvis. The symptoms suggested some partial occlusion of the bowel, due possibly to a stricture. This was emphasised by the fact that the rectum was ballooned. The patient was not comfortable when lying down. As all medical measures had failed, I carried out an exploratory incision. The distended coil seen in movement was the sigmoid flexure. It was full of gas, but its walls were not hypertrophied. The colon, and especially the descending colon, contained a large quantity of hard scybala. The obstruction was due to the retroflexion of an otherwise normal uterus. The fundus fell back upon the bowel and compressed it against the pelvic wall. It was not possible to introduce the little finger between the fundus of the uterus and the pelvic wall. The uterus could be easily lifted up, but when pushed back it fell upon the bowel like a closing valve.

The bowel wall showed no contraction in any part, and was perfectly normal. The left ovary was prolapsed. The course of events in such a case as this was probably as follows: The patient is out of health, the bowels become constipated, and gas and fæces collect in the sigmoid flexure. The distended coil very readily adds to the bend in the retroflexed uterus, and the gut becomes pressed upon. As the bowel remains unrelieved, that pressure does not become lessened. The ovary is prolapsed and may be made the centre of reflex nervous disturbances. That there is considerable local nerve disorder is shown by the ballooned rectum. The constipation may have been largely of reflex origin, and the displaced uterus may well have inhibited the act of defæcation.

The fundus of the uterus was felt per rectum before operation, but it could not be assumed that the displacement alone was the cause of the intestinal disturbance. When the parts were viewed from within the abdomen, the manner in which the prominent uterine fundus wedged the bowel against the pelvic wall was very emphatic, and there is no doubt that such obstruction as this induced was intensified by abiding

flatulent distension of the sigmoid flexure and a certain ill-defined disturbance of the nerve apparatus of the parts concerned.

In the second case, the patient was younger, was unmarried, and was very neurotic. Her bowel troubles had followed a severe attack of influenza. When I saw her, her symptoms of obstruction had existed for over three months, the abdomen was greatly distended: there was continued colic and occasional vomiting; visible coils of intestine in movement were apparent. At no time could her symptoms be said to have been severe, although she was confined to bed.

On opening the abdomen, the distension was found to be in the main limited to the sigmoid flexure. On following the bowel down towards the anus, it was seen to be jammed between the pelvic wall and a retroflexed, but otherwise normal, uterus. The obstacle offered by the uterus was most definite, and its valve-like partial occlusion of the bowel was readily demonstrated. The intestine could hardly be said to be in any appreciable way hypertrophied, although, as its walls did not appear to be as attenuated as the distension of the gut would suppose, some muscular increase must have been present. In this case also there was ballooning of the rectum. There was nothing abnormal in the condition or situation of the ovaries. As the bowel had been so long distended, I made a pin-hole stoma in the sigmoid flexure. This prevented the accumulation of gas and gave the long distended bowel a period of rest.

At the end of two months I closed the little opening by a second operation.

In this case also there appeared to be a considerable degree of nerve disturbance, in addition to, and possibly dependent upon, the wedging down of the uterus.

In connection with the subject of obstruction due to the pressure of tumours outside the bowel, reference may be made to the account which has been already given (page 88) of adhesions which produce symptoms of intestinal obstruction by compressing the gut.

CHAPTER XI.

FÆCAL ACCUMULATION.

It is not uncommon for the bowel to become blocked by an accumulation of fæcal matter within its lumen.

It will be obvious that this form of obstruction must be practically limited to the colon. If it involve the small intestine it must be by extension of the accumulation from the colon. It cannot occur primarily in the small intestine. The blocking of the lesser bowel by foreign substances which have been swallowed, or by masses of utterly indigestible matter, cannot be considered to come under the present category.

The colon being the part of the bowel involved in obstruction due to fæcal accumulation it may be further assumed that the blocking of the gut will most usually concern its lower or terminal parts.

Accumulations of fæces are most common in the rectum and sigmoid flexure, and then in the cæcum. Masses of fæces may block the colon at any point, and more particularly at the flexures of the bowel. Still the three common sites of the accumulation are those just named.

The accumulation in the colon may assume the form of a more or less isolated nodule or mass.

Thus a considerable lump may be found in the cæcum or sigmoid flexure, and the rest of the colon be comparatively clear of any gross accumulation. An isolated lump may even persist after free purgation.

On the other hand the accumulation may assume the form of several isolated fæcal masses. One of these may occupy the cæcum, another the transverse colon, and possibly a third the sigmoid flexure. The bowel between these masses may appear to be fairly clear.

Finally, the accumulation may take the form of a steady

filling up of the colon from the rectum or sigmoid flexure upwards. After the sigmoid flexure has been filled the descending colon becomes blocked with fæces, then the transverse colon is occupied, until at last the cæcum is reached. Cases have been recorded in which the entire colon has been occupied from one extremity to another by an incredible accumulation of fæcal matter.

The isolated masses are composed of comparatively hard fæcal lumps, while in the general filling up of the colon from below the collected fæces are of a softer character. In the majority of the instances of blocking of the whole colon there is some mechanical obstruction towards the rectal end of the gut. This may be due to distortion of the sigmoid flexure dependent upon the overloading of that coil. Such a case would come under the present category.

It is obvious, therefore, that the size of the fæcal mass may vary from a small lump of the dimensions of a hen's egg to a huge column of excrementitious matter which may engage the whole of an enormously distended colon.

The sacculi of the large intestine lend themselves to the lodgment of fæcal matters, and the harder of the masses met with in the bowel are moulded within these sacculi.

It is curious and noteworthy that retained fæces tend to become inspissated and hardened.

Some masses which have been long retained seem to have parted with all their moisture and to have the consistence almost of dry mortar.

In the diarrhœa which often follows the ridding of the colon of a fæcal accumulation scybala of intense hardness and dryness may not infrequently be found among the liquid stools.

The causes of fæcal accumulation are the causes of chronic constipation, and into the etiology of this common affection it is unnecessary to enter in this work.

It will suffice to allude to certain of the factors which bring about this loading or blocking of the bowel.

1. In many cases there is evidence of diminished expulsive power, or of defective innervation of the bowel.

This weakness would appear in some cases to be congenital. It is more often acquired. It is illustrated by the constipation which may attend certain exhausting diseases and certain injuries and affections of the brain and spinal cord. It is concerned, possibly, to some extent, with the constipation of the insane and the neurotic.

In association with this factor in the etiology must be

noticed the effect of weak abdominal muscles, of lack of exercise on the patient's part, of damage to the muscular apparatus of the bowel from long continued inflammation of its walls, and the result of the long over-use of aperients.

2. In the second place there may appear to be some inhibition of the act of defæcation. This is illustrated by the constipation attending painful piles, fissure of the anus, operations upon the anus, painful bladder affections and the like.

Examples are also provided by the intestinal lethargy which is often associated with a chronically diseased vermiform appendix or an inflamed ovary, and which disappears in a marvellous manner when the irritating organs are removed.

The obstruction of the bowels which may attend a local and quite slight degree of peritonitis, or a slight injury to the serous membrane itself, probably belongs to this category.

It is noteworthy how, in certain of these cases, opium acts as an aperient.

3. In a third series of examples the trouble appears to depend less upon the condition of the bowel itself and more upon the state of its contents.

Under this heading must be found the constipation which attends chronic dyspepsia, the bolting of food, the eating of food at irregular hours, and the consumption of masses of indigestible matter. In certain instances the actual articles of food eaten by the patient cannot be classed as indigestible, but they are unsuited to the particular individual. For example, one has often noticed that in adults the persistence in a milk diet may lead to the formation of the densest of scybala.

In some persons constipation appears to be largely due to the small quantity of fluid taken daily with the food.

4. Finally, it is possible roughly to distinguish a class of cases in which some anatomical disposition or some slight pathological lesion would appear to be a prominent factor in the production of the accumulation.

The colon is found to be unduly long or portions of it are unduly prominent. Thus the cæcum may be found to form a large and elongated pouch, which may hang listlessly into the pelvis, or be lying on the pelvic floor. The sigmoid flexure may be long and pendulous, and may so nearly conform to the outline of a capital omega that its two extremities are in actual contact. Nearly the whole of the free part of the loop may be lying in the pelvis.

The transverse colon may be elongated and distorted; it may assume a V-like bend, and the centre of the loop may

be on a level with the symphysis pubis. In cases of relapsing perityphlitis associated with marked constipation I have several times seen the transverse colon present at the wound made in the right iliac fossa for the purpose of removing the appendix.

In the cases of deformity which have just been mentioned, it is impossible to say which condition is antecedent to the other, the constipation or the anomaly in the bowel. It is easy to understand that long continued over-loading of the colon may lead to such changes in the large intestine as have been just described.

In other examples, the constipation is associated with some congenital narrowing of the colon, short of a state of actual stricture. Such cases have been alluded to in the section on congenital deformities of the bowel (page 250). The sigmoid flexure in other instances may be unduly short, or the sigmoid mesocolon may be scanty and very much over-loaded with fat.

There may be a contraction or shrinking of the sigmoid mesocolon whereby the free movement of that coil is hindered. A peritoneal band may be associated with the colon in such a way as to inhibit a normal peristalsis. Fig. 30 shows a broad membranous band connected with the sigmoid flexure, which may have had such effect.

From the present category are excluded the frequent cases in which the fæcal accumulation is dependent upon the pressure of a tumour or a retroflexed uterus, or upon the impediment offered by an enlarged prostate, or by moderate adhesions, and the like.

An account of the tumour formed by a mass of accumulated fæces is given in the clinical section of this book.

The amount of the accumulation may, as already stated, vary from a few isolated and not unduly large masses to a collection which may occupy the whole of the colon, from the anus to the ileo-cæcal valve.

We read of cases where after death a "bucketful" 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.

In cases of extensive accumulations the colon may become of enormous size. The cæcum in such instances has been described as 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. I am rather disposed to think that these cases of extensive and enormous distension of the colon are usually associated with some mechanical impediment to the passage of fæces, and are not common in connection with a mere passive accumulation of fæcal matter.

This point has been alluded to in dealing with the subject of idiopathic dilatation of the colon (page 242).

As an example, however, of a case in which it would appear that the accumulation was the outcome of mere constipation, I may quote the following.

Dr. Little* reports the case of an idiot, aged thirty-four, who 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.

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, in the lower part of the ileum, and in the sigmoid flexure. The largest and most numerous are met with in the cæcum.

They may lead to acute peritonitis by abrupt perforation. When the perforation is slow and gradual, a form of localised and subacute peritonitis may be produced. The slow perforation may lead to an abscess, to a communication between the colon and another part of the intestine, or to a vesico-colic fistula. It may be the cause of numerous and complex adhesions, which may deform the bowel; it may lead to a form of pelvic cellulitis, which has been more than once mistaken for a pelvic sarcoma; it may cause a firm attachment between the colon and some other organ or peritoneal surface.

* Path. Soc. Trans., vol. iii., p. 106.

It has been already stated that the stercoral ulcer in process of cicatrisation may lead to stricture of the large intestine.

Excellent examples of the perforation or giving way of the bowel at the seat of a stercoral ulcer, associated with fæcal accumulation, are given by Southam* and Berry.†

In certain recorded examples the over-distended bowel has become ruptured and has been rent open. It is not, however, quite demonstrated that such rupture may take place independently of any ulceration of the gut. As a rule, the bowel wall has been found to be ulcerated, and, in places, gangrenous.

Ileus Paralyticus.—It will here be convenient to allude to the condition known to older writers as "ileus paralyticus." This term is applied to the condition of acute obstruction, or of acute peritoneal disturbance which not infrequently marks the close of a case of fæcal accumulation.

It is assumed that the primary cause of fæcal accumulation is an insufficiency in the forces which move the intestinal contents forwards. If this lack of power advances to a state of absolute paralysis of a segment of the bowel, then it is said there arise symptoms of an acute character, associated with collapse, intense pain, increased tympanites, and continued vomiting.

The sole pathology of ileus paralyticus is summed up in the assumption that a portion of the bowel has become incapable of peristaltic movements, and as a result of this acute symptoms follow.

It is stated that ileus paralyticus could affect both the small and the large intestine.

I venture to think that ileus paralyticus, as described in the text-books and in the previous edition of this work, has no clinical existence.

It has—so far as I am aware—never been shown that complete paralysis of a segment of the bowel can alone lead to symptoms of acute intestinal obstruction which end rapidly in death.

It is claimed that the persistence of symptoms after the successful reduction of a strangulated hernia, or the successful restoration of a volvulus of the colon, are examples of this; but, so far as my experience goes, the persistence of

* *Brit. Med. Journ.*, 1895, vol. i., p. 254.

† Ibid., 1894, vol. i., p. 301.

symptoms under the conditions named is due to a definite peritonitis.

The symptoms in question are increasing feebleness passing into collapse, undiminished tympanitic distension, increasing vomiting, and usually, but by no means necessarily, a continued inability of the bowels to act.

How often it is that the symptoms persist and rapid death follows the liberation of a coil of intestine strangulated by a band. Such death, however, is due to peritoneal infection or septicæmia, and not to ileus paralyticus. Those, however, who still claim that ileus paralyticus exists would maintain that the persistence of the symptoms and the final dissolution of the patient are due to the fact that the damaged coil of intestine remains paralysed.

Now and then among the records of abdominal operations one notices the report that the patient died of "paralytic distension of the bowel." In such cases the following symptoms have developed within a few days or perhaps a few hours of the operation. The abdomen becomes distended, there is obstinate vomiting, there are increasing feebleness and failure of the pulse, and possibly complete constipation. No measures which are adopted to relieve the bowel afford relief, the tympanites remains and probably increases, the eyes become sunken and the tongue dry, and as the pulse increases in rapidity and threadiness the patient begins gradually to sink. He dies collapsed, like a poisoned man. There may have been but little pain, and no great degree of tenderness, and no necessary rise of temperature, but such a patient does not die of ileus paralyticus. The bowel may be "paralytically fixed" in the abdomen, but the cause of such cessation of peristalsis is peritonitis and the septicæmic condition which creeps along with it. I have never met with an example of such a case as this in which a diffused peritonitis was not found after death. The surgeon is very loth to own to any septic element in the case, and there is no doubt that "ileus paralyticus," "paralytic distension of the bowel," "traumatic paresis of the bowel," and the like have salved many surgical consciences.

The fact that the patient may recover from mild phases of post-operation peritonitis cannot be allowed to furnish an argument in support of ileus paralyticus.

As an example of this more fortunate condition I may quote the following case.

I removed the appendix of a man aged thirty-four for relapsing perityphlitis. The operation was of the simplest

possible character, but it was done under somewhat disadvantageous conditions. On the third day after the operation the patient, who had so far not made a good recovery, began to vomit. The abdomen was distended, especially in the epigastric region. A great transverse coil, absolutely tympanitic, appeared to occupy that district. He vomited everything he took. The abdomen was the seat of discomfort, but not of pain. It could hardly be called tender. All food by the mouth was discontinued, and then a distressing hiccough began. The temperature remained normal, the pulse about 100. The bowels responded to a salt enema. The patient had had morphia for two days after the operation, but no morphia was given on or after the third day. He was treated by rectal feeding and by hypodermic injections of strychnia. The hiccough, with occasional sickness, continued for nearly fourteen days, coming on in paroxysms. The abdomen remained distended as it was at the onset of the symptoms, but was free from tenderness and from anything more than discomfort. The patient made a perfect recovery. I have no doubt whatever that these protracted symptoms were due to a phase of peritonitis.

As an argument in favour of the existence of ileus paralyticus it has been pointed out that experiments upon animals show that a coil of bowel which is enormously distended with gas will not respond to the strongest electrical current, and, further, that, if the distension be long maintained, the gut will scarcely recover its muscular power.

It is quite possible that this may be true of the intestine of man, but it has not been shown that such paralysis can lead to the particular train of acute symptoms which are considered to indicate ileus paralyticus. The greatly distended bowel is apt to be already ulcerated, it is disposed to become perforated and even gangrenous, and in conditions short of these extreme lesions it is probable that its damaged wall will easily allow of the escape of bacteria from the lumen of the gut.

It is needless to say that in cases of fæcal accumulation the bowel may become mechanically blocked with fæcal matter, just as a small drain-pipe may become blocked by an accumulation of solid substances which have passed into it. In most cases, even in large accumulations, flatus will continue to pass, and occasionally a little fæcal fluid, the result of catarrh in the segment of the bowel above the block. The bowel at the seat of the accumulation is no

doubt incapable of action, and is inert and practically paralysed. The symptoms, however, which attend this condition are not those ascribed to ileus paralyticus. They are the symptoms of chronic obstruction. If the loaded bowel becomes actually kinked or twisted upon itself, then the phenomena of acute obstruction are produced, but to such phenomena the name ileus paralyticus cannot be applied.

PART II.

THE CLINICAL MANIFESTATIONS.

CHAPTER I.

THE CLINICAL VARIETIES OF INTESTINAL OBSTRUCTION.

From the clinical point of view cases of intestinal obstruction may be conveniently divided into three classes:—(1) Acute obstruction; (2) chronic obstruction; and (3) cases in which symptoms of acute obstruction supervene on those indicative of chronic obstruction.

The symptoms of intestinal obstruction are liable to considerable variation, and it is not to be claimed with certainty that a particular pathological condition causing obstruction will always be attended with particular and unvarying symptoms.

The general features of the three types of intestinal obstruction are here set out in brief outline. The more detailed account of each form will be found on pages 323, 391 and 435 respectively.

1. **Acute Intestinal Obstruction.**—The attack is sudden in *onset*. In the majority of instances no exciting cause is apparent.

The patient is seized with very severe abdominal *pain*. This is generally localised about the umbilicus, that is, about the great nerve centre for the intestine. Sometimes the pain corresponds to the seat of the obstruction, but not commonly. The patient may be "doubled up" by it or roll in anguish on the floor. The pain is of the nature of colic, and is usually constant, although liable to exacerbations. There is at first, at least, little or no *tenderness* of the abdomen.

There is *collapse*, with great depression of strength, pallor, sunken eyes, a feeble rapid pulse, a cold sweat over the face, a sighing respiration. *Vomiting* appears early, is first

composed of the contents of the stomach, is then bilious, and later brownish and offensive. It is copious and persistent, gives little or no relief, and in time very usually becomes stercoraceous. There is *constipation*, which is usually absolute from the first. The belly becomes more or less *distended*, and towards the end of the case is apt to become tender. The *tongue* is foully coated. *Thirst* is intense. The *temperature* is below normal. The *amount of urine* is diminished.

If unrelieved, the symptoms persist, the exhaustion increases rapidly, the tongue becomes dry and brown, the face has an aspect of horrible anxiety, the features are pinched, and the eyes sunken. The patient dies with those symptoms of *septic poisoning* which mark the termination of acute peritonitis. There may be delirium, but as a rule the patient retains consciousness to the last. The vomiting usually remains the most distressing symptom.

The majority of the acute cases die, if unrelieved, within six or seven days. The varieties of acute obstruction are enumerated on page 321.

The most *characteristic forms* are met with in association with strangulation by a band, volvulus of the sigmoid flexure, acute intussusception and acute and abrupt blocking of the bowel by a gall stone or foreign body. The detailed account of the symptoms of acute obstruction will be found on page 323.

2. **Chronic Intestinal Obstruction.**—The *onset* in this form of obstruction is gradual, and the progress of the malady irregular. There are attacks of abdominal *pain* which are not severe, which come on at first at long intervals, are often provoked by food, and are frequently ascribed to indigestion or colic. These attacks become in time more frequent, more severe, and of longer duration. They are attended with some vomiting and constipation, and with more or less constant uneasiness within the abdomen. The *vomiting* is probably slight, and does not persist. There may, however, remain much nausea and disinclination for food.

The *constipation* is not at first absolute. The patient is in the early stages relieved by aperients. These drugs then act with less and less effect, and at last only occasion severe pain and vomiting. Sometimes there is a period marked by *diarrhœa*. This diarrhœa is "spurious." It is due to catarrh excited in the bowel by retained fæcal matter above the obstruction, and is only met with when the stenosis is somewhat low down in the colon. Between these attacks the patient may feel fairly well, and suffer only from some

abdominal distension, irregularity of the bowels, nausea, malaise, and loss of appetite.

The *tongue* becomes white and coated, and the breath often most offensive. The *temperature* is not usually disturbed, nor is the *amount of urine* passed abnormal. The belly becomes more and more *distended*. A *tumour* is often discovered. Evidence of an *accumulation of fæces* is often present. *Visible coils of intestine* can be seen in movement through the apparently thinned abdominal parietes. When the movement takes place the patient has pain. There are frequent rumbling and *gurgling sounds* in the abdomen, which are very audible to those around.

The pain becomes more continuous and more severe, the vomiting is more persistent, the constipation is at last almost absolute, the distension of the belly increases, and the strength rapidly fails.

Unless some accident, such as perforation, occurs, the patient (if unrelieved) dies exhausted and marasmic, worn out by the continued pain and vomiting, wasted by inability to take food, and poisoned by the absorption of noxious matter from the horribly putrid contents of his own intestine. The breath has often at last a perfectly fæcal odour. Death may be said to occur, if the general courses of chronic obstruction be considered, in some six months after the onset of the symptoms of obstruction. The varieties of chronic obstruction are detailed on page 322.

The most *characteristic forms* are illustrated by stricture of the bowel, by gradual compression of the bowel by a tumour growing outside its walls, by the gradual filling of the lumen of the bowel by a tumour growing from its actual coats.

The detailed account of the symptoms of chronic obstruction will be found on page 391.

3. **Chronic Intestinal Obstruction Ending Acutely.**—This class of case is not uncommon. The patient has some obstruction in the bowel which does not completely block it. He has the symptoms of chronic obstruction. Upon these are suddenly engrafted the phenomena of acute, or subacute obstruction. This sudden alteration may be due to many causes. There may be a very narrow stricture which has become suddenly blocked by a mass of undigested food or by some foreign body that has been swallowed. These acute attacks are very often induced by a brisk aperient: occasionally they come on after violent exertion.

In other cases the stenosed bowel has been kinked or acutely bent upon itself and so closed, or it has become the

seat of a volvulus or of an intussusception. Very often a slight attack of peritonitis—due probably to ulceration above a stricture—will bring on the phenomena of acute obstruction. In not a few instances attention has been first called to a malignant stricture of the colon by an attack of subacute obstruction, the patient having previously complained only of dyspepsia, constipation, and colic. A case of fæcal accumulation may end with acute symptoms due to conditions which have been alluded to in dealing with the so-called "ileus paralyticus" (page 280). This variety of obstruction is further dealt with on pages 322 and 435.

CHAPTER II.

THE SIGNIFICANCE OF THE LEADING SYMPTOMS.

1. Collapse.—Collapse as an early symptom is seen only in cases of acute obstruction. It is due, not to the abrupt arrest of the movement of the intestinal contents, but to the sudden and severe lesion inflicted upon the intestinal and peritoneal nerves. It has, indeed, nothing to do with the mere obstructing of the alimentary canal.

In a certain exact sense, collapse is not a symptom of intestinal obstruction. The collapse met with is precisely similar to that which attends nearly all acute lesions within the abdomen, all lesions at least which present the common factor of a sudden and severe impression made upon the peritoneal and visceral nerves. The signs of a sudden and painful disturbance within the peritoneal cavity are those of collapse, together with pain and vomiting.

There are pain, profound exhaustion, a distressful anxiety, pallor, a small soft, quick pulse, cold extremities, sweating, shallow respiration and vomiting. These phenomena vary in prominence and intensity, but they are in some degree common to all cases in which there has been a rude and abrupt impression made upon the nerve centres within the abdomen. It may almost be said that all quite acute troubles within the abdomen commence with the same train of symptoms. A student who is well versed in the rigidly formulated signs of abdominal lesions as given in text-books is surprised to be told that until many hours have elapsed it is often impossible to say whether a sudden abdominal crisis is due to the perforation of a vermiform appendix, or to the bursting of a pyo-salpinx, or to the passage of a gall stone, or to the strangulation of a loop of intestine. The twisting of the pedicle of an ovarian cyst has led to symptoms which have been mistaken for

perityphlitis; a sudden peritoneal hæmorrhage has been confused with intestinal obstruction; and the rupture of a hydatid cyst has been diagnosed as a perforation of the intestine. It is quite possible—indeed, quite usual—for these various troubles to present at first symptoms which are common to them all, and which merely indicate that an abrupt and painful impression has been made upon the abdominal nervous system. Often at first there are no differentiating symptoms. There may be features in the past history of the patient which indicate a diagnosis, but in the absence of such evidence the cautious surgeon is simply assured that some sudden emergency has occurred within the peritoneal area, and that he must wait for localising signs before he can offer a diagnosis. To these common phenomena of a crisis within the abdomen Gübler* has applied the convenient term of "peritonism."

Into the physiological processes involved in the production of the symptoms of collapse it is not necessary here to enter. The matter has been 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. There is marked inequality in the distribution of the blood. 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, rapid and empty pulse.

The disturbance is a reflex one, which varies in degree and extent according to the severity of the lesion.

It is said by some that the pulse is rendered slower at the very onset of the strangulation of the bowel, and that an appreciable time elapses before it assumes the familiar rapidity of beat. Clinical evidence as to this point is, however, difficult to obtain. There is hyperæmia of the abdominal organs which tends to increase the difficulties of the snared bowel. Not only is the temperature of the skin reduced, but also the temperature within the rectum. It is therefore assumed by some that there is, in collapse, a reflex disturbance of the heat-regulating centres.

The severity of the initial shock, which is so marked a feature at the onset of acute intestinal obstruction, depends

* Journ. de Thérap., 1877.

upon the suddenness of the strangulation, its rigour, the amount and nature of the gut involved. It is more marked when the small bowel is concerned as compared with the colon, and in the lesser bowel it is the more severe as the stomach is approached. If regard be had for the nerve supply and nerve associations of the different parts of the alimentary canal, this is precisely what would be expected. It is surprising how profound a degree of collapse may attend the snaring of quite a small loop of jejunum, providing that such snaring be abrupt and intense. The amount of bowel implicated must, of course, play an important part, and I have seen intense collapse attend an acute volvulus implicating the whole of the sigmoid flexure. Clinical experience shows, by-the-bye, that the sigmoid flexure possesses—when compared with the rest of the colon—a very susceptible and responsive nervous apparatus. In certain disordered conditions it exhibits quite a high degree of nerve irritability, which throws it into marked contrast with the rest of the somewhat dull and apathetic colon.

I have met with several instances in which quite moderate collapse has attended the strangulation of a voluminous coil of small intestine. When the abdomen has been opened in these cases, it has been a matter of surprise that the patient has not exhibited a more profound degree of shock. This circumstance is, however, explained by the fact that it is difficult to bring about intense and abrupt strangulation in a voluminous coil, and that a coil so snared is likely to undergo somewhat slowly the after-changes which attend upon strangulation. The most profound degrees of collapse which I have noticed have been associated with cases in which a few inches of the jejunum have been abruptly and violently strangulated by a small cord-like band; the patient being at the time of the accident in perfect health.

The collapse at the outset of acute intestinal obstruction will obviously be influenced by the age and general condition of the patient. It is most marked in the young adult who is full of life and vigour at the time of the lesion. In quite old patients it is remarkable how comparatively slight the degree of collapse may often be and how attenuated are its manifestations.

There are, however, certain conditions and states of the individual which appear to modify the effect of shock in a manner which cannot be explained.

I have encountered a case in which an alarming degree

of shock has attended a strangulation of the bowel which proved on operation to be of quite moderate degree, while on the other hand I recall the case of a lady of thirty whose abdomen I opened on the seventh day after the onset of obstruction symptoms, to find a coil of ileum almost cut in two by a cord-like band, and yet whose early symptoms had at no time amounted to what could be called collapse.

In some instances the collapse may be so profound as to resemble the collapse of cholera. The resemblance is especially marked when the case is associated with muscular cramps (usually of the lower limbs) and possibly with some degree of diarrhœa. Not a few cases have been recorded in which acute intestinal obstruction has been without hesitation diagnosed as cholera.

So far allusion has been made only to the initial collapse in acute obstruction of the bowels, and it remains to be mentioned that a condition of collapse of a somewhat different type very usually precedes death in those cases which end fatally. This terminal collapse may mark the close of any case of intestinal obstruction whether it has been acute or chronic in its course.

In an acute case, for example, the collapse which ushers in the clinical manifestations passes away; the pain is more or less entirely relieved by morphia; the vomiting and other phenomena of obstruction remain, yet the patient's pulse has recovered itself. Various medical measures of treatment are employed, and a certain delusive improvement in the patient's state may be claimed. About the fifth or sixth day, however, he passes into an insidious condition of collapse, and on the seventh day he dies. This collapse is identical with that which marks the end of a case of fatal peritonitis, and there is no doubt but that it is due to auto-intoxication, to self-poisoning, and that it merits the term employed by some of "septic collapse."

There is about the patient who is dying of peritonitis or of acute intestinal obstruction every suggestion of a poisoned man. He lies back in bed prostrate, with gaunt cheeks and sunken eyes. His pain has vanished, but some haunting fear has taken its place. The hands, which wander with pathetic restlessness over the bed-clothes, are cold and damp. Beads of sweat stand upon the brow. The tongue is that of a man who is dying of thirst. There is still continued vomiting. The pulse has sunk to an uncountable thread. The breathing is laboured and accompanied with faint sighs and groans, and the countenance is ashen and livid. Such a

picture makes a reality of the metaphor of "the shadow of death."

So far as the aspect of the patient goes, he may be dying from snake-bite or from the poison of cholera. He is, in actual fact, dying of poison derived from his own intestine. The contents of the bowel are loaded with the products of putrefaction and with the toxins of innumerable bacteria. The bowel wall is damaged and can no longer prevent the escape of these potent poisons, and their escape is followed by that collapse which ends in death.

2. **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. Its severity will be measured by the suddenness of the strangulation, the amount of bowel involved, and upon other obvious circumstances. It depends at a somewhat later period, or in the first instance in certain cases, upon the tumultuous, irregular, and futile 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 but 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 for a time 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. 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 general terms, it may be said that the pain in intestinal obstruction is, for the most part, a colicky pain. The patient feels that it concerns the bowel. It appears often "to twist him up." There is a sense of distension or of something dragging at the bowels; there is an abiding impression that if only flatus could be passed the pain would be relieved. Many say that when the pain is severe—for example, during a paroxysm—they feel something moving in the abdomen, and that the movement is always arrested at the same spot.

There is no doubt but that the pain at the onset of an

acute obstruction of the bowels is terrible in its intensity, and may be fitly described as agonising.

In the matter of diagnosis, especial attention must be called to a feature in the character of the pain. 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.

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 which 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 which 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.

With regard to the situation of the pain, as distinguished from tenderness, I would dissent from the statement 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, usually misleading. In the development of human intelligence the

factors upon which an appreciation of position and distance are founded are tolerably well known. 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, no doubt, 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.

In fact, 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 in any way to assist in 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 might be possible for an individual to localise painful sensations in certain segments of the gut; but even such an experience would scarcely allow of pain being localised in one very limited portion of a tube which is many feet in length.

It is possible that a human being with a transparent abdominal wall would in time be able—by a careful watching of the small intestine—to localise pain in definite sections of that bowel.

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, supports this notion.

In both these instances, however, the localisation of the pain is often assisted by an abiding tenderness. In cases of stricture of the colon associated with tenderness the seat of the trouble is very often found to correspond to the spot indicated by the patient. When, however, there is no tender spot to be discovered, abdominal pain is of very little use in defining the site of a stenosed part of the large intestine. Over and over again have surgeons been deceived on this point. In instances of stricture of the colon associated with visible and painful peristaltic movements, the spot where the movements appear to lead to, and at which they are arrested, is often the spot at which the stricture is located. The patient will sometimes declare that he can appreciate that the movement in the intestinal coil is always arrested at the same locality. Even with these additional aids to localisation it is often found that the site indicated by the patient, and considered probable by the surgeon, does not correspond to the actual seat of the disease.

I can remember a case of stenosis of the colon in which there were pain and tenderness in the depths of the right iliac fossa. Visible peristaltic movements were present and appeared to lead to this region. The patient was convinced that the "stoppage" was situated in the cæcal region, but subsequent surgical procedures displayed an epithelioma of the upper part of the rectum.

In cases of acute intestinal obstruction the initial pain is commonly referred to the region of the umbilicus, or to a point in the median line a little above that cicatrix. The initial pain in a strangulated hernia—especially when the sac contains small intestine—is very usually referred to the umbilical region.

The region thus indicated corresponds to the site of the superior mesenteric and solar plexuses, and there is no doubt but that it is to these great nerve centres of the abdomen that the pain is referred.

The initial pain in the first attack of acute perityphlitis is nearly always referred to the umbilical region.

A patient may place his hand over the umbilicus to indicate the exact seat of his pain, and yet the cause of the trouble may be the strangulation of a loop of ileum deep down in the pelvis or in one or other of the iliac fossæ. The early intense pain of acute strangulation is, no doubt, very diffused, and the hand placed over the umbilicus does, perhaps, little more than indicate that the distress is situated in the abdomen.

As time goes on, the seat of the strangulation may be indicated as the site of the pain. This is quite probable if one recalls the gross changes which are taking place in and about the snared bowel, the local peritonitis which is being induced and the tenderness which can scarcely be absent.

I have noticed that in trouble in the descending colon and sigmoid flexure pain is very often referred to a spot just to the left of the umbilicus. This is especially to be noticed when the sigmoid flexure is concerned, and is well marked in cases in which that bowel has long been the seat of catarrhal inflammation.

The spot so emphatically indicated in many of these instances appears to correspond roughly to the inferior mesenteric plexus.

It must also be borne in mind that a painful trouble in one side of the abdomen may lead to pain in the opposite side of that cavity.

For example, instances have been noted in which stone in one kidney has been associated with pain in the opposite and sound organ. I have seen cases of disease of a normally placed vermiform appendix in which all the pain was referred to the left iliac fossa. In one of these instances pressure upon the diseased appendix induced pain, not over the point of pressure, but in the opposite iliac fossa. I have removed an appendix full of pus from a patient whose symptoms were always referred to the left side of the abdomen.

I have alluded elsewhere to a case in which, after cholecystotomy, I was cutting away some redundant gall bladder which had been brought out of the wound. The patient was not anæsthetised, and the operation was only complained of as causing pain at a spot under the left lower ribs.

In intestinal obstruction instances now and then present themselves in which the chief pain complained of is on the opposite side of the abdomen to the seat of the bowel lesion.

3. **Vomiting.**—Vomiting is one of the most common and most marked of the symptoms of intestinal obstruction. It may be considered under three headings:—

(1) The vomiting which appears at the very *commencement* of an acute case is no doubt reflex, and is of precisely the same nature as the vomiting which may follow a wound of the abdomen or a crush of the testicle. Such sickness may be coincident with the initial pain and be one of the very earliest manifestations. The patient is seized with violent pain in the abdomen and at once vomits. Marked

vomiting at the very onset of the attack is most commonly met with in children and young adults. It is obviously modified by the circumstances which influence reflex vomiting, such as the state and nerve peculiarities of the patient, the sensibility of the part of bowel damaged, and the condition of the stomach. Some individuals vomit on the least provocation; others assert that nothing ever makes them sick, and that with them vomiting is unknown. I recall the case of a sensitive girl of twelve whose vermiform appendix I had removed for relapsing perityphlitis. Her attacks had been associated with considerable vomiting, and, as her mother expressed it, "the least thing made her sick." The slight pain caused by the removal of the wound sutures on the tenth day produced a sudden and copious vomiting, which was evidently reflex.

It is needless to say that this initial vomiting is influenced by the amount of food contained in the stomach. If strangulation of the bowel occur immediately after a full meal, it is a matter of almost absolute certainty that vomiting will be prompt, and that the whole viscus will be emptied. If, however, the organ be quite empty at the time of the accident, vomiting may not be among the early manifestations.

(2) The vomiting which marks the *close* of a fatal case of intestinal obstruction may be due to the obstruction itself, but it is very often the vomiting of a rapidly-increasing septicæmia. Such vomiting may continue after the strangulation has been relieved, and even after an artificial opening in the bowel has been made. In such a case the continued sickness is the sickness of peritonitis and the septicæmic condition which is so prominently associated with that affection.

(3) The vomiting which occurs during the *progress* of intestinal obstruction, excluding the initial vomiting in acute cases and the final vomiting in fatal cases, depends for the most part upon the actual obstruction in the lumen of the bowel.

The Character of the Vomit.—The vomiting in intestinal obstruction is characterised by its early onset, its persistence, and its copiousness. At first the contents of the stomach are evacuated. Then the ejected matter is bilious, and may be composed apparently of pure bile. In the next stage—if the case progress—the matter is usually thin and of a brownish colour, or it may be comparable to pea soup or be of a yellow tint like the yolk of egg. The vomited matters soon attain what is called an "intestinal odour." Finally, the matter vomited becomes stercoraceous, which means that it has the odour of fæcal

matter. The term stercoraceous does not imply that the vomited matter is composed of fæces. Fæcal vomiting is a symptom of very doubtful existence, and is only met with in quite peculiar and rare circumstances. I have never met with an example of fæcal vomiting in any case of intestinal obstruction that I have seen. I assume that the term "fæces" is limited to the contents of the lower part of the colon, or possibly to the contents of any part of the colon. The contents of the lower ileum have often the distinct characters of soft fæcal matter in normal circumstances.

It was at one time assumed that in any case of stercoraceous vomiting the obstruction was low down in the colon, and that, as the result of the block in the bowel, the fæcal contents of the gut were returned through the ileo-cæcal valve into the small intestine, and thence into the stomach. This assumption has long since been proved to be without foundation.

Stercoraceous vomit, *i.e.* vomit which has a fæcal odour, is usually met with in obstruction of the small intestine, and is quite uncommon in obstruction of the colon. Stercoraceous vomiting may occur when the obstruction is high up in the jejunum. Indeed, Dr. Pye Smith* describes a case of cancerous stricture in the upper part of the duodenum, in which the vomited matter had "a strong and decidedly fæcal odour." The very existence of such vomiting is used as evidence that any given obstruction is not in the colon.

Stercoraceous vomiting is tested by its odour, and, having regard to the origin of the term stercoraceous, the adjective is suited to the condition it professes to define.

The patient vomits matter that has about it the suggestion of fæces. The odour is, however, not always that of fæces, and certainly not that of healthy fæces. It is intensely offensive, and this offensiveness suggests the term stercoraceous. The colour of this filthy fluid varies. It may be a dirty brown or a dirty yellow, or a yellowish green or a greyish brown. It is always watery. It is like the matter voided in diarrhœa. It never contains scybala or actual fæcal masses or fæcal matter. Lumps with some resemblance to scybala are occasionally seen in the vomit. They are probably masses of coagulated milk stained with bile, and covered with the foul fluid from the bowel.

When the obstruction is in the small intestine, the fæculent character is given to the contents of the bowel by certain decompositions due to the bacteria present. These

* Path. Soc. Trans., 1894, p. 63.

decompositions lead not only to intensely foul-smelling products, but also to intensely poisonous substances. Nothing in the human body can be more foul than the contents of the gut in a case of obstruction of the small intestine. The bowel wall is damaged, its circulatory condition is disturbed, its normal course of peristaltic movement is arrested, its contents cannot escape, the phenomena of normal digestion are wanting, and bacterial growth is rampant. The result is that the fluid contained in the involved bowel becomes foul beyond description, and if it be poured into the stomach and vomited it merits the term stercoraceous.

The colon seems better able to deal with decomposing contents, or such contents are retained by that bowel with less manifold inconvenience. This is what may be expected. The lesser bowel is accustomed to contain food in process of digestion, the colon—or rather the lower part of it—is accustomed to contain fæces and food refuse in process of decomposition. Stercoraceous vomiting is more common and appears earlier in obstruction of the lesser bowel than of the colon.

When the obstruction occupies the duodenum or upper 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 become discoloured and acquire by decomposition an odour which is very offensive and which is often described as "intestinal."

Allusion has just been made to a case of Dr. Pye Smith's, in which vomiting of matter with a fæcal odour occurred with stricture of the duodenum.

The Production of Stercoraceous Vomiting.—The production of stercoraceous vomiting has been the subject of much discussion, not a little of which is utterly superfluous. When it was assumed that stercoraceous vomiting was the vomiting of actual fæcal matter, it was assumed also that it depended upon an obstruction in the colon, and that fæces regurgitated through the ileo-cæcal valve into the small intestine and thence into the stomach. It has, however, now been shown that stercoraceous vomit is not composed of fæces, and, moreover, that this symptom is very much more common in obstruction of the lesser bowel than in occlusion of the colon. Indeed, stercoraceous vomiting is a feature in small-gut obstruction. It is, therefore, no longer necessary to assume that when this symptom exists there is any insufficiency of the ileo-cæcal valve. It is true that this 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 exceedingly uncommon, as is proved by repeated examinations of the parts after death from stricture of the colon. In cases of stricture of the lower colon it is usual to find the whole colon distended with accumulated fæces. The distended gut may become enormous, and so efficient is the valve, in all but the rarest cases, that in many instances death has been due to actual rupture of the over-dilated cæcum. Indeed, it may be said that in slowly-advancing obstruction of the colon the large intestine will burst before the valve will give way.

The actual production of stercoraceous vomiting may be explained in the following manner.

Let it be imagined that the ileum at a certain spot becomes occluded. The function of the bowel is arrested or, at least, grossly disturbed. Fluid accumulates above the obstructed point. It decomposes. If any movement be imparted to the bowel, it cannot serve to force the contents downwards, and it must have the effect of propelling them towards the stomach. If the intestine contracts by virtue of its muscular power, or if increasing distension in adjacent coils causes the bowel to be pressed upon, it can only empty itself in one direction, *i.e.* towards the stomach.

Dr. Brinton, in his well-known monograph, amplifies this explanation in the following way. 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 which is the result of peristalsis in 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 which 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 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. 106). He further pointed out that a series of such pistons passing down the tube one after the other would tend to lengthen indefinitely the upward axial current and render it perfectly continuous.

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.

FIG. 106.

In some cases fæculent vomiting of a more or less undoubted character has been due to a fistulous communication between the colon and the upper part of the small intestine, as occurred in a case reported by Mr. Shaw.*

It is impossible to leave this subject without some reference to the question of *antiperistalsis*, which was at one time accredited with being the 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, little evidence to show that antiperistalsis is 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 stercoraceous vomiting, then would one expect to

* Path. Soc. Trans., vol. iv., p. 147.

find at an operation 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 vomiting during life.

The following series of experiments upon animals, to illustrate the production of peristaltic movement, may be briefly considered.

Nothnagel* showed that the normal intestinal contents provoke movement in the bowel, spreading from the stomach to the anus, but that violent irritants applied to the gut produced movement in the opposite direction. When the intestinal wall was touched with a soda salt or stimulated by a faradic current, a contraction of circular fibres followed, which spread towards the stomach and only feebly towards the anus.

Lüderitz† demonstrated that distension of the gut to the maximum produced paralysis, and rendered the gut incapable of responding to any stimulant—chemical, mechanical, or electrical.

Hess‡ introduced a light rubber ball into the bowel, and watched its movements under various conditions. Movements of contraction began above the ball, and pushed it downwards. If a stimulant, such as a crystal of nitrate of soda, be applied to the bowel above the ball a peristaltic wave spreads towards the stomach, but the ball does not move. A like stimulant applied to the gut below the ball caused a peristaltic wave to spread towards the stomach, and the ball to move upwards. In the passage of a foreign body along the intestine contraction of the gut just above the substance is being continually produced. It is indeed propelled downwards by repeated upward spreading commotions. Hess showed that interference with the circulation of the gut such as followed ligature of a mesenteric artery or the circulation of dyspnœic blood produced peristalsis. The quite empty bowel keeps at rest.

Bokai§ states that the most sensitive part of the intestinal canal is the duodenum and jejunum, the ileum comes next in order, then the rectum, and last of all the colon.

* Zeit. klin. Med., bd. iv., heft. iv., 1882.
† Virchow's Archiv, 1889, bd. 18; and 1890, bd. 122.
‡ Deutsch. Archiv f. klin. Med., 1887.
§ Archiv f. exp. Path. u. Pharm., 1887, bd 23, p. 209.

4. **The State of the Bowels.**—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 in chronic constipation, in great distension of the bowel, or in cases associated with a little peritonitis. 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 the partial enterocele or Richter's hernia, where only a part of the circumference of the bowel is involved in the strangulation.

In cases of acute strangulation it is not infrequent, early in the case, 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 diarrhœa.

It is not uncommon in cases of acute 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.

In intussusception there is a form of diarrhœa, and a spurious diarrhœa may persist for months in a case of stricture low down in the colon. This species of diarrhœa is the outcome of catarrh of the bowel above the place of stenosis.

The diagnostic significance of the altered shape of the motions passed is dealt with in the account of the symptoms of stricture of the bowel (page 394).

5. **The State of the Abdomen.**—Three matters will be considered under this heading, viz. visible peristaltic movements, meteorism, and abdominal tumour.

(i.) VISIBLE PERISTALTIC MOVEMENTS and visible coils of

intestine indicate a long-abiding, partial mechanical obstruction which has led to hypertrophy of the bowel above it. This feature is, therefore, of considerable diagnostic value.

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.

It is indeed in the chronic varieties of intestinal obstruction that this important symptom is seen. It indicates not only that there is a long-abiding obstacle in the lumen of the bowel, but also that that obstacle only partially occludes the intestinal tube.

The bowel becomes hypertrophied in its attempt to force material through the narrowed strait. Its muscular tissue becomes increased as does that of the wall of the left ventricle in stenosis of the aortic orifice.

The hypertrophy of the bowel proceeds but slowly, and some time—certainly many weeks—must elapse before the increase in the intestinal coats can reach a degree sufficient to render the coil conspicuous.

Post-mortem examination shows that in quite chronic cases the hypertrophy can reach a high degree and the wall of the bowel become enormously thickened. The most marked examples of this are afforded by the colon, inasmuch as instances of stenosis of the gut are most common in the lower colon, and are most usually of a chronic type. Stenoses in the lesser intestine are, comparatively speaking, infrequent and follow a less rapid course in the majority of instances.

In a well-marked case the hypertrophied coils can be seen moving beneath the thinned parietes. Sometimes one individual coil—possibly the transverse colon—can be seen to stand up in relief and then subside. When it subsides, it indicates that the muscular tunics of the bowel are contracted; when it becomes prominent, it indicates that those tunics are relaxed, and that the enlarged bowel is occupied by gas. The prominent coil is nearly always tympanitic on percussion.

These movements in the bowel are associated with colicky pain and often with gurgling and bubbling sounds.

In other instances several coils can be seen, but not necessarily at the same time. The movement beneath the

parietes has been compared to that of a snake, but it is a snake that moves slowly and in disconnected segments.

A coil will rise up slowly under the parietes, exhibit some undulatory or twisting movement, and then vanish. Pain is felt when the coil is shrinking or contracting, not when it is becoming prominent or dilated.

When the obstruction in the bowel becomes complete the movements of visible coils cease.

Such movements are not seen in cases of acute obstruction, or only in exceptional instances of that trouble attended with severe colic, and in patients with attenuated parietes.

Certain questions in connection with the position of visibly moving coils are discussed on page 315.

It remains to be asked if the existence of visible intestinal coils in movement beneath the parietes is positive evidence that the bowel is the seat of a partial mechanical obstruction. The answer to this question is that, in the very great majority of the examples, the symptom mentioned is positive evidence of such obstruction. The exceptions are few, and consist mostly of cases in which the patient is emaciated and the abdominal walls are thin. In individuals with very thin and very lax abdominal walls, as seen in emaciated women who may have had several children, the outline of coils of bowel when distended may be defined beneath the parietes, and under the influence of stimuli some feeble movement may be seen in them. It is needless to say that normal coils of bowel can also be seen in faint movement through the attenuated walls of large ventral or umbilical herniæ, but such instances as these can hardly be ranked as exceptions to the rule just quoted.

I have only met with two instances in which visible peristaltic movements were to be seen through normal abdominal walls in patients who exhibited no mechanical obstruction in any part of the intestine. They were both cases of the same type. The patients were females, one was about sixty years of age and had had several children, the other was thirty and unmarried. Both were very thin and intensely neurotic subjects. They suffered from obstinate constipation, with considerable flatulent distension of the abdomen, attended with little pain and with no vomiting. A week would sometimes elapse before the bowels would respond to the measures used to act upon them. Both patients exhibited *bizarre* nervous phenomena of an extreme type, and both were bedridden.

In both cases I made a free exploratory incision, and discovered that the flatulent distension was limited to the

colon, which was not hypertrophied, and that there was no mechanical obstruction of any kind. In one patient I made a minute temporary stoma in the sigmoid flexure to allow gas to escape. It was closed after a few months. Both patients were relieved of their abdominal symptoms. The point of interest is that in these cases coils of intestine in movement were visible, and the movements were attended with some colic.

In dealing with cases of obstruction due to the pressure of a tumour outside the bowel, I have alluded to two instances of obstruction due to retroflexion of the uterus, in which this symptom of visible coils was present, but in a modified condition (page 273).

(ii.) METEORISM.—It was at one time assumed that the distension of the belly which takes place in intestinal obstruction was due to mere accumulation of the intestinal contents and of flatus above the point of obstruction. The flatus—which is the essential factor in meteorism—was stated to be due partly to mere accumulation and partly to an abnormal production of gas as a result of unusual decomposition. It was therefore inferred that the more complete the obstruction the more marked was the tympanites, and that the greatest degree of meteorism was to be met with when the bowel was occluded low down. Indeed, the necessary conclusion followed that the further the obstacle was from the stomach the greater was the degree of meteorism.

Extended clinical experience has, however, shown that this explanation, although containing a large element of truth, is neither satisfactory nor sufficient.

Mere accumulation of the bowel contents is by no means the only factor in the production of meteorism. That symptom is, on the contrary, largely influenced by disturbances of the muscular and nervous apparatus of the bowel, and by disorders in the circulation of the gut.

It is needless to say that advanced meteorism may exist quite independently of any intestinal obstruction. The bowel when paralysed from any cause is in a state of tympanites, and the tympanitic abdomen in peritonitis depends upon no mechanical obstruction.

In not a few cases tympanitic distension of the bowel appears to be largely or solely of nerve origin. There is no doubt but that many examples of so-called "flatulent dyspepsia should be classed with nervous diseases.

A certain phase of this subject has been dealt with in treating upon idiopathic dilatation of the colon (page 242).

The question of the production of meteorism in intestinal obstruction can be further illustrated by certain experiments which have been made upon animals.

The most complete series of experiments in connection with this subject are those made by Kader,* and a summary of the results he obtained will be found on page 13.

Meteorism is most marked and is earliest seen when the colon is obstructed. In no form of intestinal obstruction is meteorism at once more sudden and more severe than in volvulus of the sigmoid flexure.

In occlusion of the upper jejunum the distension of the abdomen may be confined to the region of the stomach. When the small intestines are distended and the colon is empty, the median parts of the belly are protuberant. When the colon is the part distended, its anatomical disposition is often very clearly to be made out through the parietes. It is unsafe, however, to base a diagnosis as to the seat of the obstruction from the apparent situation of distended coils.

This matter is further dealt with on page 315.

The degree of meteorism in any given case varies from time to time. It is not so much reduced by vomiting or even by diarrhœa as may be supposed. It is very often lessened by strychnia administered hypodermically. It is in many instances increased by morphia.

(iii.) An ABDOMINAL TUMOUR may be felt in the following cases:—Intussusception, fæcal accumulation, cancer, certain neoplasms, and in some cases of obstruction by foreign bodies.

A number of coils of small intestine, matted together by adhesions, have formed a species of tumour, and a localised dulness on percussion has been caused by collapsed coils of the lesser bowel which have become grouped together below an obstruction. Such empty coils may occasionally be felt by the finger on a rectal examination, and be mistaken for a solid substance.

6. The **diminished amount of urine** passed in many of the acute cases does not depend upon the seat of the obstruction, as once was urged, but upon its acuteness and the degree of the impression made upon the nervous system. It is rather one of the symptoms of collapse, and varies with the extent of the collapse and the severity of the pain. In these cases a marked increase in the amount of urine passed attends the administration of a full dose of opium.

7. **Indicanuria.**—Indican is met with in the urine in certain forms of intestinal obstruction, and especially in acute obstruction involving the small intestine.

* Deutsch. Zeitschrift für Chirurgie, 1891, p. 57.

Skatol and indol compounds and their allies in the form of aromatic sulphates are stated to be more or less the products of intestinal putrefaction. Dr. Rose Bradford has pointed out that these curious products appear to be excreted by the kidney rather than by the fæces.

Indican belongs to this group, and is in chemical language indoxyl potassic sulphate.

Indican is formed in the alimentary canal from indol, and indicanuria is especially met with in cases attended by intestinal putrefaction.

Indicanuria is found in acute and chronic intestinal obstruction, in peritonitis, and in several other conditions, such as suppuration of the pleural cavity.

Its value as a means of differential diagnosis between obstructions in the colon and in the small intestine is alluded to on page 320.

Indican in the urine can be detected by the following methods:—

To the specimen of urine about one-fourth or one-third of its volume of hydrochloric acid is added, together with some calcium hydrochlorate. The mixture is allowed to stand for twenty-four hours, and then a characteristic blue scum is observed on the surface.

Macmunn's method is as follows:—The urine is boiled with an equal measure of hydrochloric acid and a few drops of nitric acid, is cooled and is then agitated with chloroform. The chloroform is coloured violet if indican be present in any quantity.

In a paper by Mr. Pearce Gould on a case of acute intestinal obstruction, an admirable coloured illustration is given of the test tube effects produced by indican in urine.*

* Trans. Clin. Soc., Lond., vol. xxxi., 1898, p. 47. *See* also Neubauer and Vogel; Analyse des Harns, p. 556, Wiesbaden, 1898; and Alfred Allen; Chemistry of Urine, p. 200, London, 1895.

CHAPTER III.

THE SYMPTOMS AS MODIFIED BY THE POSITION OF THE OBSTRUCTION.

THE matters 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 are not very rigidly marked, and can only be given in broad outline. There are no distinctions which may be considered as absolute and invariable.

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 at once 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 acute obstructions in the other, it will be found that the great bulk of the fancied distinctions entirely disappears. It is usually assumed that obstructions of the colon, when compared with those of the smaller intestine, are apt to present a tardy course, to be associated with comparatively little pain, and with a slighter degree of constitutional disturbance, and to be attended by vomiting which 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 colon and obstructions in the small intestine, the more distinctly is it 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 these reservations have been made, it will be found that there are a few features which may be made a basis for comparison in cases of a fairly equal degree of severity, although even then 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. So far as response to stimuli is concerned, the lesser bowel is shown to be sensitive and irritable.

On the other hand, the function of the large intestine is to a great extent passive. The part it plays in digestion is quite unimportant. It serves as a receptacle for the contents of the bowel, so that long intervals may elapse between the evacuation of these 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 which 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 less elaborate nerve relation and a less extensive area exposed to peritoneal infection.

There is no evidence to show that there is any considerable 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 dissimilar. And in connection with this matter it is noticeable that the form of obstruction of the colon which 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 concerned.

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.

Such comparison as can be made between obstructions of like degree involving the lesser bowel on the one hand and the colon on the other is summed up in the following analysis of the leading symptoms.

Pain.—When the small intestine is concerned, the pain usually appears earlier, is more pronounced, more abiding, and more severe. The localisation of the pain as an element in the differential diagnosis is of very little use.

Vomiting.—In obstruction of the small intestine, as compared with that of 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 stercoraceous than is the case when the stoppage is in the colon. It becomes stercoraceous, on an average, about the fifth day in small-gut obstruction. Vomiting due to trouble in the large intestine may become irregular, may cease for a while, and may be comparatively slight. It tends to appear late, to be scanty, and is rarely stercoraceous until after a considerable interval. In obstruction of the small intestine the vomiting often gives a degree of relief which is not noticed in the vomiting attending the colic obstruction. In any case the relief, if any, is only temporary.

Constitutional Disturbance.—This is, other things being equal, more marked in small-gut obstructions than in those of the colon. There is, in the former, a greater tendency to severe collapse, and consequently a more frequent appearance of the various phenomena connected with shock.

Meteorism.—Meteorism, as expressed by mere distension of the abdomen, is of no diagnostic value in acute obstruction in the way of indicating whether the obstacle be in the small or the large intestine.

Speaking in general terms, it may be said that in acute

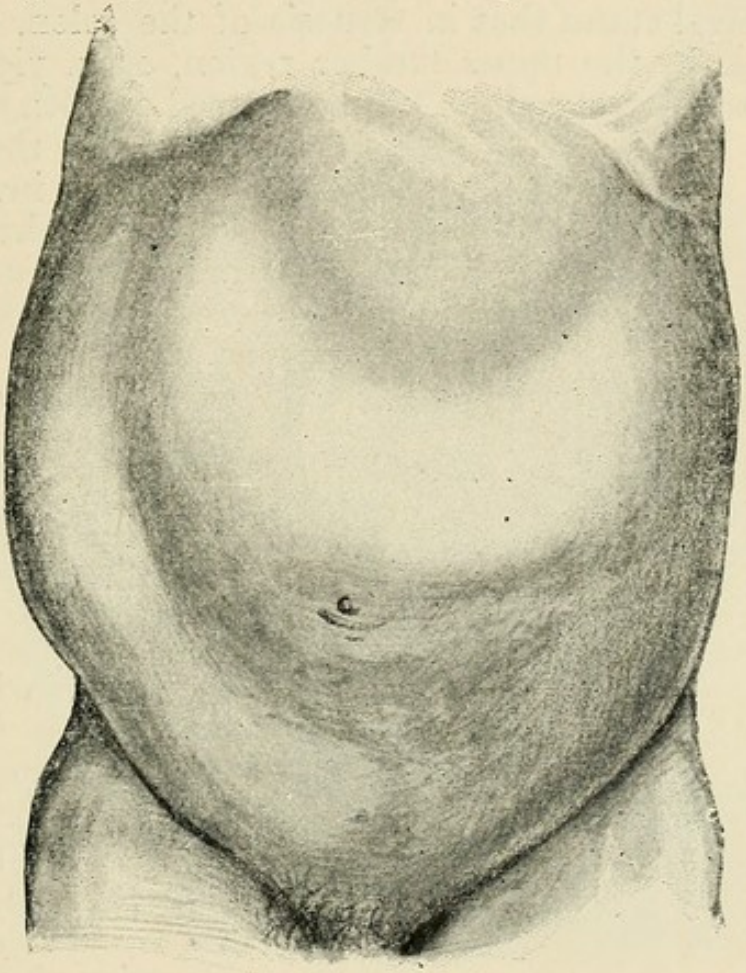


FIG. 107.—Dilatation of the Colon above a Stricture of the Splenic Flexure. (*After Nothnagel.*)

obstruction the distension is less when the lesser bowel is involved than it is when the colon is concerned.

In chronic obstruction also, the highest degree of distension of the belly is met with in examples of stenosis in the lower parts of the colon.

When the lower part of the small intestine is obstructed, the meteorism first shows itself, and remains for a while 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.

The distended sigmoid flexure may stretch across the

whole abdomen, from the left iliac fossa to the right lobe of the liver.

In the matter of the rapidity with which meteorism may advance, the most striking example is afforded by volvulus of the sigmoid flexure.

Nothnagel states that in stenosis of the colon, percussion of the back, in the upper lumbar region, often yields a loud deep tympanitic note which will be noticed on both sides of the body if the sigmoid flexure be involved, and on the right side only if the obstruction be in the transverse colon. Percussion in these regions in normal subjects produces a more or less dull note.

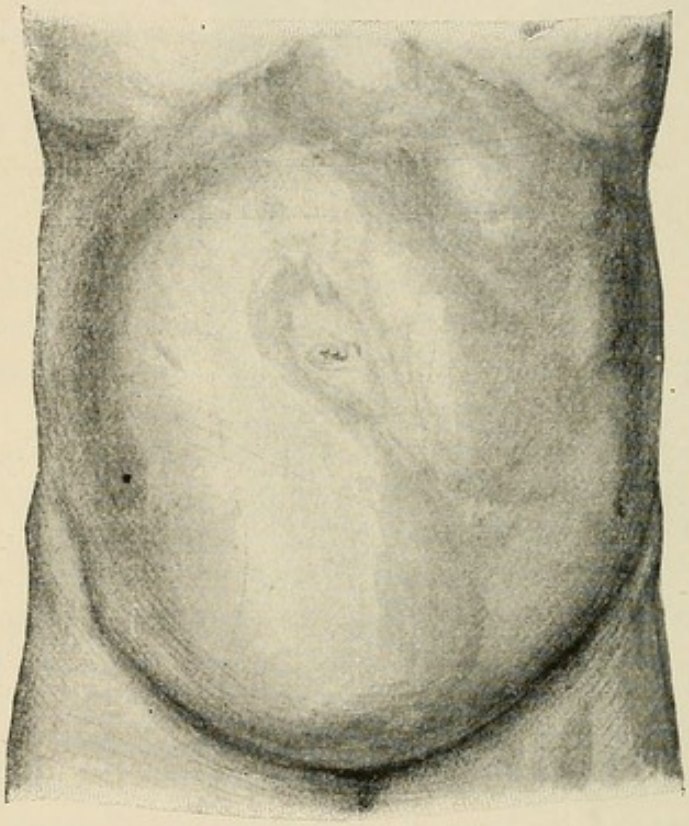


FIG. 108.—Dilatation of the Sigmoid Flexure above a Stricture at the lower end of the Flexure.

Much has been written about the diagnostic value of distension of the flanks in indicating whether the obstruction is situated in the colon or in the lesser bowel. In acute obstruction this symptom is of no diagnostic value whatever. In chronic obstruction it is of very little practical use. If there be an obstruction in the large intestine so that either the ascending or the descending colon, or both, are sufficiently dilated to distend the flank, then the distended and hypertrophied coils will be so far evident that the symptom apparent in the flank is *per se* of no significance.

I have seen the flanks distended in a case in which the obstruction concerned the ileum and Nothnagel mentions an instance in which distension of the flanks, and fulness of the upper part of the abdomen were met with in a case of stenosis of the jejunum.

The fulness of the flanks is, moreover, much influenced by the posture of the body, by the amount of fat in the tissues, and by the firmness of the muscles on the one hand, or their laxity on the other.

Visible Coils of Intestine.—In cases of chronic obstruction it is usual, after a while, for the hypertrophied bowel above the stenosis to become visible through the probably attenuated parietes, and to be, moreover, seen in movement.

It is obvious that much importance must attach to the

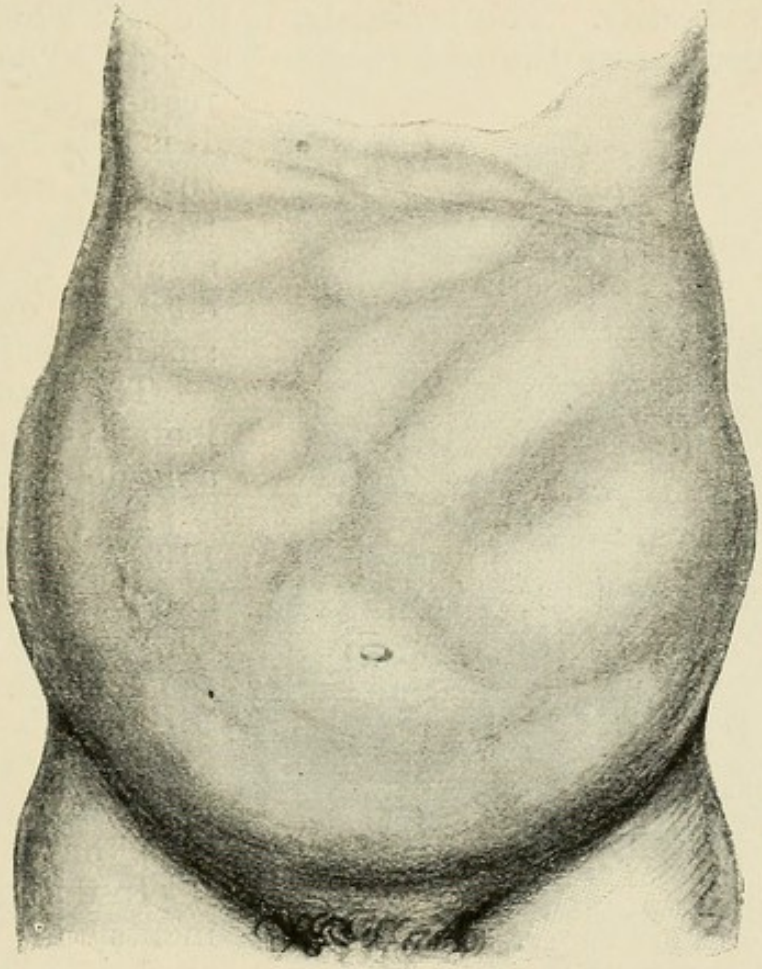


FIG. 109.—Dilatation of the Colon and small Intestine above a Stricture of the Sigmoid Flexure.

recognition of the visible coil when the question of the locality of the obstruction arises.

It is not so easy to identify these dilated coils as may be supposed.

The dilated loops are more often segments of the colon than of the small intestine.

The small intestine above an obstruction may become enormously increased in size, but coils which can be appropriately called gigantic are probably always portions of the colon.

Now and then, the degree of mobility of the dilated coil may be of service in defining its locality.

The best rule in attempting to identify a particular loop of bowel, when seen through the parietes, is to ascribe it to that part of the intestinal canal which would normally occupy

the position of the loop under notice. The distended coil, which is most readily recognised, is the transverse colon (*see* Fig. 107). When of large size, its curved outline is very characteristic.

The sigmoid flexure also may form a loop which is not difficult to identify. This especially is the case when the loop has extended across the abdomen to the right hypochondriac region (*see* Fig. 108). It is to be remembered that the much dilated transverse colon or sigmoid flexure may entirely overlie the small intestines.

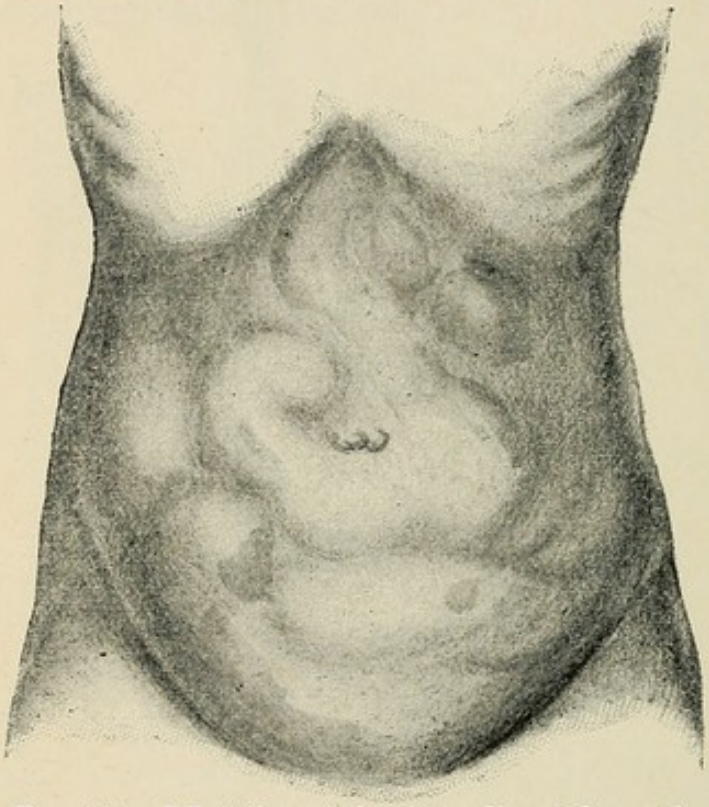


FIG. 110.—Dilatation of the Ascending Colon and Ileum above a Stricture at the Hepatic Flexure of the Colon. (*After Nothnagel.*)

The distended colic loop is often considerably deformed.

In Figs. 109 and 110 are shown examples of distension of both the colon and the ileum, and in Fig. 111 is shown an example of visible coils belonging to the lesser bowel only.

In watching movements in the distended coils, it will be noticed that peristaltic movements are slower in the colon than in the small intestine.

The movements in a dilated and hypertrophied stomach are, when once seen, readily recognised from like movements in dilated intestines. The peristaltic waves which pass over the enlarged stomach are more or less limited to the left hypochondrium, and have always appeared to me to pass somewhat obliquely downwards and to the left.

In a well-marked case of movement in the wall of a hypertrophied and dilated stomach the following appearance is presented. A globular swelling emerges from under the left ribs and moves slowly, like a wave, from left to right. Its course is a little oblique in a downward direction. It finally vanishes under the right ribs, becoming less prominent and flatter before it disappears. When in the middle of its course, it may appear as a well-rounded globular, swelling the size of

a fœtal head, with a groove in front of it and another behind it. Before one wave has vanished on the right side another swelling comes into view from under the left ribs.

If the pylorus be depressed downwards, the movement of the wave is still more and more oblique, and the right ribs are not reached.

In one case under my observation the movement of the wave appeared to be from right to left, an appearance which was no doubt illusory.

Fig. 112 shows the "organ-pipe" arrangement of the small intestine, which, according to Nothnagel, is only met with in cases of extensive peritoneal adhesions. I have only seen it in association with old tuberculous peritonitis.

Some diagnostic value may attach to the recognition of the point where peristaltic movement ends among the coils, which are visible through the parietes.

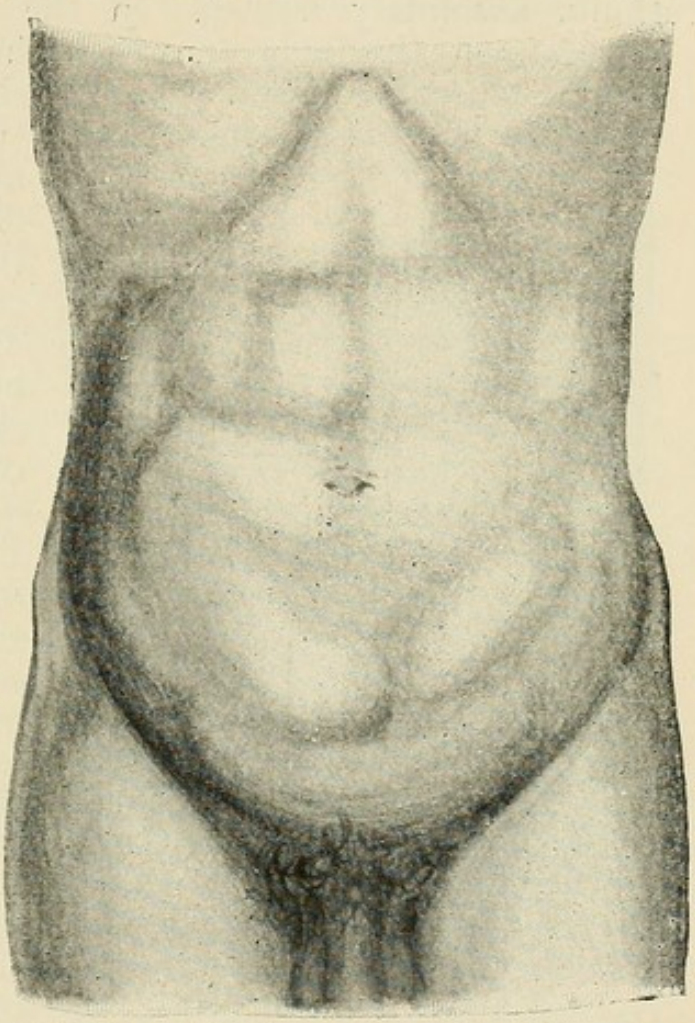


Fig. 111.—Dilatation of Coils of small Intestine above an Obstruction in the lower Ileum.

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. The rectum may be contracted or filled with fæces or ballooned. 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.*

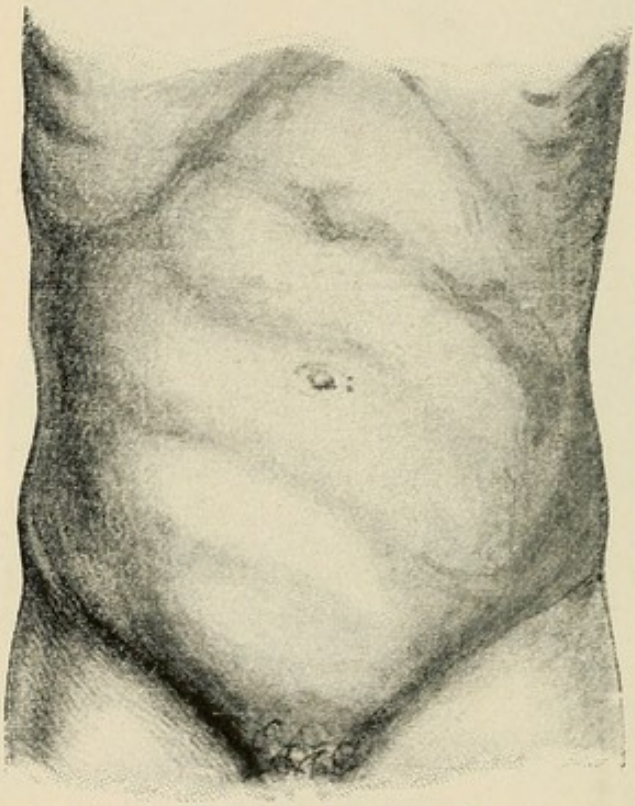


Fig. 112.—Dilated Coils of small Intestine. "Organ-pipe" arrangement. (*From a case of chronic tuberculous peritonitis with adhesions.*)

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

* Path. Soc. Trans., vol. vii., p. 207.

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 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 I have 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 by an extensive mesocolon. Such is occasionally the length of this mesocolon that the summit of the omega loop can be made to touch the cæcum, to reach the level of the umbilicus, or even to touch the gall bladder. 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 none of the many experiments I made upon the dead body could I make the long tube pass beyond the loop of 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 forced 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.

Auscultation of the Colon.—This method of investigating the intestine was considered at one time to be of value in diagnosis.

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. It was stated that 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, conclusive evidence is afforded that the obstruction, wherever it may be placed, is at least not in the large intestine.

I made a somewhat extensive inquiry into this method of diagnosis, and carried out experiments upon the dead body, and made numerous investigations in cases of actual obstruction. At first I was disposed to think the measure of service in determining the seat of the obstruction, but further experience convinced me that auscultation of the colon in cases of intestinal obstruction was absolutely valueless as a means of diagnosis.

Indican in the Urine.—When obstruction concerns the small intestine, then there is a very marked excretion of indican by the urine. Indeed, indicanuria is a pronounced symptom of an obstruction so placed. Jaffe says that in small-gut obstruction indican in considerable amount will be found in the urine as early as the second or third day. Nothnagel states that if no indican can be found in the urine, the obstruction cannot be in the small intestine, the case being assumed to be acute.

Indicanuria is met with in peritonitis, and it also occurs in stenoses of the colon (especially in the cancerous forms) when the obstruction has lasted for a long time.

The value of indicanuria as a diagnostic symptom has not yet been fully demonstrated. It is said to be met with in many wasting diseases, and Dr. Rose Bradford selects cancer of the rectum as a disease affording a good example of the symptom. It is allowed by most writers, however, that—as regards obstruction—indicanuria is most marked when the lesser bowel is involved. (*See* also page 309.)

Indicanuria is, therefore, of no diagnostic value if acute peritonitis be present, or if the obstruction have been of long duration.

CHAPTER IV.

THE DIAGNOSIS OF THE DIFFERENT FORMS OF INTESTINAL OBSTRUCTION.

THE FIRST STEP IN THE DIAGNOSIS.—Having dealt with certain general matters in connection with the symptoms of intestinal obstruction, it now becomes necessary to deal with the particular clinical features of the different varieties of this trouble.

Let it be assumed that the surgeon has brought before him a case of intestinal obstruction.

He can have no difficulty in at once deciding whether the case is (A) acute or (B) chronic, or (C) whether it is a chronic case which has developed acute symptoms.

An outline of the symptoms of these three types of obstruction has already been given on page 285.

After this elementary point has been disposed of, a simple method of classification will soon bring the case into its proper category.

A.—**The Case is Acute.**—It will probably belong to one of the four varieties enumerated below:—

1. Strangulation by bands or through apertures.
2. Volvulus of the sigmoid flexure.
3. Acute intussusception.
4. Acute obstruction by gall stones or foreign bodies.

For internal herniæ *see* page 102.

The morbid anatomy of these four forms of intestinal obstruction is dealt with on pages 24, 126, 141, and 185.

The clinical manifestations of certain rare and anomalous forms of obstruction due to bands are described on page 75.

Owing to the difficulty of classifying internal herniæ clinically, the symptoms of all forms of that condition are discussed on page 102.

Volvulus of the sigmoid flexure represents the only common form of volvulus.

The rarer forms of volvulus are described on page 133.

It is obviously undesirable to complicate the clinical classification of intestinal obstruction by the introduction under separate headings of forms which are quite rare and often merely curious.

Some cases of intestinal obstruction, which are usually chronic, may, in rare instances, follow an acute course. See, for example, the cases of stricture of the ileum reported on page 401.

B.—**The Case is Chronic.**—The trouble may be due to one of the four varieties enumerated below:—

1. Stenosis of the small intestine.
2. Stenosis of the colon.
3. Chronic intussusception.
4. Fæcal accumulation.

The morbid anatomy of these four forms is dealt with on pages 141, 202 and 275.

Under the term stenosis are included all varieties of stricture, and the many conditions in which the lumen of the bowel is partly occluded by adhesions (page 85), by matting of coils together (page 90), by compression from without (page 88), by bending (page 98), by obstructing substances (page 194), or by new growths (pages 259 and 269). *See* also some forms of hernia (page 102).

C.—**The Case has been Chronic and has developed Acute Symptoms.**—The cases which come under this heading are cases of chronic obstruction in which the symptoms of that variety are present, but in which the already narrowed bowel becomes suddenly occluded and acute symptoms are produced. This variety is best illustrated by a stricture of the colon, in which the narrowed part of the gut becomes suddenly occluded by bending or kinking of the bowel, or by the blocking of its lumen by a foreign body which has been swallowed, or by a mass of undigested food. Similar acute phenomena may supervene in any case of chronic obstruction.

CHAPTER V.

ACUTE INTESTINAL OBSTRUCTION.

General Description of a Case.—**Onset.**—The onset is sudden and abrupt.

Pain.—The patient is seized, more or less suddenly, with acute pain in the abdomen. This pain may be very intense, may cause the patient to be "doubled up," or even to roll on the floor. It is relieved by pressure. The pain is like that of colic somewhat. It is often described as a "tearing" pain. It is continuous, but with exacerbations. It does not, however, intermit at any time, nor are there any intervals of calm between definite paroxysms. The patient often feels that if he could pass flatus, or a motion, the pain would be relieved.

With this violent pain is associated more or less collapse. This may be profound, and may imitate the collapse of cholera. The patient appears to be suddenly struck down by a calamitous disease. In almost every case there are profound exhaustion with pallor and faintness, and an expression of intense anxiety and distress.

In the majority of cases the pain is referred to the immediate vicinity of the umbilicus. In only a few instances may it be relied upon to correspond to the seat of the obstruction. The pain at the umbilicus is usually, no doubt, a referred pain, the site being the mesenteric plexus (page 296). The localisation of the pain is often very misleading, as the following examples will show:—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 ligament,† while in another the strangulation was deep in

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

† Path. Soc. Trans., vol. xii., p. 103.

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.‡

It may be said, then, that the position of the pain in acute 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, or with the septicæmia with which these cases terminate.

There is more or less direct connection between the intensity of the pain and the severity of the other symptoms.

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

Mr. Marsh‖ reports the case of a boy who was attacked

* Union Médicale, 1860, p. 97.
† *Brit. Med. Journ.*, vol. i., 1883, p. 999.
‡ Bull. de la. Soc. Anat., 1843.
§ *Medical Times and Gazette*, vol. ii., 1877, p. 482.
‖ *Lancet*, vol. i., 1893, p. 588.

with sickness after eating some unripe fruit. The sickness abated, but on the sixth day it returned and became "fæcal." There was but little abdominal distension, and no action of the bowels. Laparotomy was performed, and a strangulation by a band discovered and removed. The patient recovered. Throughout the whole period of the case the boy had but very trifling pain.

Among fifty well-recorded cases of strangulation by a band, I found eight in which the pain was described as intermittent.

The circumstances of these eight examples are worthy of brief notice.

1. Female, aged fifty-three. 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 twenty-three. 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 twenty-six. 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.‡

4. Female, aged twenty-one. 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 forty-two. In this case, alluded to later, there was, besides the incarceration, a stricture of the intestine, to which the paroxysmal pain was probably to no small degree due. (*See* page 336.)

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

7. Female, aged twenty-six. Mr. Bryant's case of band arising from the bladder. Each paroxysm was attended with strangury, and the "play" allowed to the band by its mobile point of attachment probably prevented the obstruction from being very complete. (*See* page 337.)

8. Female, aged forty-five. 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 obstruction of the bowel was not so complete as it may have been, nor so perfect as it commonly is.

Vomiting.—Vomiting is a conspicuous, constant, and most distressing symptom. In an isolated case or so, it has been the earliest symptom of the obstruction. In the great

* *Brit. Med. Journ.*, 1883, p. 999.

† St. Bart.'s Hosp. Reports, vol. xvii., p. 277.

‡ Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 632.

§ Ibid., p. 564.

‖ Sur le Diagnostic et Traitement des Étranglement Internes. Thèse de Paris, 1870.

¶ *Lancet*, vol. ii., 1873, p. 773.

majority of cases, it comes on immediately after the appearance of the pain, or within a few hours after that event. I have met with instances where the vomiting did not appear until twenty-four hours after the onset of the pain.*

As regards its character, the ejected material consists, first, of the contents of the stomach, and then usually of bilious matters, being of a dirty green. 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. 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, and occurs, indeed, in between 50 and 60 per cent. of the examples.

The period in the attack at which the vomit assumes a stercoraceous character varies from the second to the ninth day. An average taken from a large number of cases gives the fifth day as the mean. The cases in which the vomited matter does not become stercoraceous are represented by those in which death occurs at an early period, or by those in which the progress of the case is less acute than usual.

An example of the vomiting of blood is provided by Dr. J. Cockle. It was in a case of acute strangulation of the lower ileum by a diverticulum. The patient lived only two and a half days. The vomited matter was never stercoraceous.‡

Very rarely the vomited matter contains blood.

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 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. The amount ejected at a time varies. It may be very copious, especially at first. Later, it may amount to a mere mouthful each time.

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

* *See* cases by Dr. Hilton Fagge; Guy's Hosp. Reports, vol. xiv.; and Dr. Boeckel; Bull et Mém. de la Soc. de Chir., tome vi., 1880, p. 339.

† The whole subject of stercoraceous vomiting is considered on page 300.

‡ *Brit. Med. Journ.*, vol. ii., 1882, p. 785.

before death, just as the pain may abate in 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 also sometimes observed 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-fæculent for a while. 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 fæculent. 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 fæculent, except on one occasion.*

In this and like cases it is evident 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, presumably by the paralysing effect it has upon the intestine, seems to have some influence upon the production of stercoraceous vomiting. When acute peritonitis sets in early, there is certainly much less tendency for the ejected matter to become stercoraceous. In some cases this has been very marked.

In nearly every instance the act of vomiting is associated with much retching and distress.

Constipation.—Constipation is, as a rule, absolute from the first, and continuous. Neither fæcal matter nor flatus is passed after the onset of the attack. It would seem as if the bowel below the seat of the obstruction became

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

instantaneously paralysed, since it cannot be assumed that in every case the colon is quite empty at the time that the strangulation occurs. A special exception to this rule is afforded by acute intussusception, in which there is a peculiar type of diarrhœa.

In the other varieties of acute obstruction there are very few exceptions to the condition of absolute constipation.

In a few instances a motion has been passed during or immediately after the occurrence of the initial symptoms, having been 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 now and then such scybala come away repeatedly. Flatus generated in the large intestine may also be passed, but the circumstance is quite exceptional.

I have met with a few recorded instances, in cases other than intussusception, where blood is said to have been passed. In one case, in a man aged fifty-three, 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 another case (the case by Mr. Berkeley Hill, alluded to on page 327) 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. Nothnagel† mentions a case in which some 80 cm. of the lower ileum were strangulated beneath a tight band connected with the vermiform appendix. The patient was a woman of fifty, and enemata are stated to have been returned stained with blood.

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.

The passage of blood from the bowel is a conspicuous feature in acute intussusception.

A more or less copious motion may be passed just before death or in the act of dying. In most of the examples of this occurrence the stool is derived from the bowel below the obstruction, subsequent post-mortem examination having shown that the occlusion of the intestine is absolute. In a few instances the unusual motion may have come from the

* Dr. Fincham; *Med. Times and Gazette*, vol. ii., 1876, p. 651.
† Die Erkrankungen des Darmes, Wien, 1896, p. 337.

bowel above the obstruction, as the following examples will show:—

In one case, in a man aged twenty-one, the disease 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 another 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 a band. The mechanism of the relief was probably the same in this case as in the preceding.†

In two other 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. 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.§

Most rarely of all there are on record a few examples of acute intestinal obstruction (other than intussusception) in which there has been some diarrhœa.

These cases have been for the most part attended by a cholera-like collapse. The condition has been described by Malgaigne as "cholera herniaire." The subject is considered under the heading of "cholera" in the chapter on the general diagnosis of intestinal obstruction (page 444).

Constitutional Symptoms.—An initial *rigor* is exceedingly rare. In one example‖ of strangulation the patient had several rigors, but in this case a circumscribed peritonitis was developing at the time of the onset of the obstruction, and was probably the cause of the shivering attacks.

Collapse is one of the earliest symptoms, and may be profound or even fatal. Patients attacked with acute intestinal obstruction have been found lying insensible upon the

* Dr. Hilton Fagge; Guy's Hospital Reports, vol. xiv., p. 272.

† Bull. de la Soc. Anat. de Paris, 1861, p. 118; by M. Brichetau.

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

§ Dr. Kernot; Path. Soc. Trans., vol. xv., p. 101.

‖ M. Terrier; Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 564.

floor of their bedrooms, having dropped to the ground as they were stepping out of bed. Among the histories of acute cases are instances in which the subject of severe obstruction has been found lying in a water-closet, cold, collapsed, and almost senseless. I can recall a case in which the patient was seized with very acute strangulation while in his study late at night. The servants had retired, and he was unable to summon aid. In the morning he was found upon the floor, cold and insensible, with evidences of copious vomiting. He seems to have dropped on the ground on his way to the door. The case was rapidly fatal.

Collapse of an extreme degree when associated with some history of looseness of the bowels may give rise to a suspicion of cholera, especially if cholera is prevalent at the time. This matter is alluded to in the chapter on the general diagnosis of intestinal obstruction (page 444).

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, monotonous, and muffled. A cold sweat breaks out upon the surface, and in those extreme cases which may be mistaken for cholera, the limbs become cyanosed and the complexion livid. The lips are bluish-red.

The patient is the subject of a piteous restlessness, turning his head petulantly from side to side, and keeping his hands engaged in an almost constant purposeless movement. The patient usually dies with those manifestations of general septic poisoning which mark the termination of fatal peritonitis. The intelligence is, as a rule, retained to the last.

The *pulse* is small, rapid, soft, and thready, and varies with the general condition. It is usually improved up to a certain point by opium.

The *temperature* is, as a rule, subnormal throughout. The onset of peritonitis will commonly not affect it, but now and then there may be a feeble reaction, and the temperature may reach to 99° or 100°. Such examples are not common. With perforation the temperature is that of profound collapse.

The *respirations* are superficial and thoracic. Should the abdomen become much distended the breathing may be embarrassed.

The *tongue* is usually coated, being at first white, then dry and brown.

The mouth is parched, and a very offensive taste is complained of.

Intense *thirst* is usually a prominent and distressing symptom. It is most marked in instances associated with profuse vomiting, and in those attended by peritonitis.

Obstinate and distressing *hiccough* is occasionally a prominent feature. It is rare.

The *quantity of urine* is very commonly diminished, and in the most acute cases may be entirely suppressed, the bladder being found empty. As has been noted, the effect of internal strangulation upon the renal excretion is brought about mainly through the nervous system (*see* page 308). 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.

A considerable increase in the amount of indican excreted from the kidney is a feature of acute intestinal obstruction when it involves the small intestine. (*See* pages 308 and 320).

Strangury is very rarely noticed. In one instance in which this symptom occurred the obstructing band was attached to the bladder. In another 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.

Tenesmus is practically unknown in the acute cases, with the notable exception of intussusception. In intussusception tenesmus is a prominent symptom.

In some 6 per cent. of the cases of acute strangulation *cramps* are complained of. 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

* Bull. et Mém. de la Soc. de Chir. de Paris, vol. ii., 1867, p. 698.

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.

The Condition of the Abdomen.—The abdominal walls in most instances remain flaccid, or in their normal condition until such time as local or general peritonitis sets in, or distension reaches a considerable degree. Even in some cases where peritonitis was found after death the parietes have retained their normal suppleness to the end.

In certain very acute cases both of strangulation by bands and of intussusception, the abdominal walls have been found retracted or sunken in or drawn in at the onset of the attack. Most of the examples of this condition have been afforded by very rigorous strangulation of a loop of small intestine.

Meteorism.—Distension of the abdomen is in most varieties of this form of obstruction comparatively slight. It usually appears about the third day. It seems to be least marked in the rapid cases, and especially in cases attended by extreme vomiting.

In acute intussusception meteorism is usually absent, especially in the early stages of the trouble.

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. It soon becomes more or less general, and the abdomen becomes cask-shaped.

A special exception must be made of volvulus of the sigmoid flexure, in which meteorism is early, is pronounced, and is often at first definitely localised.

The question of any tumour or area of limited dulness within the abdomen is discussed under the separate headings.

Under these headings is also considered the uncommon appearance of visible coils of intestine seen through the parietes.

Local tenderness, 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 trifling, or not sufficiently marked to attract 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 some diagnostic value, since it appears to be restricted to the actual seat of the lesion. It depends, no doubt, upon congestion or inflammation of the involved coils, or upon some peritonitis excited in their serous coat. As a factor in diagnosis, therefore, it is of more value than is the spontaneous pain observed in these maladies.

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

1. 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 obstructions that come under this heading form collectively more than one-fourth of all the varieties of intestinal obstruction.

Certain anomalous forms of obstruction due to isolated bands and adhesions are dealt with on page 75, where their clinical features are also considered.

Internal herniæ are considered on page 102.

The clinical phenomena in the ordinary cases are identical with those just described as characteristic of acute intestinal obstruction. The leading features are, indeed, those of an acutely strangulated hernia. They may be summarised as follows:—

History.—Age.—The patients are mostly young adults. 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. Perityphlitis falls with greatest frequency between the ages of ten and thirty. Pelvic peritonitis occurs, with comparatively few exceptions, during the period of child-bearing, and as a rule early in that period. 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 hernia is common, and perhaps at no other period of life are

injuries of a severe character more frequent, or abdominal operations more common.

Many cases, however, are met with after forty.* Forms of peritonitis which may be recovered from, and which lead to adhesions, may occur after that age, and, moreover, strangulation of the bowel may not occur for many years after the peritonitis, which 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 "band" in young children, the strangulating agent was probably of congenital origin and due to developmental defects.

Strangulation by means of the true diverticulum, occurs most frequently during the twenty years between ten and thirty. Of the two decades the latter presents the greater number of cases. Leichtenstern found the average age in seventy cases to be twenty-five years. He notes eight cases between the ages of two and ten years, and Trier has recorded a case in an infant of eight months.† Above the age of forty, strangulations due to the diverticulum are rare.

Sex.—This form of obstruction is a little more common in males than in females. While pelvic peritonitis is more frequent in females, perityphlitis is a little more common in males. It is curious that strangulation by Meckel's diverticulum is more often met with in male subjects.

Previous History.—Out of fifty fully recorded cases 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.

Lucas-Championnière‡ records five cases in which obstruction symptoms developed a few days after operation. One

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

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

‡ Revue de Chirurgie, 1892, p. 264

operation was for the removal of an ovarian tumour and four were operations upon hernia.

Franklin* details the case of a patient who developed symptoms of acute intestinal obstruction four days after he had received a severe blow upon the abdomen. The obstruction was found to be due to a band of recent lymph.

Harrison Cripps† has published a case in which acute intestinal obstruction due to adhesions set in eighteen days after the removal of a large tumour of the broad ligament.

In several reported cases weeks or months have elapsed between the obstruction of the bowel and the time at which the cause of the strangulation was probably developed. The longest interval of this kind with which I am acquainted concerned a female of fifty-two who died of strangulation of the ileum due to a band which was connected with the pelvic peritoneum. Twenty-one years before her death she had had "inflammation of the womb" following labour.‡

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

Some of the patients among the above-mentioned series of fifty cases 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 dependent upon the cause that ultimately brought about the obstruction.

As an example of such a case may be given one reported by Dr. J. T. Fox§ of strangulation beneath a Meckel's diverticulum in a boy aged five, who had had previous attacks of "stomach-ache."

In 12 per cent. of my collected cases 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

* *Lancet*, 1893, vol. i., p. 273.
† *Brit. Med. Journ.*, 1894, vol. ii., p. 1103.
‡ Guy's Hospital Reports, vol. xiv., p. 272.
§ Path. Soc. Trans., 1898, p. 103.

three. In some examples these previous attacks had been very severe. There is little doubt but that in not a few instances the repeated attacks of obstruction were really outbreaks of relapsing perityphlitis. Mr. Gay has given details of a case of a man aged forty-two 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.*

Onset.—In 70 per cent. of the cases the onset of the attack is more or less distinctly sudden.

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 which 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 aperients.

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. Now and then it has 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 which 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. 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 has come on after the administration of a purge. In a case reported by Dr. Hector Mackenzie† the strangulation symptoms appeared after the patient had taken one drachm and a half of oil

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

† Ibid., 1890, p. 27.

of male fern. 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 a 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 which 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 it. 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.*

Pain.—Pain appears early, is very severe and persistent, and is mostly located about the umbilicus. It is of the nature of a griping pain, and is continuous with exacerbations.

Vomiting.—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.—Constipation is continuous and absolute from the first. Enemata may evacuate the contents of the colon. There is no discharge of blood from the rectum.

Constitutional Symptoms.—*Collapse* is marked and the prostration is often profound. The condition of the *pulse*, the *temperature*, the *respirations*, and the *tongue* has already been detailed (page 329). There is often intense *thirst*, as already mentioned, and noteworthy diminution in the *quantity of urine* excreted (page 331). *Tenesmus* is absent.

The Condition of the Abdomen.—The *abdominal parietes* are flaccid, unless peritonitis has set in.

Meteorism is slight. It appears usually about the third day, and in most cases involves first the epigastric and umbilical regions.

Local tenderness of the abdomen is absent, at least at first.

Tumours or localised districts of dulness caused by the distended and strangled loops are extremely rare, and are, in any case, very indefinite.

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

Coils of intestine are not visible, except in the very rarest of instances.

In fact, a careful examination of the abdomen by palpation in these cases usually reveals nothing, and a digital examination of the rectum gives equally negative results.

There are, however, some few exceptions to these statements. (1) Some local dulness 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 dulness 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 which 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 dulness 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 dulness 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 dulness on percussion*, and (2) *a tumour felt through the parietes.*—Out of fifty recorded cases, I find only six examples of the first phenomenon and four of the second. With one exception, the dulness was localised in the right iliac region, the rest of the abdomen being tympanitic. In every instance it corresponded to the site of some little tenderness on pressure. In one case, it was due to the matting together of the ileum and cæcum by adhesions, and might have depended upon still existing perityphlitis. 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 dulness was just to the right of

the right rectus muscle. It was caused by a loop of strangulated jejunum.

The tumour detected through the parietes 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 a 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.

(3) *A tumour felt through the rectum.*—Although extensive coils of empty and flaccid intestine are often found hanging inertly into the pelvis, it is seldom that they have been felt during life. Such coils, when they are capable of being appreciated by the finger, present as a soft doughy roundish mass which can be felt through the anterior wall of the rectum.

This mass has been the subject of no little confusion, and has led to not a few unsound diagnoses.

In only three cases out of the fifty just alluded to 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 was 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.

2. Volvulus of the Sigmoid Flexure.—This is the only common variety of volvulus. Other varieties of volvulus are dealt with on page 133. Volvulus of the sigmoid flexure forms about one-fortieth part of all cases of intestinal obstruction.

History.—*Sex ; Age.*—Volvulus of the sigmoid flexure is more common in males than females in the proportion of 4 to 1. It is very rare before thirty. The patients' ages are usually between forty and sixty.

Previous history.—In nearly every case there is a history of previous constipation. In many instances the constipation has been very obstinate for years. Some of the patients have been the subjects of occasional attacks of diarrhœa. Some particularly indigestible food may have been swallowed. There is often a history of colic, which is relieved by placing the body in a certain posture.

Onset.—The mode of onset is usually sudden.

Pain.—Pain appears early, is a marked symptom, is severe, but not usually so severe as in the previous form, and is commonly intermittent at first. 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.

Vomiting.—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. It may be absent. There has been quite insignificant vomiting in patients who have died as early as forty-eight hours from the onset of the attack, on the one hand, or have lived for a week or ten days after the commencement. The vomited matters are at first alimentary, and then bilious. Very rarely are they stercoraceous. Indeed, stercoraceous vomiting occurs in only 15 per cent. of the cases, setting in (when it does occur) about the fourth or fifth day. In some cases the vomiting abates considerably, or is 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—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 which 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. There is, as a rule, no discharge of blood from the rectum.

Constitutional Symptoms.—*Collapse* is not so marked as in the previous class of case. Its degree depends to a great extent upon the suddenness of the onset, the severity of the twist, and the amount of bowel involved. In the most acute cases the patient dies collapsed within forty-eight hours.

The *pulse* has no special feature, and is apt soon to 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. Thus Dr. Mayo* quotes a case in which the temperature was 100 on the evening of the third day. 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 which depends mainly upon the great and often abrupt distension of the abdomen. Dyspnœa is in many cases a marked feature, and a great sense of suffocation and of discomfort about the thorax has 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

* Annals of Surgery, 1893, p. 28.

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 the 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.

The question of the increase of indican in the urine is alluded to on pages 308 and 320.

In only one case within my knowledge does *strangury* 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. It may be expected to occur in some 15 per cent. of the cases.

The Condition of the Abdomen.—The *abdominal walls* soon become rigid, partly on account of the degree of distension and partly on account of the early and almost constant appearance of at least local peritonitis.

Meteorism.—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 remarkable. 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 epigastrium. 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 which forms early in the case, may be 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.

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.

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. Out of a series of twenty well-recorded cases, 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.

Other Forms of Volvulus.—It will be convenient to describe here the clinical manifestations which attend other and rare forms of volvulus. These varieties of volvulus are fully described on page 132, and the symptoms of each form will be considered in the order in which the varieties are placed in the section on pathological anatomy.

* 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.

† *Med. Times and Gazette*, vol. ii., 1879, p. 31.

(1) A Form of Volvulus in which the Sigmoid Flexure is Intertwined with a Coil of Small Intestine.

A description of this form of twist is given on page 132. Leichtenstern has collected twenty-one examples of this curious lesion. With one exception, all the patients were males, the ages ranging between twenty-four and seventy-three.

In all the strangulation was of a very severe type.

The *symptoms* attending 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. Meteorism is usually prominent. 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.—A description of this form of volvulus is given on page 133. There are three varieties of this condition.

(A) The ascending colon is twisted around its own axis.
(B) There is a volvulus of an abnormal loop formed by an ascending colon and cæcum provided with a long and distinct mesocolon.
(C) The cæcum is twisted around its own axis, or "bent upon itself."

(A) Of the first of these three varieties I have been able to find but one example. It is described on page 133.

(B) 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 (*see* page 134), 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. "Fæculent" 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 eighth day. Perforation of the cæcum had occurred. There was commencing general peritonitis.

(C) The *symptoms* of volvulus of the cæcum vary greatly, and even among the five instances alluded to on page 135 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's 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 stercoraceous 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. It 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.—On reference to

the description of these lesions given on page 135, it will be seen that the volvulus may assume one of two forms.

(A) *There is a Volvulus of the Small Intestine about its Mesenteric Axis.*

The reader is referred to the account already given of this form of volvulus (page 135).

The *symptoms* met with in this volvulus vary considerably. The course of the malady may be acute or chronic. One patient out of those alluded to on page 135 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 cases, the average duration of the attack was five days, the extremes being thirty-two hours and nine days.

In most of the 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 eight recorded cases, the vomited matter 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-stercoraceous, 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. Naunym reports a case of volvulus of the lesser bowel in which much blood was passed per anum.

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. 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 which 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-fours of intense abdominal pain. There was a volvulus of the lower ileum, but no peritonitis.* In another 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.

In the more acute cases some peritonitis is common.

Nothnagel† describes a case in a man aged thirty. He was seized with violent pain about the navel which lasted some ten minutes. He then vomited and passed a soft stool. No more vomiting occurred, but each day he was seized with violent attacks of colic, the pain being about the umbilicus. Each day a slight motion was passed with or without an enema. On the fourteenth and fifteenth days of the disease he again vomited. Much tympanitic distension of the abdomen ensued. He gradually sank, and died on the nineteenth day. The autopsy revealed a volvulus of the upper jejunum, the mesentery of which was twisted more than once round. There was general peritonitis.

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

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

† Die Erkrankungen des Darmes, Wien., 1896.

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 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 which was never stercoraceous, and from constipation which 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. †

(B) *Two Suitable Coils of Small Intestine are Twisted Together.*—In this very rare form one coil of gut acts as an axis around which the other is wound. All that is known clinically of this curious accident is given on page 140.

3. ACUTE INTUSSUSCEPTION.—Intussusceptions form about

* Loc. cit., p. 565.

† *Med. Times and Gazette*, 1876, vol. ii., p. 33.

30 per cent., or a little less than one-third, of all species of obstructions of the bowels.

As regards the clinical phase of the invaginations, it may be estimated that some 85 per cent. are acute or subacute and some 15 per cent. are chronic.

History.—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 trustworthy. 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 „

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 which 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 *

Onset.—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 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. (*See* the section on the etiology of intussusception, page 177.)

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

* *New York Med. Journ.*, July, 1877.

† Path. Soc. Trans., vol. xi., p. 109; Mr. Nunneley.

‡ Mr. Pitts; St. Thomas's Hosp. Reports, 1882, p. 75.

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 afterwards 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.

The Acute and the Chronic Forms.—Before commencing a notice of the separate symptoms, a superficial comparison may be made 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 lack all the most distinctive signs of invagination.

Pain.—Pain, as already stated, is usually the first symptom of intussusception. It is also one of the most constant and most 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 increases 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

* Ohle. Mag. für die gesam. Heilk. Rust., 1817, bd. ii., s. 253.
† Mr. H. Marsh; St. Bart.'s Hosp. Reports, 1876, p. 95.
‡ Heidelb. med. Anal., 1842, bd. 8, s. 428.

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 (page 294) 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.

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.

Vomiting.—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 severer 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. Vomiting occurs earlier in children than in adults.

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 stercoraceous.* 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 instance of acute invagination where the sickness had

* Bull. de la Soc. Anat., 1867. p. 136; M. Naudier.

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 which are associated throughout with diarrhœa. It is also very often slight in degree in those instances of the malady which 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 cases 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 bilious. Stercoraceous 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 with 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.—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

* *Lancet*, vol. i., 1877, p. 273; Mr. Ransford.

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. When gangrene is in progress the smell of the stools is peculiarly offensive and is described by some as "carrion-like." 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.

Constitutional 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

* Le Moyne, loc. cit., p. 23. *Med. Times and Gazette*, vol. ii., 1865, p. 195. *Amer. Journ. Med. Sciences*, vol. xii., p. 372.

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, be very pronounced, and lead on to death. This is especially the case with acute invagination 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. I have alluded to a case in dealing with the prognosis in which death took place in nine hours (page 380).

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 a be 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 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 *strangury* 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.

Tenesmus is a striking symptom. It is more commonly met with in acute and subacute than in 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 subacute 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 ninety-four cases marked by tenesmus to be thus divided: enteric form, four; ileo-cæcal forms, seventy five; colic forms, fifteen. The proper value of these figures can be appreciated by reference to the table showing the *relative* frequency of the various varieties (page 145).

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 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.†

The Condition 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 very largely 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

* Path. Soc. Trans., vol. xviii., 1867, p. 92.
† Ibid., vol. viii., p. 177.

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 when peritonitis sets in.

Local Tenderness.—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. 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.

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.

An abdominal 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 well made out. It usually appears fixed. It may often, however especially in chronic cases, be observed to change its position, now to 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 the tumour 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 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

* Bull. de la Soc. Anat., 1870, p. 260.

A 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. In one the patient was a man aged sixty, and the tumour, prolapsed beyond the sphincter, was taken for a polyp or a cancerous

* 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., p. 31.

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 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.‖ The case is reported by Mr. H. Morris.

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's 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

* *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, p. 42.
‖ Path. Soc. Trans., vol. xxviii., p. 131; Mr. Henry Morris.
¶ Bull. de la Soc. Anat., 1867, p. 136.

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.

4. Acute Obstruction by Gall Stones, Foreign Bodies, etc.—The principal form of acute obstruction met with under this heading depends upon gall stones. It will therefore be convenient to select obstruction by gall stones as typical of the present series of cases. At the end of the section notice will be taken of acute obstruction by foreign bodies and by enteroliths.

Acute Obstruction by Gall Stones.—It must be distinctly understood 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, or induces some colic with occasional vomiting and some constipation; and in another set of cases evidences of *chronic* obstruction are produced.

A volvulus of the small intestines may follow upon the contortions induced by the passage of a large gall stone through the small intestine. Mayo Robson gives two examples of this exceedingly uncommon condition. One patient was a woman of sixty-eight, who exhibited the symptoms of acute intestinal obstruction, and upon whom laparotomy was performed on the eighth day of the obstruction. A volvulus of the small intestine was discovered and untwisted. Eight days after laparotomy a gall stone three inches in circumference was passed by the rectum.

The second patient was a woman aged sixty-two, who was suffering from acute intestinal obstruction, and upon whom laparotomy was performed on the sixth day. She had had several attacks of hepatic colic, some of which had been attended by jaundice. Coils of intestine in movement were visible through the parietes. A volvulus of the lesser bowel was discovered and untwisted; the patient did well. In both these patients there was a well-marked localised swelling near the umbilicus which became hard during the paroxysms of pain.

In a few examples the biliary calculus may cause acute obstruction, due to the actual blocking of the bowel by the stone. In such cases it will be found lodged in the duodenum, jejunum, or more usually in the lower ileum. It is with this form of gall stone obstruction that the present section is alone concerned.

Intestinal obstruction due to gall stones is comparatively

rare, although Schüller* has collected one hundred and thirty-nine examples of this accident.

Sex and Age.—The condition is much more common in females than in males. Among Schüller's cases only 25·9 per cent. are in men.

The great majority of the patients are beyond middle age, most of the cases falling between the ages of fifty and seventy. Indeed no less than 75 per cent. of the instances are in patients over fifty. Among Schüller's cases the extremes in the matter of age are respectively eighteen and ninety-four years.

Previous History.—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 which 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 the gall bladder and associated with symptoms which may be very properly ascribed to the passage of the stone direct from the bladder into the duodenum. These symptoms are usually marked by a more or less acute abdominal disturbance marked by severe pain in the hepatic region associated with tenderness. There may or may not be jaundice. There will be some rise of temperature, together with vomiting, constipation, meteorism, and, indeed, the usual phenomena of local peritonitis. On the other hand the symptoms due to the escape of the stone by ulceration into the duodenum, or colon, may be quite slight, and may be well mistaken for an attack of hepatic colic. I have met with instances in which there had been such a passage of the stone, but in which there was no single circumstance in the patient's history to indicate when the calculus had effected the fistulous communication.

As to the length of time which 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 uncertainty which may surround the exact period at which the stone entered the bowel.

As a rule calculi produce intestinal trouble within a few days of reaching the bowel. Obstructive symptoms may

* Gallensteine als Ursache des Darmobstruction. Strassburg, 1891.

† *New York Med. Journ.*, vol. xxxvi., 1882, p. 17.

follow close upon the inflammatory phenomena which mark the passage of the stone from the biliary passages by ulceration. I was called to see an old gentleman of over seventy years of age who had been laid up in bed for four weeks. During all this time he had exhibited the symptoms of severe local peritonitis about his gall bladder. The local symptoms were such as to make it probable that some suppuration had taken place. There was fever and occasional vomiting, but no jaundice. A considerable mass could be felt under the liver. It was fixed and tender. There was a well-marked history of gall stones. After the peritoneal symptoms just described had lasted some three weeks they exhibited a sudden improvement. The pain, tenderness, and swelling became less, the fever abated, and it became more than probable that the gall stone had entered the bowel. This probability was realised, because almost immediately after this period of relief the patient was seized with symptoms of subacute intestinal obstruction, which passed away within a week. It was after this that I saw him. The mass below the liver presented evidences of suppuration, and I incised it, evacuating a large and irregular abscess cavity beneath the liver, in which were lodged several large gall stones. There was no doubt but that the abscess was intermediate between the biliary passages and the bowel, and that into the bowel one stone had already passed.

A case somewhat akin to this is reported by Dr. Carrard.* The patient was a woman aged fifty-four, who six weeks before an attack of intestinal obstruction, which ended in death, had had an abscess opened in the right hypochondrium, which was supposed at the time to have been connected with the liver.

The interval between the probable entrance of the stone into the gut and the onset of obstructive symptoms may be considerable. In a case reported by Dr. Bradbury† the symptoms of local peritonitis about the gall bladder were noted on September 24th, but the phenomena of obstruction did not appear until November 11th. The gall stone had made its way into the duodenum by ulceration, and was impacted in the jejunum. Leichtenstern states that so long a period as three years may elapse between the introduction of the stone into the intestine and the development of obstructive symptoms.

* *Revue Méd. de la Suisse Romande*, No. 2, 1882.

† *Brit. Med. Journ.*, Sept., 1897, p. 796. *See* also a case by Dr. Taylor, in which the interval appears to have been three months; *Lancet*, April 6th, 1895.

Mr. Eve reports a case in which the calculus is assumed to have remained in the bowel for ten years, and in one of Mr. Smith's cases the stone is believed to have been fifteen years in the bowel.

In all these and like cases it must be a matter of question if the evidence upon which the assumption is based that the stone entered the bowel at a certain time is quite to be depended upon.

Onset.—The onset is usually abrupt, but the degree of acuteness of the symptoms is subject to no little variation.

Pain.—The pain is severe, and of the nature of colic. It is continuous with marked exacerbations. On the whole it is not so severe as the pain which accompanies strangulation by a band. Very often the initial pain is compared to that of hepatic colic.

Vomiting.—In these cases vomiting is an early and conspicuous symptom. It 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 lower duodenum, or upper jejunum, the vomiting has been very severe. Indeed, I know of no form of intestinal obstruction in which the vomiting is more incessant, more obstinate, and more copious than it is in cases in which the upper jejunum is blocked by a gall stone. In a case of Dr. Pye Smith's, the gall stone was in the upper part of the jejunum. The vomiting was so profuse that no less than one gallon and a quarter of bilious fluid was ejected in forty-eight hours. The patient died on the sixth day after the commencement of the symptoms.

The vomited matter is apt soon to assume an offensive odour, which is called by some "intestinal" and by others "fæculent." Schüller says that the vomited matter was stercoraceous seventy-seven times in 120 cases. Vomiting which may be properly called stercoraceous may occur when the stone has blocked the jejunum, and this character of the ejected matters is pronounced when the stone has engaged the lower ileum.

Constipation.—In the acute cases constipation is, as a rule, absolute. In subacute cases a more or less free action of the bowels may be obtained after the onset of the symptoms, and this is especially marked in cases in which the stone has lodged in the upper parts of the small intestine.

Constitutional Symptoms.—These are those of acute obstruction, much modified according to the abruptness and severity of the attack. On the whole they are much less intense than the general symptoms which attend acute strangulation of the bowel.

I have met with no case in which either strangury or tenesmus was a symptom and none in which blood was passed per anum.

In one instance, where death followed in five days, the patient, a woman of sixty-nine, was seized with violent cramps and ultimately died comatose.

The Condition of the Abdomen.—This calls for no especial description. The degree of meteorism is usually quite slight, and that symptom may indeed be wanting. Tenderness of the abdomen is not met with unless some peritonitis be present. It is marked when an obstructive attack follows upon the inflammatory phenomena which may attend the escape of a stone from the gall bladder into the bowel.

In a few cases the gall stone has been felt through the abdominal wall when the patient was under an anæsthetic. Such was the case in a patient of Mr. Eve's,* in whom it was possible to feel a calculus lodged in the left iliac fossa.

Other Forms of Intestinal Obstruction due to Gall Stones.—It will be convenient to dispose of those forms of obstruction which are due to gall stones, and to describe in this place such forms of the trouble as are not to be ranked as acute.

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

* *Brit. Med. Journ*, vol. i., 1895, p. 195.

and the actual passage of the stone may be considerable. It may amount to one, two, or even three weeks.* In a certain number of the recorded cases there is a history of several attacks 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 which 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 which have probably been associated with the passage of the stone along the intestine.

As more than one large concretion may be in the bowel at the same time two or more attacks of obstruction may occur after the first gall stone has been passed. Dr. Maclagan† describes two cases of this kind and Mr. Clutton‡ another.

The symptoms in some examples are neither acute nor chronic. Such a case is recorded by Dr. Taylor, in which the symptoms of obstruction, after having been marked, abated, and then in a little while became severe again. In this instance laparotomy was not performed until the twenty-seventh day. A gall stone four and a half inches in circumference and two inches long was removed from the lower ileum. The patient did well.

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 stercoraceous, there may be some meteorism, and the coils of intestine may be visible through the parietes.

In certain of these cases the stone would appear to cause but partial obstruction, and symptoms are produced which are identical with those of stricture of the small

* Diseases of the Gall Bladder. By Mayo Robson. London, 1897.
† Clin. Soc., Trans., Lond., vol. xxi., p. 87.
‡ Ibid., p. 79.

intestine. That is to say, there are attacks from time to time of paroxysmal pain, some vomiting that rarely becomes stercoraceous until quite the end of the case, and constipation which may not become absolute, and which 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.

So far as the duodenum is concerned, it is probable that the diverticula are in most cases not formed in the manner described, but are really instances of gall stones which have become encysted on their way into the duodenum, having escaped from the gall bladder by ulceration.

It may here be convenient to note two or three *anomalous cases* which possess some interest.

It would appear that in 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. 113 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

* Middlesex Hosp. Museum, No. viii., 57. *See* also Path. Soc. Trans. vol. viii., p. 231.

† *New York Med. Journ.*, 1882, p. 17.

had more or less severe attacks of intestinal obstruction for the six weeks that preceded her death.*

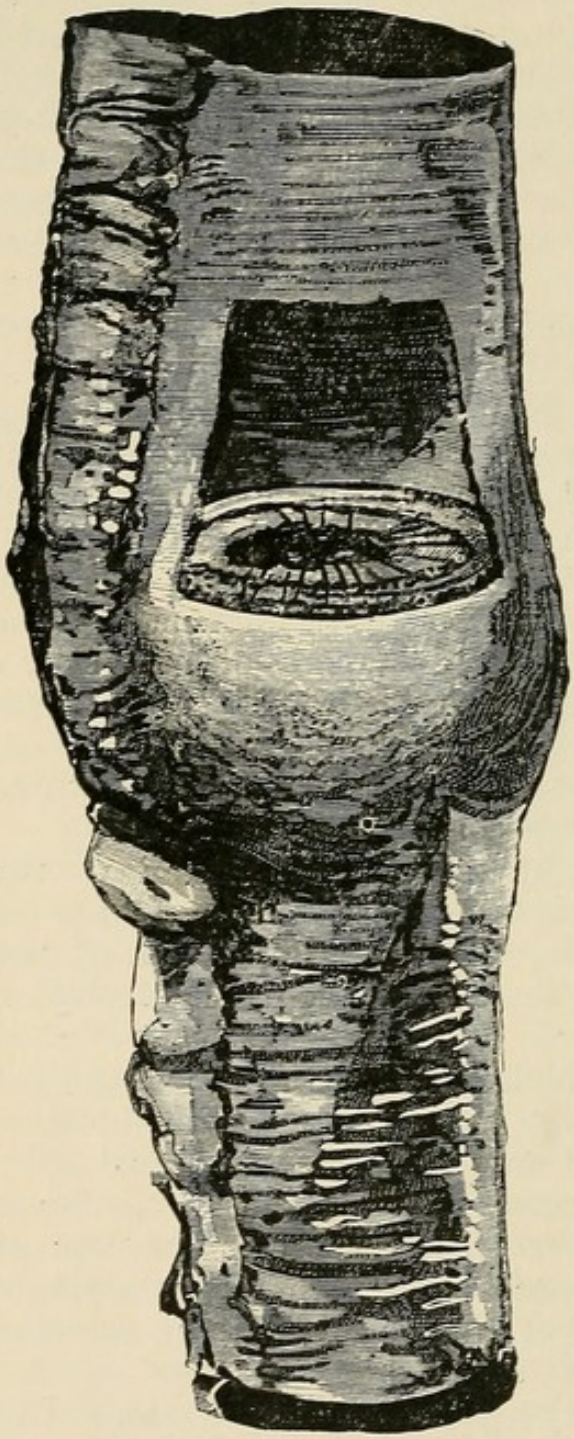


Fig. 113.—Gall Stone impacted in the Ileum.

A section has been made of the gall stone.

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 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 probable that this 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-quarters inches. No inconvenience

* Path. Soc. Trans., vol. ix., p. 203 ; Dr. Scott Allison.

† Bull. de la Soc. Anat., 1875, p. 176.

followed upon the use of this very undesirable 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 possibly be justifiable 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 not justified in thrusting a needle vaguely through the abdominal parietes for the purpose of obtaining aid in diagnosis. Fifty such punctures may be made before a gall stone impacted in some parts of the bowel may be hit.

Intestinal Obstruction by Foreign Bodies and Enteroliths. — *Foreign Bodies.* — There will be a history very probably of the swallowing of a foreign body. The substance may possibly be felt through the parietes when the patient is under an anæsthetic, or made evident, if it be of suitable composition, by means of the Röntgen rays.

As to the troubles induced in the bowel by foreign bodies there is little to add to what has been already said on p. 185.

If the foreign substance block up the bowel, then the symptoms produced are exactly like those produced by a gall stone and such variations in the symptoms as may depend upon gall stone may be in like manner brought about by a foreign body.

The impacted foreign substance may induce ulceration of the gut and lead to symptoms of enteritis.

The ulceration may in turn lead to perforation, to acute peritonitis, to localised peritonitis, or to a circumscribed abscess.

Nicholls‡ reports a case in which a fatal peritonitis was due to the perforation of the ileum by a crown of a species of spear grass, which had evidently been swallowed.

When a localised abscess has formed it may make its way to the surface and the foreign body be discharged or discovered by the surgeon who evacuates the pus (*see* Fig. 77).

Such an example is reported by Dr. Maylard,§ a fish-bone having been discovered in the abscess.

* *Med. Record of New York;* Dr. James Whitaker, 1882.
† Paper read before Royal Med.-Chir. Soc.; *Lancet*, May 17, 1884.
‡ *Brit. Med. Journ.*, vol. i., 1894, p. 1242.
§ Trans. Path. and Clin. Soc., Glasgow, 1885, p. 197.

The localised abscess may burst into some hollow viscus, and the foreign body be discharged through that viscus. This matter is treated upon on page 189.

Enteroliths.—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" (*see* page 197) the patient, an idiot boy aged sixteen, died of acute obstruction which 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 Schroeder's case, described on page 197, the patient, a man of fifty-three, had suffered for twenty-three years from agonising attacks of abdominal colic, obstinate constipation, hæmorrhoids, meteorism, cardiac palpitation, and headache. Mucus was passed from the rectum. The enterolith was passed in due course, and then all the symptoms gradually subsided. In Mr. P. H. Watson's case, mentioned on page 195, 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. The 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 perityphlitis and finally lead to perforation and death.

CHAPTER VI.

THE COURSE AND PROGNOSIS IN ACUTE INTESTINAL OBSTRUCTION.

1. Strangulation by Bands or through Apertures.—The course in this variety of intestinal obstruction is very rapid and the prognosis very bad.

The average duration of a case is about five days. The extremes are eight hours and twenty days. It may be safe to say that every case unless relieved ends in death. The prognosis is more serious even than is the prognosis in strangulated hernia, owing to the fact that the parts engaged are well within the abdominal cavity.

The issues of the case are of course affected by the ordinary circumstances which govern all prognosis, such as the age and health of the patient, the condition of the bowel at the time of strangulation, and other obvious circumstances.

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

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.

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. Le Moyne, for example, mentions two cases, both in young soldiers in perfect health, in which death took place in ten hours and eighteen hours respectively. In the one case the ileum was engaged in a slit in the mesentery, and in the other the ileum was strangulated beneath a diverticular ligament.

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.

The onset of stercoraceous vomiting is a matter of moment. If a large body of cases of acute obstruction of the present variety be examined, it will be noticed that on an average life is only prolonged three days after the appearance of stercoraceous (or as it is often called fæculent) vomiting.

The mode in which death takes place varies.

Some patients die of collapse, others of perforative peritonitis, while the majority succumb to septicæmia. In this septicæmia the poison is derived from the putrid matter within the patient's own intestine, and in the production of this septic material the bacterium coli commune, no doubt, plays a prominent part. In one instance or so the death has been ascribed to heart failure, to mere exhaustion,

to the inhalation of vomited matters, and to suppurative changes about the gut in cases which are not markedly acute.

Peritonitis of a pronounced type 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" which, 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. Among older records there is no doubt but that not a few of these cases of recovery from acute obstruction are really cases of recovery from recurrent perityphlitis.

Then, again, one isolated case or so has been recorded where patients were attacked with symptoms of intestinal incarceration which could not be diagnosed from like attacks known to be due to "bands." These patients, after being almost *in articulo mortis*, after vomiting stercoraceous 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 miraculous 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, in 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 strangulation, 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 laparatomy, which ended in cure, the diverticulum was more livid than the gut that it was compressing‡; and lastly, Dr. Servier quotes an

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

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

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

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 which 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 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. The relief in such an instance would be identical to that obtained by the operation of lateral anastomosis.

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.

2. VOLVULUS OF THE SIGMOID FLEXURE.—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 the series of cases I have collected was six days. The longest period during which the patient lived was twenty days,‡ the shortest sixty-four hours.§ Nothnagel alludes to instances of death in twelve and twenty-four hours, but gives no particulars.

* De l'Occlusion Intestinale, p. 42. Liége, 1871.

† No. Q 7.

‡ Contrib. à l'Etude de l'Occlusion intestinale, by Dr. Le Moyne. Paris, 1878.

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

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, interference with the thoracic organs by the enormously distended bowel, peritonitis, and above all intestinal septicæmia. In the more chronic cases death is ascribed to peritonitis, septicæmia, 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 which 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, 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 twenty recorded 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 reported case 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

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

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 in a previous section (page 85) alluded to the fact that when the lower part of the sigmoid flexure, or the upper part of the rectum, becomes suddenly occluded by the process known as kinking, symptoms may be induced which 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 stercoraceous; peritonitis was developing. The rectum had been closed by kinking, and the sigmoid flexure filled a great part of the abdomen (page 86).

The prognosis of the other varieties of volvulus is considered in the section which deals with the clinical features of those uncommon varieties (*see* pages 344 and 345).

3. INTUSSUSCEPTION.—It will be more convenient to consider in this place the future of all types of intussusception, as it is difficult in dealing with the course and prognosis of the affection to separate the acute cases from the chronic. A brief reference to the course and ending of the chronic cases is given on pages 418 and 433, but the main features in the prognosis will be considered in this place.

Compared with the acute cases the chronic forms are comparatively unimportant, and they play no very conspicuous part in the general circumstances of intussusception.

Rafinesque divided intussusception into four clinical 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 and 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 is, from a clinical point of view, convenient.

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 269 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. Sixty 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 seventy-nine 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. In the Royal College of Surgeons is an intussusception of the ileum, one inch long, from an infant aged fifteen weeks who died in nine hours (specimen No. 2701).* 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.

* As a good example, *see Lancet*, vol. i., 1882, p. 604. The child lived thirteen hours.

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 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 which occur in invaginations that are still reducible. 2. Those which 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 no doubt, although its occurrence must be a matter of some rarity. There are several instances reported of fatal intussusception in which the patient has had one or more previous attacks which, in all points save 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 which underwent spontaneous reduction.

I think, moreover, that some of the cases of supposed cure of invagination by large doses of opium, administered promptly, 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. 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 reduc-

* *See* case recorded by Henrot: Des Pseudo-étranglements, p. 53. Paris, 1865. Also case by Travers; Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 211, London, 1812.

tion 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.

The following case reported by Nothnagel is more precise. The patient was a healthy man of fifty who had never had any bowel troubles. In April, 1892, he was quite suddenly attacked with violent colicky pains which radiated from the right iliac region. These attacks of colic were repeated for almost four months. They came on at intervals of one to three days, and lasted from twelve to twenty-four hours. They were accompanied by nausea and vomiting.

Gradually it was noticed that during these attacks coils of intestine were to be seen in movement through the abdominal parietes. The bowels acted normally every day. The patient became much emaciated. He entered hospital in June, and the case was diagnosed as a new growth of the intestine. Operation was proposed but declined. Strange to say, while in the hospital all the patient's symptoms vanished without treatment of any kind, and in four weeks he left the hospital, apparently cured. He remained in robust health for one year and three months. In November, 1893, his former troubles reappeared, and assumed precisely the same characters as before. He became greatly emaciated, and was exhausted by the frequent pain, the vomiting, and the loss of sleep. The bowels continued to act with perfect regularity, and were normal in appearance. In April, 1894, he came under the care of Dr. Nothnagel. A tumour was now discovered, apparently in the transverse colon, which had all the characters of an invagination tumour. Hypertrophied coils of small intestine could be seen during the attacks of colic. Laparotomy was performed and an ileo-cæcal invagination discovered. At the summit of it was a polypus. There was no trace of peritonitis, there were no adhesions, and the invagination was reduced without the least difficulty. The patient made a good recovery.

* *Gazette des Hôpitaux*, 1852.

To the **second** category belong two kinds of cases. 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 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 which 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 165). 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 (according to this author) 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	„	„

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.

* Revue Mensuelle de Méd. et de Chir., 1878, tome ii. p. 255.

Spontaneous elimination occurred:

At the end of 3 days in	1 case.
„ 4 „	2 cases.
„ 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 would appear, therefore, from Leichtenstern's statistics, that out of every hundred cases of intussusception of all kinds some fifteen patients may be expected to recover in consequence of the spontaneous elimination of the invaginated bowel. My impression is that this proportion is far too high. Cases of spontaneous elimination ending in cure are apt to be more certainly reported than are cases ending in death, and I would venture to think that the prospect of recovery in intussusception depending upon spontaneous elimination is represented by considerably less than 10 per cent. of the total number.

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 intestinal toxæmia or 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.

Stricture of the intestine may follow from cicatrisation at the line of elimination, and the stricture so produced may cause in its turn fatal obstruction. Such an occurrence is, however, very rare. It is true that some narrowing of the parts may take place after the separation, as is well shown in Fig. 114.‡ I have had under my care a case in which certain slight and chronic symptoms of obstruction were probably due to such narrowing. Recovery following upon elimination is not very uncommon, 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, one mentioned below) where such a circumstance has without doubt occurred. It would appear, then, that stricture of

* *Amer. Journ. Med. Sciences*, vol. xii., p. 372.

† Path. Soc. Trans., vol. xix., p. 207.

‡ Royal College of Surgeons Museum, No. 1377. For another example, *see* Dr. Hare's case; Path. Soc. Trans., vol. xiii., p. 86.

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 which 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 which

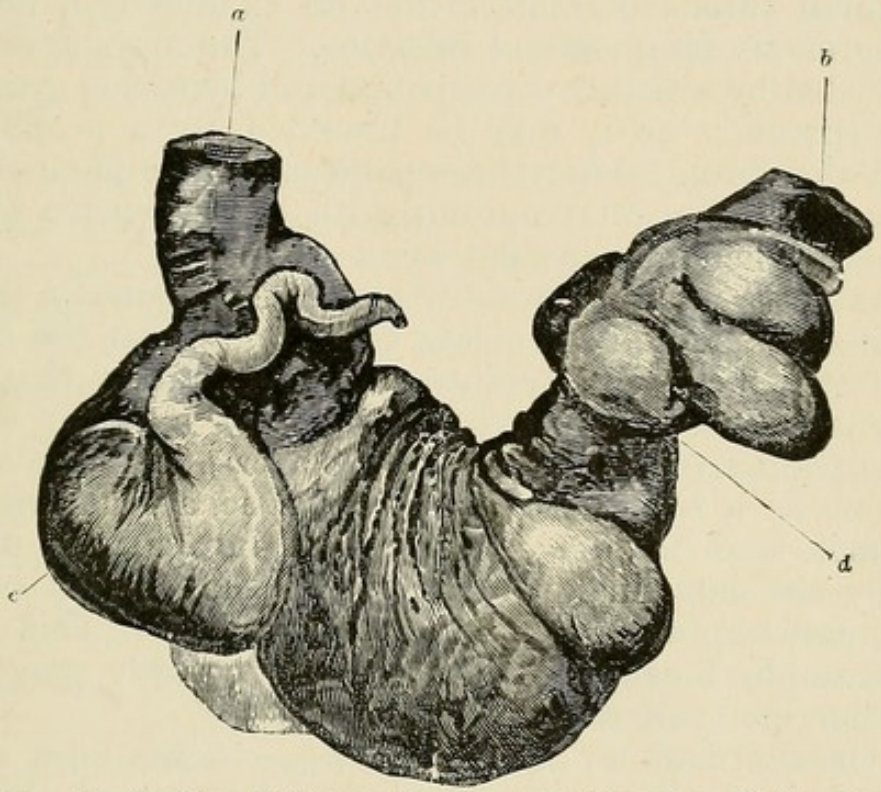


FIG. 114.—Contraction of Colon after the separation of an Intussusception.
a, ileum; *b*, colon; *c*, cæcum; *d*, seat of contraction.

had greatly deformed that viscus. In the absence of more 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-two, 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

* Dr. Bristowe; Path. Soc. Trans., vol. xx., p. 180.

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, and blood often 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 168 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.

4. Obstruction by Gall Stones.—As has been already indicated, in dealing with the clinical features of this form of intestinal obstruction, the course of the trouble may vary considerably both in duration and in the severity of the symptoms.

There is no doubt but 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.

When, however, the calculus does cause obstruction of the bowels, the results are usually disastrous. In the cases which I have myself collected, I find that in 35 per cent. of the examples in which the stone caused definite and severe symptoms of obstruction the patients recovered by the

spontaneous passage of the stone, and that in the remaining 65 per cent. the patient died or was in a few examples relieved by operation.

Among 280 cases of intestinal obstruction due to gall stones collected by Schüller, Dufort, and Courvoisier,* the mortality is given as 52 per cent.

Kermisson and Rochard,† dealing with a collection of 105 cases, give the death-rate as 50 per cent.

Lobstein ‡ has collected ninety-two instances of obstruction by gall stones. Sixty-one of these were not treated by operation, and of this number twenty-nine died. Thirty-one were treated by operation, and of this number nineteen died.

When obstruction symptoms are produced by gall stones they are nearly always acute.

The duration of the obstruction may vary from one to twenty-eight days.

In the cases which end in recovery the average duration of the obstruction is seven days, and in those which end in death five to ten days.

In one instance reported by Sargent § the patient died in half an hour apparently from collapse.

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 which 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 a case reported by Hutchinson¶ the symptoms were very acute, and on the sixth day it was considered that the patient was dying. On the morning of the seventh day, however, she passed a gall stone one inch in diameter and made a perfect recovery.

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

* Mayo Robson; Diseases of the Gall Bladder, 1897, p. 86.
† Archives Générales de Méd., Feb., 1892.
‡ Beiträge zur klin. Chirurgie, bd. xiii., heft 2.
§ *Brit. Med. Journ.*, 1879.
‖ Bull. de la Soc. Anat., 1875, p. 570. Paris.
¶ Archives of Surgery, 1892, vol. iii., p. 9.

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 a 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 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.‡

I have myself twice opened abdominal abscesses, in the cavities of which I discovered loose gall stones.

Some of those who die from the effects of obstruction die from mere exhaustion and intestinal toxæmia, 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.‖

* *New York Med. Record*, vol. xxxi., 1882, p. 427. A like case is reported by Dr. Ormond; *Brit. Med. Journ.*, vol. i., 1897.

† Dr. Thorowgood; Path. Soc. Trans., 1877, p. 131.

‡ Dr. Carrard; *Revue Méd. de la Suisse Rom.*, No. 2, 1882, p. 82.

‖ Path. Soc. Trans., 1852, p. 357.

CHAPTER VII.

CHRONIC INTESTINAL OBSTRUCTION.

GENERAL DESCRIPTION OF A CASE.

History.—In the majority of the examples there is no element of interest in the previous history of the patient. The bowels may have been acting regularly, and the digestion may have been perfect up to the time of the commencement of the symptoms of obstruction.

In a comparatively few cases there is a history of injury, of hernia, of dysentery, or of some other form of ulceration of the bowel, of peritonitis of some degree, or of persisting constipation.

These previous troubles may or may not have had to do with the stenosis which has been produced in the bowel.

In general terms, it may be said that the previous history of the patient is of no value in assisting the diagnosis, and is, indeed, often quite misleading.

Onset.—In the typical case the onset is slow and insidious, and the patient can hardly state with precision when the symptoms began. The initial symptoms are generally grouped under the heading of "digestive disturbances." There is definite and repeated discomfort in the abdomen, which becomes more and more defined and more and more painful. These early symptoms need not be associated with any constipation, and they very often do not suggest obstruction of the intestine.

It will, however, generally be noticed that the patient has sought relief from these initial symptoms by taking aperients.

In a quite small proportion of the cases the symptoms begin more or less abruptly, the patient being at the time apparently in sound health. In such examples, no phenomena have attended the narrowing of the bowel, until

one day the stenosed part becomes blocked by a mass of undigested food, or by hardened fæces, or the bowel at the affected part becomes kinked or bent upon itself.

It is needless to say that, the more fluid the contents of the bowel, the more slowly do the symptoms develop, and also the more likely are there to be sudden manifestations by reason of accidental blocking of the gut.

The general course of chronic intestinal obstruction is irregular, the patient being now better and now worse, and the progress of the case is apt to be marked by obstructive attacks which become, in time, more frequent, more serious, and more abiding.

Pain.—The pain occurs in paroxysms, and is distinctly of the nature of colic. It is a griping pain. It comes on in attacks which, as the case progresses, increase in frequency, in intensity, and in duration. The interval between the attacks decreases. The paroxysms may last for a period ranging from a few minutes to several hours

The pain may be, to a certain extent, localised, especially when the obstruction is in the colon.

The patient associates with it some movement or struggle in the bowel. Usually the pain is very definitely increased by purgatives, especially when the trouble is well advanced. The administration of an aperient, on the other hand, has led to the first manifestations of the trouble.

Between the attacks, the patient feels, during the early stages of the affection, free from abdominal discomfort. But as the stenosis becomes narrower the interval between the attack is marked by a sense of distension and uneasiness which increases in degree until at last the patient is never free from some amount of abdominal pain. When the obstruction becomes complete, the pain becomes continuous.

Vomiting.—This is not a marked symptom. There is nausea during the early attacks probably, and this may pass on into vomiting at a later period.

In general terms, it may be said that in chronic obstruction the vomiting is not pronounced, appears late, is scanty, uncertain, infrequent, and but rarely stercoraceous. When the obstruction becomes complete, the vomiting is a prominent and distressing feature and assumes a stercoraceous character.

State of the Bowels.—Constipation is the rule. In a small proportion of cases the bowels have acted regularly until towards the end. It is needless to say that constipation is a much more marked feature of stenosis of the colon than it is of stenosis of the small intestine. In stricture of the

small intestine the bowels may act with perfect regularity. A normal stool may be passed daily in a case in which there is a stricture as low down as the sigmoid flexure. For example, Nothnagel reports the case of a woman, aged fifty-eight, who was in vigorous health until a certain day, when she was seized with violent colic. Up to this day she had worked with her usual energy as a laundress, and had passed a normal stool every day without aperients. The attack of colic was repeated daily, and on the seventh day she developed symptoms of intestinal obstruction and for the first time sought medical advice. She died suddenly of collapse on the tenth day, and the autopsy revealed a cancerous stricture of the lower end of the sigmoid flexure which would not admit the little finger.

However, as has been already stated, constipation is the rule in all forms of chronic intestinal obstruction, and this constipation becomes more and more obstinate as the case progresses, until at last it appears to resist all attempted measures to give relief. A time comes, towards the end—and often some time before the end—when aperients have to be discontinued on account of the intense pain and collapse they produce.

In stricture of the colon the motions passed often give evidence of having been very long retained.

When the stenosis involves the colon, the patient is almost certain to present at some time during the progress of the disease the phenomena of spurious diarrhœa. The lower down the obstruction, the more marked and the more common is this curious symptom. Indeed, it is in cancer of the rectum that it is met with in its most pronounced form.

In all cases of abiding and unexplained diarrhœa in adults, it is very essential that an examination should be made of the rectum.

A certain amount of diarrhœa may attend cases of stenosis of the lesser bowel and be due to the same causes which lead to that symptom when the colon is involved.

In the section on the morbid anatomy of obstruction of the bowel (page 16) an account is given of the changes which take place in the gut above the stenosed part. The bowel becomes hypertrophied, its blood-vessels become engorged, and its mucous membrane becomes irritated by the presence of long-retained decomposed matters and congested by reason of the abiding distension of the bowel walls.

There results, therefore, a catarrh of the bowel above the stricture. This leads to a copious mucous discharge, and

this watery material, carrying with it a certain amount of suspended fæcal matter, escapes at the anus as a loose evacuation, which is frequently repeated. Thus patients with obstruction of the bowel may complain that their bowels are always acting, that "everything runs through them," and that they dare not take an aperient for fear of increasing the persisting diarrhœa. This spurious diarrhœa may last for a few days or persist for many weeks, and I have known it continue for months. When it is of short duration, it alternates with obstinate constipation, so that the bowels either do not act at all or are acting—according to the patient's estimate—too freely.

There is no doubt but that this diarrhœa is a natural method of giving relief to the overloaded bowel, as it washes away a not inconsiderable amount of retained fæces, and relieves the distended blood-vessels. The patient, however, is usually conscious of the fact that the relief is trifling and imperfect, and often feels that the bowel is still loaded.

A striking feature of this spurious diarrhœa is the intensely foul odour of the motions which are passed—an odour which is not easily forgotten.

Sometimes the catarrh which leads to this diarrhœa is attended with a considerable discharge of mucus, which is to be recognised in the evacuations. This mucus may be stained with blood, even in cases of non-malignant stricture of the colon.*

I have known a patient with cancer of the rectum pass through a left inguinal colotomy wound two and more teacupfuls of clear, white, jelly-like mucus in a day. When a stricture exists, the mucus is retained, for the most part, until it has been liquefied by decomposition. It is only from an artificial anus that I have seen large masses of white transparent mucus poured out. What escapes from the normal anus appears as a thin fluid, or as those shreds of skin-like material which are common in colitis.

As a matter of fact, the spurious diarrhœa of chronic obstruction of the colon is due to colitis.

Blood may appear in the motions in cases of stenosis of the bowel, but it is an uncommon symptom, except in cancer of the rectum, and is usually quite slight in degree.

A fairly copious bleeding higher up in the intestine may give rise to peculiarly stinking stools, which German writers have described as having a "carrion-like smell."

The Shape of the Motions.—This is a matter to which considerable attention has been directed in most descriptions

* Dr. Doyle's case; Trans. of the Royal Acad. of Med. in Ireland, 1892, p. 81.

of stenosis of the bowel. In such accounts particular importance is attached to "pipe-like" or "tape-like" motions, and to solid stools which show grooves, or marks, or spiral indentations on their surfaces. It is assumed that these peculiarities of conformation are given to the fæcal column by the narrow strait through which it has passed.

The shape and size of the motions are of very little value, however, in the diagnosis of stricture of the bowel, and are often most misleading.

The part of the alimentary canal which is the most concerned in the shaping of the motions is the sphincter, and the very great majority of tape-like or rod-like stools are the work of that muscle.

After an operation for piles the shape of all solid motions may be permanently altered. A fissure of the anus may lead to rod-like motions, and there is a condition of irritable sphincter which is invariably attended by motions which have been evidently squeezed through a narrow strait.

A flattened motion may be caused by a very enlarged prostate, or by a uterine fibroid, or any other pelvic tumour which may bulge into the rectum.

With stools altered in shape and size stenosis of the bowel has little to do.

Stricture of the lesser intestine can have no possible effect upon the size and outline of motions passed by the anus. Even if the contents of the ileum were of sufficient consistence to receive an impression from a narrowed passage in the bowel, the peculiarity of contour could not possibly be maintained by the fæcal mass during its passage from the cæcum to the external sphincter.

The same applies to strictures of the ileo-cæcal valve, and of the right and middle portions of the colon. It is conceivable that, when the stricture is situated in the transverse colon, a motion which has passed the strait may be hurried unaltered through the rest of the colon, and may be passed at the anus with distinguishing marks upon it. Such a circumstance, however, must be very exceptional.

I have known rod-like and tape-like motions to have been passed in cases of stenosis situated in the descending colon and sigmoid flexure, especially when diarrhœa has followed upon a long constipation. The circumstance is, however, rare, and when it occurs is of little or no diagnostic value. After all, the narrowing of the solid fæcal matter passed may be due to the sphincter.

It is well to remember that it is in the ampulla of the rectum that the motion to be passed is, as a rule, finally

moulded. I have known a mass of long-retained stony fæces in the rectum to render tape-like the more recent motions which have passed by it and escaped.

I have also known a large, rounded mass of fæcal matter, the size of a hen's egg, to be passed by a patient who had a stricture that would only just admit the forefinger, and which was situated only six inches from the anus.

In stricture of the rectum, alteration in the shape of the motions passed and narrowing of their width is common, and in strictures low down is usual. With the rectal cases of stenosis we are not now concerned.

Speaking generally, the symptom under discussion is of little or no use in the diagnosis of the seat of the mischief in chronic intestinal obstruction.

Constitutional Symptoms.—The subject of chronic intestinal obstruction becomes enfeebled and wasted. The appetite is impaired, the digestion is disturbed, and the patient is weakened by the persisting pain, and poisoned by products of the decomposition which is proceeding in his own intestine. An occasional slight rise of temperature is not uncommon. It may last only for a day. It is due, probably, to septic absorption from the bowel, the contents of which have been long retained. It is most common after these contents have been in some way disturbed, *e.g.* by movement, massage, enemata, or aperients.

Thus in cases of fæcal accumulation the dislodgment of the long-retained mass is very commonly followed by a mild degree of fever, which is of short duration.

When the obstruction is due to malignant disease, there is often noticed that loss of colour, of weight, and of vigour which is so marked a feature of cancer. In due time, the cachexia of cancer may be pronounced. Certain reservations, however, must be made with regard to this alteration in the patient's aspect. In the first place, the symptoms of obstruction may be due to cancer, and yet the patient at the onset of the trouble, and even for some time after, appear to be in excellent general health. The reason of that is this. The malignant growth may cause intestinal obstruction while it is yet very small, while it is so little advanced as to cause no general impairment in health apart from that due to disturbance of the bowel. Epithelioma of the bowel may cause grave obstuction when it is scarcely more substantial in bulk than a heavy wedding ring (*see* Fig 95).

In the second place, patients with obstructed bowels due to any cause are apt to become ashen or yellowish of hue, a change in complexion which is probably due to the absorption

by the blood-vessels of those colouring matters which are lavishly produced by the disordered intestine, and which are expelled from the body rather through the kidneys than by the rectum.

The symptom of *indicanuria* has been alluded to on page 320.

Tenesmus is often complained of when the obstruction is situated low down in the colon, and is a feature in chronic intussusception, especially when the colon is involved.

Condition of the Abdomen.—The abdomen may present a quite normal appearance, especially when the stenosis concerns the lesser intestine, or when the trouble is yet in its earlier stages. As a rule, however, there is some distension of the abdomen, and the degree of it varies with the site and rigour of the obstruction. Towards the end of a case of stricture of the colon the distension of the abdomen may be enormous. The increased proportions of the belly depend partly upon an accumulation of intestinal contents, and partly upon meteorism.

The meteorism varies, and undergoes fluctuation from time to time. When it is considerable, the abdomen is made prominent and barrel-like. When it is absent, the loaded coils of bowel—especially those formed by the colon—tend to gravitate into the loins when the patient is recumbent, and to produce a wide, flat abdomen very easily mistaken for the appearance of the abdomen in ascites.

An evidently loaded bowel associated with diarrhœa is a striking feature, when present, of chronic intestinal obstruction. The diarrhœa in such case will be of the spurious type above alluded to (page 393).

The abdominal walls remain flaccid except in the presence of peritonitis.

Two very prominent and conspicuous features are present in chronic intestinal obstruction, or at least during the most characteristic stages of that affection, viz. rumbling and gurgling sounds in the bowels, and visible coils of intestine in movement.

Both these symptoms are due to that disordered and persistent peristaltic movement which is a feature in chronic obstruction. The movement is, of course, in the bowel above the stenosed part. That bowel is more or less distended, its canal is more or less loaded, and its walls are more or less thickened. The bowel is making a persistent effort to overcome the obstruction, and to rid itself of some of its accumulated contents.

These efforts are expressed by the painful colicky attacks which are a marked feature of the affection.

As the pain comes on, gurgling and bubbling sounds are to be heard, and beneath the probably thinned parietes visible coils of intestine are seen to stand out in relief.

The gurgling sounds are often very loud, and can be heard at a distance. They are described by many terms and expressions. Sometimes there are sounds as of air bubbling through water: at other times there are whistling or squeaking sounds, which may be associated with rumbling and rushing noises and sounds as of water running or splashing within a confined space.

It is quite evident that these noises are due to peristaltic movements, which are affecting large and resonant coils of bowel with thickened walls and with copious contents composed of gas and fluid matters.

The quantity of fluid in the bowel is often greatly increased by the persistent taking of aperients.

The visible movements in the bowel are apt to be excited by movement of the patient, by even the removal of the bedclothes and by the placing of a cold hand upon the abdomen.

An account of these visible movements has already been given on page 304.

They are induced by aperients, and also by food when the small intestine is concerned.

They are very conspicuous in long-standing cases in which the colon is involved, and in which the parietes are attenuated.

The surface of the abdomen becomes uneven. A rounded elevation appears in one place and depressions appear in another. They produce an aspect comparable to that of a "relief-map" of a hilly country. Slowly the hill-like elevation sinks and vanishes, and out of the shallow valleys appear fresh eminences, which rise up and move along beneath the skin. The movements are slow and attended by colicky pain and by more or less of the rumbling and gurgling sounds which have just been described.

The same coil appears again and again, and can be often quite definitely recognised.

I have already discussed, on page 315, the question of the identification of individual coils, so that some light may be thrown upon the possible site of the obstruction.

It is needless to say that coils of the colon form larger elevations than do loops of the lesser bowel. At the same time, a hypertrophied small intestine may be represented by visible coils in movement which can be aptly described as enormous.

Movements are less slow in the small intestine than in the large.

In certain cases of chronic obstruction—notably in examples of cancer of the bowel, of intussusception, and of fæcal accumulation—a *tumour* may be discovered in the abdomen. These tumours are discussed in the sections which follow upon the specific forms of chronic obstruction.

Ballooning of the Rectum.—The term ballooning of the rectum is applied to a condition of the terminal part of the bowel in which it is found to be dilated and fixed, as it were, in the dilated condition, like a pupil which has been dilated by atropine. The term "ballooning" is a misnomer, because the rectum is not distended nor blown out by gas. Its condition is due to some phase of paralysis.

This peculiar state of the bowel is described on page 413, to which section the reader is directed.

In relation to the present subject it only remains to be said that ballooning of the rectum is often met with in association with stricture of the colon, and especially with cases in which the stenosis involves the descending colon or sigmoid flexure. It is not by any means an invariable feature even in strictures in these latter situations. Ballooning of the rectum is also met with in conditions other than those in which the bowel is stenosed. These conditions are alluded to on page 414. So far as one can rely upon an experience which has not been definitely tabulated, I am under the impression that the majority of the examples of ballooning of the rectum are in association with stricture of the left side of the colon.

I. STENOSIS OF THE SMALL INTESTINE.

Under this heading the following different varieties of obstruction of the lesser bowel may be classed:—

1. Some cases of bending of adherent small intestine (page 87).
2. Some cases of adhesions binding a portion of the bowel into a fixed loop (page 93).
3. Cases of compression of the gut by adhesions (page 88).
4. Cases of matting together of several coils of intestine (page 96).
5. Cases of narrowing of the gut from shrinking of the mesentery (page 101).
6. Some instances of volvulus (page 346).
7. Obstruction by neoplasms (page 259).
8. Some cases of obstruction by gall stones and foreign bodies (page 368).
9. Some cases of compression by a tumour outside the gut (page 272).
10. Stricture of the small intestine either malignant or non-malignant (page 202).

Of these different forms the last named is the most familiar, the most precisely defined, anatomically and clinically, and the most common.

In the account which follows, the symptoms described will be those of stricture of the small intestine, since that lesion is the type of all forms of chronic obstruction in the lesser bowel.

Certain of the varieties above tabulated are very rare, and some are merely curious.

All these forms of intestinal obstruction present symptoms which more or less closely resemble one another, and which find their typical representation in a case of stricture of the bowel. In each instance it will be noted that there is some permanent but partial occlusion of the bowel.

The resemblance between these various forms of intestinal obstruction is so close that a certain differential diagnosis is impossible.

Any distinctive features (such as they are) which may be associated with any of the above forms of obstruction will be found detailed in the accounts given of each of these varieties in the previous parts of this work (references to the various sections are given on page 399).

In the first four forms there will probably be some history of a local peritonitis that gave rise to the adhesions producing the obstruction, or there will have been manifestations of tuberculous peritonitis. In the fifth form there may be the same feature in the previous history, or some evidence of mesenteric gland disease. In the eighth form there will be the history associated with gall stones and foreign bodies, to which attention has been directed. In the ninth variety, the tumour, which will probably have origin in the pelvis, may in many instances, be obvious upon examination.

Stricture of the Small Intestine.—History, Age, and Sex. In the matter of sex there is nothing definite to notice. The trouble appears to be about as common in males as in females.

Non-cancerous strictures usually occur about early middle life, while cancerous strictures are rare before forty. König says that strictures due to tuberculous ulceration are most common between the ages of twenty and thirty. The congenital strictures will probably make themselves manifest in early life.

The previous history of the case is seldom of any clinical value. In the non-cancerous cases there may be a history of enteritis, of tuberculous disease, of injury, of strangulated hernia, and even of the impaction of a foreign body.

The part played by these antecedent conditions is dealt with in a previous section of this book (page 203), and the time which may elapse between the assumed causative lesion and the obstructive phenomena has also been alluded to in the section referred to.

Mode of Onset and General Course.—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 which, 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, and follow a tedious and long-extended course.

Before definite obstruction symptoms develop there may be a period marked by obstinate digestive troubles, by "intestinal indigestion," by flatulence, constipation, and some degree of wasting.

Following upon these manifestations the phenomena of obstruction appear gradually. 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 anatomically pronounced before very serious clinical 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 the involved coil of gut becomes abruptly closed by kinking or by some of those methods of producing obstruction which depend upon adhesions.

Thus it happens that in the clinical history of stricture of this bowel we very often find the symptoms beginning with an attack of almost acute obstruction.

The patient may recover from such an attack by the lumen of the bowel becoming cleared, and the phenomena of obstruction may be repeated with varying degrees of acuteness over and over again. In a few recorded cases there has been only one attack; it has been sudden and acute, has seized the patient when in apparent good health, and has led to death in as short a period as seven to ten days.

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 pain in the lower part of his abdomen. On admission the limbs were cold and cyanosed, the face was

livid, the eyes were sunken, the patient was much troubled by vomiting, and the pulse was 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 methods 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 ileum, which had become obstructed by a plug of clayey fæces.†

It is needless to say that such cases do not belong to the category of chronic obstruction. Such abrupt and intense examples of obstruction have been mistaken for strangulation of the bowel by a band.

It will be evident from what has been said that the course of a case of stricture of the lesser bowel is uncertain, and to this may be added the fact that even in chronic cases that course is apt to be extremely irregular and to be marked by great fluctuations.

Pain.—The most conspicuous and most constant feature of this trouble consists in certain attacks of paroxysmal pain which 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 some degree of 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 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,

* Le Diagnostic de l'Étranglement intestinal à Symptômes cholériformes, by Félix Réfrégé. Paris, 1867.

† *Lancet*, vol. i., 1873, p. 42.

sometimes marked by diarrhœa, but more often by constipation. At the commencement the patient complains merely of indigestion and flatulency after food. In time the attacks become more definite and more severe, until at last the sufferer 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 lasting probably not more than two or three minutes.

The severe attacks—which may appear at long intervals—are no doubt due to the temporary blocking of the bowel either by the intestinal contents, or by the bending, twisting, or kinking of the gut. These attacks may be alarmingly acute while they last, and when they have passed away the patient may remain for weeks or months free from any gross intestinal discomfort.

The frequently repeated and almost continuous attacks of pain (which come on every hour or less, and which last some minutes only) are due to disordered and violent peristaltic movements in the hypertrophied bowel above the stricture. These pains are in time associated with visible peristaltic movements and with rumbling and gurgling sounds.

It will be seen, therefore, that the painful attacks in stricture of the bowel are represented by two perfectly distinct types, one due to blocking of the lumen of the gut and one due to a violent and tumultuous peristaltic convulsion in the bowel.

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 have been warded off for a long while by adopting a perfectly fluid diet, and have reappeared at once on any relaxtion of the rule.

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.—Vomiting in these cases, although a constant symptom, is by no means a pronounced or distressing one. During the more severe of the obstructive attacks (attacks that appear early in the case, occur at long intervals and last some time) vomiting is present. It even then appears late and is often scanty. If the obstructive attack, however, lasts for some time (a matter of days), the vomiting is apt to become stercoraceous, although the examples of this are infrequent.

As a rule, the vomiting only becomes stercoraceous towards the termination of the final attack of obstruction. On the whole, vomiting in stricture of the small intestine is a symptom subject to considerable fluctuation. It is late to appear, is often scanty, and is very rarely stercoraceous. When the bowel is really blocked, then the vomiting may, of course, be very copious and very distressing.

During the comparatively minor attacks of pain, which become the most conspicuous feature of the case, there is seldom much vomiting. There is nausea and occasionally some sickness. The vomiting seems to be the more ready the nearer the obstruction is to the stomach, and it is often distinctly and repeatedly provoked by food.

Constipation.—The state of the bowels is subject to great 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 obstructive 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.

While purgatives give distinct relief in the earlier stages of the case, they usually in the course of time add greatly to the patient's distress by increasing the intensity of the futile peristaltic movement in the hypertrophied bowel.

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.* I have not met with any other example of this symptom. In a few cases of malignant disease of the lesser bowel melæna has been reported.

Constitutional Symptoms.—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, the impaired condition of digestion and the consequent malnutrition. Emaciation is usually pronounced, and the patient's wasted and cachectic aspect may be such as to suggest the presence of malignant disease, even in the case of a simple stricture.

When malignant disease does exist in the bowel, the emaciation and loss of strength are more marked, appear earlier, and advance more rapidly.

The question of indicanuria is discussed on page 308. Septic absorption from the bowel may lead to occasional elevations of temperature.

In only one recorded case do I find any account of 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.†

The Condition of the Abdomen.—The abdominal walls remain flaccid except during some of the more painful paroxysms, or after the development of peritonitis, or during a long-abiding obstruction.

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 need not be swollen, and its walls, indeed, may be retracted, especially in cases associated with much wasting and diarrhœa. In the latter stages of the case there will be more or less abiding meteorism.

It is very usual for the movements of the intestinal coils to be visible through the parietes, a circumstance that is

* Bull. de la Soc. Anat. de Paris, 1875, p. 299.

† Bull. et Mém. de la Soc. de Chir., tome vi., 1880, p. 607; M. Berger.

to be especially noted during the paroxysms of pain. This symptom is one of the utmost importance. It indicates the presence of a long-abiding, incomplete obstruction and of hypertrophied coils above it. It indicates also an advanced stage of the trouble. (*See* page 304.)

In no instance among the recorded non-malignant cases was any tumour formed by the stricture to be felt, nor any localised dulness present that could assist in the diagnosis of the ailment.

In the cases of cancer a tumour has been detected in some 30 per cent. of the recorded cases.*

Areas of dulness due to an accumulation of fluid in the gut above the stricture are fairly common. Equally common is it to obtain, on palpation, splashing sounds as of water in a membranous bag. (*See* page 398.)

Rumbling and gurgling sounds are commonly heard, and are audible to others than the patient. They are especially noticed during the attacks of pain. These sounds, together with the movements of visible coils, are much increased by purgatives. (*See* page 398.)

Except in the presence of complications, the abdomen, in cases of stricture of the small intestine, is not tender.

Stricture of the Duodenum.—Stenosis of the bowel in this situation calls for a few words of special comment.

Congenital strictures of the duodenum are described on page 232.

Both cicatricial and malignant strictures have been met with in this part of the bowel.†

Malignant growths in the duodenum are very rare. Owing to the large size of the duodenum and the fluid character of the matter which passes through it, the symptoms of stricture in this part are but slowly developed.

When the stricture is situated in the duodenum above the point of entry of the common bile duct, the symptoms produced are hardly to be distinguished from those of stricture of the pylorus. There are gross evidences of gastric disturbance with pain in the epigastrium, vomiting at intervals, dilatation of the stomach, loss of appetite, and wasting. When the stenosis is due to a cancerous growth, there may be hæmatemesis, and a definite tumour may sometimes be felt in the right hypochondriac region.

* *See*, for example, a case by Morton ; Path. Soc. Trans., 1893, p. 89.

† Cicatricial Stricture. *See* Lange ; Annals of Surgery, vol. i., 1893, p. 588. Malignant Growths. *See* Kast and Rumpel; Illustrations of Path. Anat., part iii., and Whittier; Trans. of the Assoc. of American Physicians, 1889, p. 292. Sarcoma, Rolleston. *See* Trans. Path. Soc., 1892, p. 67. Moore; Ibid., 1883, p. 99.

When the stricture is at or below the entrance of the common bile duct, there is, in addition to the gastric symptoms above alluded to, a copious vomiting of bile, together with possible jaundice and not infrequently with dilatation of the gall bladder. The symptoms, indeed, are closely allied to those of cancer of the head of the pancreas in which the lumen of the gut is encroached upon.

The contents of the stomach are commonly said to be neutral or alkaline in these cases, and to include pancreatic secretion.

Constipation is common, there is no meteorism, and indeed the abdomen is usually quite flat or even sunken in.

Allusion has been made on page 299 to a case of Dr. Pye Smith's, in which the vomited matter in an example of stricture of the duodenum is said to have had "a decidedly fæcal odour."

Sometimes it has been noticed in these duodenal cases that a few hours after the stomach has been washed out there is a copious vomiting of bile-stained, ill-smelling matters. This represents fluid which was lodged in the dilated duodenum when the stomach was being washed out, and which was poured into that viscus soon after it had been artificially emptied. The persistent flowing of large quantities of bile into the stomach is a conspicuous symptom —when present—of duodenal stricture. In some reported cases the dilatation of the duodenum above the stricture has been simply enormous. One writer says that the duodenum could hardly be distinguished from the stomach, so large had the bowel become.

Generally speaking, the vomiting in cases of duodenal stenosis appears early, and is distinctly influenced by food.

Stricture of the Ileo-cæcal Valve.—No distinctive features attend stricture of this part. They are for the most part identical with those associated with stenosis of the small intestine, except that the vomiting is usually slighter, and symptoms are not induced by taking food. In some examples—the minority—the symptoms resemble those of stenosis of the colon.*

Among ten recorded 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 stercoraceous in three instances, remained non-stercoraceous in four, and is indefinitely described in one example. In each instance the general condition of the bowels was that of chronic

* *See* case by Dr. Raymond Johnson; Path. Soc. Trans., 1889, p. 112.

constipation. In one case only 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, alluded to on page 21, 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, two died after operation, two from perforation, while four succumbed to the effects of long-continued obstruction of the bowel.

II. STENOSIS OF THE COLON.

Under this heading the following different varieties of obstruction of the colon may be classed:—

1. Some cases of bending of adherent colon (page 86).
2. Compression of the gut by adhesions (page 90).
3. Some cases of volvulus of the cæcum (page 345).
4. Obstruction by neoplasms (page 259).
5. Compression by a tumour outside the gut (page 269).
6. Some cases of enterolith (page 372).
7. Stricture of the colon (page 202).

The only common form of obstruction is the last-named—stricture of the colon. This represents the type of chronic obstruction of the large intestine, and in the following account the symptoms given are the symptoms of stricture.

The symptoms associated with the other 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 never 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 (page 400).

Stricture of the Colon.—History, Age, and Sex. In the matter of age and sex and previous history there are the same circumstances to be noted which have been detailed in dealing with stricture of the lesser bowel (page 400). Certain examples have been recorded of cancer of the colon in quite young patients, and this has led to the statement made by some writers to the effect that cancer at an early

age is more often met with in the colon than elsewhere. The youngest patients upon whom I have operated for cancer of the large intestine were a woman aged twenty-three and a man aged thirty.

To what has been said of the previous history, in dealing with the small intestine, must be added the circumstances in connection with the colon, of colitis, dysentery, syphilitic and tuberculous ulceration.

Mode of Onset and General Course.—The resemblance between the clinical aspect of stricture of the lesser bowel and stricture of the colon is close, and in general outline the two affections follow a nearly identical course marked by symptoms of the same common type. In many instances it is difficult and indeed impossible precisely to differentiate between stenosis situated in the two segments of the intestine.

Pain.—The most conspicuous symptom consists of attacks of paroxysmal pain which appear at intervals. These attacks resemble those already described in dealing with 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. The earlier attacks depend, no doubt, upon some temporary obstruction of the stricture; the later paroxysms of pain on disordered peristaltic movements. These two causes of pain have been already considered (page 294). The pain is usually less severe than is the case in the paroxysms attending stricture of the small intestine.

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 definite 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

* Bull. de la Soc. Anat., 1870, p. 322.

commonly relieved, at first at least, by the administration of a purge. In cases, however, involving the colon the opposite obtains. Aperients are apt to aggravate existing symptoms, a circumstance which 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, 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 cases in which the stricture is due to cancer appear to be attended by more pain than obtains in the examples of simple stricture; possibly this is due to the fact that the patient's general condition in malignant disease renders him less tolerant of pain. Severe pain in the back is not uncommon in cancer of the colon, especially in cancer of the sigmoid flexure.

In one recorded case the malady appears to have actually commenced with severe pain in the back which lasted for two or three months. Here also the growth was in the sigmoid flexure.*

I have known a case of cancer of the cæcum in which most of the pain was complained of in the left iliac fossa. Examples of this "crossed pain" are not uncommon in the abdomen.

An increase in the pain just before the bowels act is not uncommon, especially when the stricture is low down in the colon on the left side.

Vomiting.—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. In the majority of cases it tends to appear late and be very scanty. In the graver 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 stercoraceous except during the obstruction that immediately precedes death. Even in such a circumstance the cases of stercoraceous vomiting are to those of non-stercoraceous vomiting as 5 to 7. So-called fæculent vomiting depends more upon the duration and completeness of the occlusion than upon its situation in the colon. There

* *Lancet*, vol. i., 1875, p. 369.

are, however, some striking exceptions to this. Thus, in three cases alluded to below, where the duration of complete constipation was respectively eighty-eight, thirty, and forty-six days, the vomiting was not severe and never became stercoraceous.

In another case the ejected matters did not become stercoraceous until the fourteenth day of absolute constipation, the patient dying about the sixteenth day. Other things being equal, stercoraceous vomiting is the more common the higher up the obstruction is in the colon.

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.

In one case of cancer of the colon reported by Dr. Bristowe vomiting occurred during the early obstructive attacks, but not during the final obstructive attack which preceded death.*

Constipation.—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 thirty cases of simple stricture constipation was the prevailing condition in twenty-three instances. In the remaining seven examples there was constipation alternating with marked diarrhœa.

In thirty cases of cancer of the bowel attended with stricture there was marked constipation in fifteen examples, and constipation alternating with diarrhœa in twelve instances, while in the remaining three cases diarrhœa was the predominant feature. It will be seen, therefore, that diarrhœa is more common in cases of cancer. The diarrhœa in stenosis of the colon is of the type known as "spurious diarrhœa," which has been fully considered on page 394.

In a few rare cases the diarrhœa may depend upon a fistulous communication between the colon and the small intestine. Such a case is reported by Dr. Raymond Johnson.† Here a mass of columnar-celled epithelioma, producing stricture, was found in the transverse colon of a woman of sixty-four. The stricture would admit the little finger. To the malignant mass the ileum was adherent, and the ulcerating growth had led to a fistulous communication between the transverse colon and the ileum at a point five feet distant from the termination of that intestine. The fistulous opening admitted the little finger.

* Path. Soc. Trans., vol. xxiii., p. 119.

† Ibid., 1889, p. 111.

The patient had suffered for two years from increasing distension of the abdomen and increasing constipation. Three days before her death diarrhœa set in. The motions were noticed to be watery and pale yellow in colour, and there is no doubt but that they were formed by the contents of the ileum, which had passed directly into the transverse colon.

If the patient die of intestinal obstruction, the final attack is usually 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 forty-six days,† and even of eighty-eight days, as occurred in a case of cancer of the bowel reported by Mr. Cooper Forster.‡ 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 directly than purgative medicines. It has been shown that in some cases water can be injected through the stricture from below, but not from above.

In the earlier stages of the case definite relief usually follows the administration of purgatives, but as the stricture becomes more narrow aperients cause intense pain, increasing the already excessive peristaltic movements and forcing the intestinal contents against the obstruction.

No action of the bowels will in time follow upon the taking of purgatives, in spite of the intense colic produced.

In not a few instances which have come under my notice very acute symptoms have followed upon the giving of a smart aperient. There has been not only violent colic, but also vomiting and a certain degree of collapse. I have known death to follow in twenty-four hours after the administration of a strong purgative in a case of rigorous stricture of the colon.

In more than one example one notices in the history of cases that the true nature of the trouble was first revealed by the disastrous disturbance induced by an unfortunately-timed aperient.

In about 15 per cent. of all cases of cancer of the colon a bloody discharge from the anus has been observed. In the larger proportion of these cases the stricture is in the sigmoid flexure.

* Dr. Coupland; Path. Soc. Trans., vol. xii., p. 94.
† *Lancet*, vol. ii., 1869, p. 80.
‡ Guy's Hosp. Reports, 1869, p. 377.

The blood is usually quite trifling in amount, although I have seen an instance of copious hæmorrhage in a case of cancer of the sigmoid flexure.

It is to be remembered that stricture of the left colon is not infrequently associated with piles. This association is, I think, much more frequent when the stricture is cancerous.

Bloody discharge from the anus will not be met with in association with the simple stricture.

I am not aware that any fragments of malignant growth have been discovered in the motions in cases of cancer of the colon.

When the obstruction involves the sigmoid flexure, the motions, when solid, are often flattened or much narrowed, or are grooved or fluted, or are passed with a spiral outline. Such stools may be noticed to be smeared with blood or mucus.

The question of the importance to be attached to alterations in the shape of the motions will be found discussed on page 394, to which reference should be made.

Ballooning of the Rectum.—This term is applied to the following condition. The finger is introduced into the rectum, and that bowel is found to be empty and to have its walls apparently dilated to the utmost. The finger, after passing the sphincter, appears to come suddenly into an open space. It requires a fair range of movement for the bowel wall to be touched, and there seems to be quite a considerable distance between what are usually opposed surfaces of the gut. The rectal wall, when touched, appears to have been stretched and to have become fixed in the stretched condition. The surface is smooth, the velvety feeling is lost, and the familiar rugæ have vanished. The finger seems to have been introduced into an empty shell. The rectum appears, moreover, to be fixed, and gives the impression of being a mucous-lined cavity with rigid walls rather than the lax soft tube it is.

The condition is due to some disturbance in the innervation of the rectum, and is due to no mere distension of the bowel. It disappears under an anæsthetic, but is not made to vanish by such dilatation of the sphincter as would allow of the escape of gas.

Ballooning of the rectum has been already considered in previous sections of this work. (*See* page 399.)

Ballooning of the rectum is often met with in association with stricture of the left side of the colon.

It is not, however, alone due to this condition. It may be met with in connection with tumours about the pelvic

brim and with a loaded sigmoid flexure or descending colon in cases of fæcal accumulation. In such instances it is possible that the innervation and blood-supply of the rectum may be interfered with by pressure. I have met with this symptom in subacute perityphlitis and in certain cases in which a neurotic element is conspicuous in the general assemblage of the patient's symptoms.

While this symptom is not sufficiently definite in its associations to be diagnostic, it must always when present raise a suspicion of stenosis of the colon. As I have already said (page 399), I believe that the majority of the examples of ballooning of the rectum are in association with stricture of the left side of the colon.

Constitutional Symptoms.—The general condition of the sufferer in these cases may be expressed in the same words which have been applied to the cases of those afflicted with stricture of the lesser intestine.

There are the same wasting, the same loss of strength, and in cases of cancer the same manifestations of anæmia and cachexia. Emaciation proceeds less rapidly when the colon is involved than when the small intestine is concerned. I have noticed that stricture of the colon is often attended with very marked mental depression bordering sometimes upon hypochondriasis. Very often in cases of cancer of the colon the symptoms of obstruction have appeared at a time when the patient has seemed to be in quite perfect health, and the very condition of bodily vigour has been used as an argument against the presence of malignant disease.

Among the special symptoms of stricture of the colon must be noticed tenesmus. It is especially apt to occur in cases of stricture low down in the colon on the left side, and particularly in cases attended by diarrhœa. I think it is more marked in the early than in the later stages of the disease and is probably not present in more than one-third of the cases. Tenesmus would appear to be more common in examples of cancer than in instances of non-malignant stricture.

Strangury is very uncommon in stenosis of the colon above the confines of the rectum.

When fever exists, it is due either to some septic absorption from the loaded intestine or to suppuration about the stricture.

The Condition of the Abdomen.—The abdominal walls remain flaccid unless there be great distension or unless some peritonitis has developed. There is but little meteorism so long as the bowels act, and in cases associated with persistent

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.

Often the outline of the colon distended with fæcal matter is very evident, and in any case the distension is most marked in those parts of the abdomen which are occupied by the large intestine. The outline of the colon, moreover, may be indicated by some dulness 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 sometimes to form very distinct tumours, the nature of which has not always been accurately diagnosed.

Coils of intestine in movement are very apparent through the parietes. Sometimes these hypertrophied coils are quite enormous. Movements in the coils are associated with colicky pains, with loud rumbling and gurgling sounds as of the bubbling of gas through water. A coil on percussion may be at one moment resonant; then when a peristaltic wave passes along it the gas which causes the resonance is driven out, and, the fæcal matter lodged in the coil alone remaining, the percussion note becomes dull. Coils distended with fluid, giving the sense of membranous bags filled with water, are often to be made out, especially after aperients have been administered.

The subject of distended coils in visible movement and of the gurgling and bubbling sounds heard in cases of chronic obstruction is dealt with on pages 304 and 315.

In cases of simple stricture no *tumour* is to be felt, but in cases of malignant disease a tumour is to be detected through the abdominal walls in no less than 40 per cent. of the examples.

Any tumour which exists may very readily be concealed by the rigidity of the abdominal wall or by the existence of even a moderate degree of meteorism. A small cancerous growth in the hepatic or splenic flexure may be so placed beneath the ribs as to be incapable of being felt from the surface. It must be remembered that a cancer of the colon may cause a fatal obstruction of the bowel, and yet be of quite small dimensions, and form no more than a rigid and narrow ring around the intestine.

The tumour, when it exists, appears as a hard, rounded, and possibly nodular growth, which is often tender on handling, which cannot be felt at all times, and which has

a degree of mobility corresponding to the segment of the colon in which it occurs.

The tumour may appear and disappear and appear again in the course of half an hour's examination of the abdomen, should there be hypertrophied coils in movement. As the bowel about the tumour undergoes contraction the mass is very apt to come prominently forwards.

Sometimes the tumour is absolutely callous on handling. Less often it is tender, and I have known a case of cancer of the sigmoid flexure in which the tumour was always very tender.

It is to be remembered that fæcal masses are very apt to be lodged above the stricture, and these may easily be mistaken for the growth or may greatly exaggerate the apparent size of the growth.

If the fæcal mass can be cleared away by enemata and aperients, the tumour may appear to vanish, and the belief be aroused that the case is merely one of fæcal accumulation.

The tumour may be at one time dull on percussion, and at another time resonant. This will obviously depend upon the relation to it of bowel which is full of solid fæcal matter on the one hand, or is distended with gas on the other.

As an example of the ease with which the surgeon may be deceived with regard to a tumour of the bowel, the following case, reported by Nothnagel, may be given :—

A woman, aged forty, began in May to have a good deal of abdominal discomfort and trouble with her bowels. By June she had well-marked phenomena of stricture of the bowel, marked by paroxysms of colic, by visible peristaltic movements, by gurgling in the abdomen, and by increasing constipation. In July a tumour appeared in the right iliac fossa ; it increased when the bowels were confined, and diminished when they were open. It was hard, uneven, and tender. The symptoms of obstruction became more and more marked, and the patient became weaker and emaciated. In October the tumour in the right iliac fossa formed a hard, unvarying mass which was not fixed, and which was diagnosed to be a cancerous tumour of the colon. In November an abscess formed about this tumour, which gave vent to very foul pus when incised. The patient died shortly afterwards. The *post-mortem* revealed a narrow stricture at the commencement of the ascending colon. The terminal part of the ileum was much dilated, and in it was lodged a large collection of cherry, plum, and grape stones. These stones, closely packed together, had formed the tumour, which had been mistaken for a cancerous growth.

Tumours formed of coils of bowel matted together by a local peritonitis have been mistaken for masses of cancer.

Mr. Henry Morris has reported two cases, one of cancer

of the ascending colon and one of cancer of the descending colon, in which the tumour was mistaken for a movable kidney.*

In certain conditions the sigmoid flexure can be felt in the left iliac fossa as a hard, defined, rounded cord of varying length, and of about the diameter and substance of a large adult thumb. Such a segment of the gut has been mistaken for a cancerous tumour.

This condition of the sigmoid flexure is due to a thickening of the bowel and a contraction of its muscular walls. It vanishes or becomes less under an anæsthetic. This curious contraction may be met with in any form of colitis in which the sigmoid flexure is involved. It would seem as if the gut is—owing to its being inflamed—in a state of irritability which presents itself under the form of an abiding contraction.

There is often constipation alternating with diarrhœa. The bowel appears to resent the entrance of fæcal matter into its tender and sensitive lumen, and such matters as do enter are rapidly expelled with discomfort and often with tenesmus. The contracted bowel is usually tender, and seems to contract more if much handled. The patient often complains of a tender and painful spot in the left iliac fossa. I have found this condition in quite mild degrees of catarrh of the sigmoid flexure, and the constipation with which it is associated is often relieved by opium. Leube calls this condition of the bowel sigmoiditis chronica.

A stricture in the sigmoid flexure or even in the lower part of the descending colon has been 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 as far as the sigmoid flexure.†

III. CHRONIC INTUSSUSCEPTION.

By an arbitrary division those cases of intussusception are considered to be chronic which have lasted for more than one month.

Details as to frequency of occurrence, sex, age, and mode of onset have already been given (page 349); and in the account of the acute forms a general notice has been taken of the symptoms of invagination (page 351).

* *Lancet*, April 27, 1895.

† *New York Med. Journ.*, vol. xix., 1874, p. 622.

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 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 145, 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 wandering spleen,* for dyspepsia, for chronic dysentery, for gastro-enteritis, for tuberculous 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 reported 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 a young man, which he affirms had existed for no less 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,

* Clin. Soc. Trans., 1898, p. 227.

† Prager med. Wochenschr., No. 21, 1883.

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 attacks of pain grow shorter and the pain itself becomes 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 (page 351).

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. Stercoraceous 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 **state of the bowels** is most variable. Natural and regular stools may be passed during the 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 which 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 subject of visible intestinal coils in movement and of the gurgling and bubbling sounds which attend this condition is dealt with on page 304.

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.

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.*

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 which 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 (page 358). The tumour may vary in position and consistence from day to day and even from hour to hour.

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.

Dr. Coleman reports a case—in a boy aged eight—in which the symptoms had existed for eighteen weeks, and in which a tumour could be felt for at least four weeks before operation.

IV. FÆCAL ACCUMULATION.

Clinical Manifestations.—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.

It is common to find a history of dyspepsia, of imperfect teeth, of hurried or irregular meals, and of long-continued

* Path. Soc. Trans., vol. x., p. 160; Dr. Quain.

neglect of the bowels. Some patients date their constipation from some long illness. Many present the phenomena of the "neurotic."

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. (*See* page 393.)

In such cases an examination of the rectum may reveal the fact that that gut is blocked by fæcal matter.

These symptoms of troublesome constipation 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 is very foul, his breath most offensive. He is much troubled by indigestion, by distension after food, by flatulency, and by eructations, etc. There is a foul taste in the mouth. He not infrequently becomes much weakened and loses flesh. He may become lethargic and morose, or fretful, irritable, and uneasy, and present some phase of hypochondriasis.

Some patients in this condition complain of languor, and are disposed to sleep a great deal. Others complain of headache and vertigo, and possibly of dulness of intellect. Two cases—both in women past middle age—have come under my notice in which the patient, after suffering from complete constipation for some weeks, became delirious and ultimately insane. In each instance the patient was removed to an asylum, and the complete evacuation of the bowels by enemata was followed by a speedy recovery of the mental condition.

In these examples of marked and long-continued constipation the patient is apt to look ill and to present some of the phenomena of intestinal self-poisoning. The skin is often dull, greasy, and unwholesome-looking, and gives out

a distinctly unpleasant odour. The conjunctivæ are often yellow, a symptom due to the absorption from the bowel of certain chromogens which are the products of decomposition. Other symptoms may appear, conspicuous among which are fever, *malaise*, headache, some delirium, and very usually vomiting. The rise of temperature noticed so often in these cases is no doubt due to septic absorption from the bowel, and I have especially noticed that the rise of temperature is most common after the fæcal mass has been disturbed. Thus some fever is quite common after the dislodgment of a quantity of retained fæces by enemata or other means. It is possible that the phenomena, depending on absorption of decomposition products from the bowel, may go beyond this. Middleton* describes a case of fæcal accumulation in which the symptoms which preceded death were persistent vomiting, high temperature accompanied by delirium, and inflammation of the parotid. The autopsy revealed a large collection of hard fæcal matter in the colon, but no mechanical or organic obstruction in any part of the bowel.

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, of nocturnal emissions or nocturnal enuresis, or of pain in the thigh (genito-crural nerves), or down the leg along some part or parts of the great sciatic nerve. Sciatica is not uncommon in cases of fæcal accumulation.

Or injurious pressure may be exercised upon certain veins: upon the spermatic veins; upon the pelvic veins, causing piles, catarrh, or hyperæmia of the uterus, or menstrual irregularities; 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 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. Visible coils in movement are only seen when there has been a long-continued block. This symptom is never so marked as it is in cases of stricture, and is often

* *Glasgow Med. Journ.*, 1891, p. 343.

† *See* case, Path. Soc. Trans., vol. xxiii., p. 104.

‡ Path. Soc. Trans., vol. iii., p. 106.

absent even in severe cases. 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 stercoraceous. The abdomen is the seat of more or less constant colic, which is, however, as a rule not intense. 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 more 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 an unyielding obstruction, of which he dies, unless he succumb to the effect of intestinal septicæmia.

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 taking twelve grains of morphia a day.† In another case 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.††

* Holmes's System of Surgery, vol. ii., p. 725, 3rd ed.

† *Boston Med. and Surg. Journ.*, vol. xv., Nov., 1876, p. 601.

‡ *Amer. Journ of Med. Sc.*, vol. lxviii., 1874, p. 440.

§ *North Amer. Med. and Surg. Journ.*, vol. iv., p. 262.

‖ Dr. Baillie, Trans. of a Soc. for the Promoting of Med. and Chir. Knowledge, vol. ii., p. 174.

¶ Staniland; *Lond. Med. Gazette*, vol. xi., p. 245.

** Dr. Crampton; Dublin Hosp. Reports, vol. iv., p. 303.

†† Dr. Valentine; Bull. des Sc. Méd., tome x., p. 74.

In another and common class of cases the patient is liable from time to time to what may be termed obstructive attacks. I have known three such attacks to take place within twelve months, the bowels having been well cleared out after each attack. In these attacks it is probable that the much narrowed canal becomes more or less suddenly blocked, whereas in the previous class of cases 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. In a few cases a volvulus of moderate degree seems to have formed.

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 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 severe. It may, however, become stercoraceous, but this is rare. All the symptoms are commonly aggravated by taking food. Coils of intestine may occasionally be visible, and more or less constant borborygmi will be heard in the abdomen. The symptoms may become worse and worse, and the patient may finally die of exhaustion and intestinal septicæmia.

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 stercoraceous 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.*

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 usually 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 tumour is the seat of much tenderness, a circumstance that probably depends upon some ulceration of the bowel (stercoral ulcer). 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 (Fig. 115).

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. Some of these lumps are of stony hardness. Indeed, tumours in this situation have been compared to a large rosary on account of their uneven and nodular surface and their density.

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. This feature in the fæcal mass is, however, quite uncommon. I have encountered it most often when I have felt a loaded sigmoid flexure through the rectal wall.

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, for sarcoma of the omentum, for retroperitoneal sarcoma, for tuberculous glands, 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.

Dr. Worrall* reports the case of a girl of thirteen upon whom laparotomy was performed for a rapidly increasing abdominal tumour. It proved to be a colon loaded with fæces.

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. It is certainly remarkable.

Dr. Gersuny† mentions the following as a feature of the fæcal tumour. If the tumour be firmly pressed with the finger the intestinal mucous membrane is made to adhere to the fæcal mass. When the pressure is removed the mucous membrane frees itself, and the act of its withdrawing itself from the solid mass is, according to Gersuny, capable of being appreciated. He illustrates the sensation conveyed by the pressing of an oiled finger into the palm of the hand and the slow withdrawal of it from such contact.

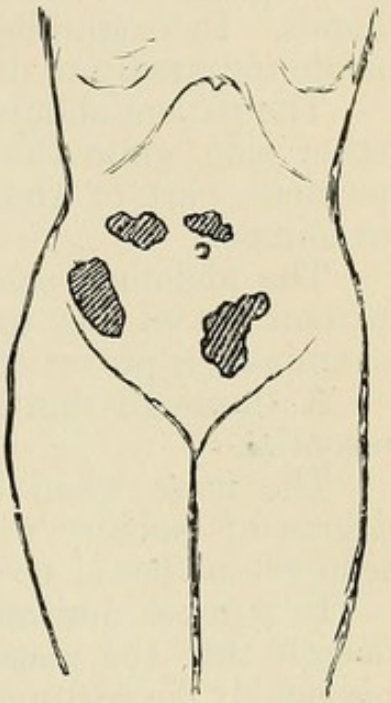


FIG. 115.—Diagram showing the positions in which fæcal masses are common.

I cannot say that I have been able to appreciate this phenomenon up to the present time. When gas has passed along a colon containing a fæcal tumour I have become aware that the bowel wall has been removed from the mass which I have been examining with my fingers, but such an experience is uncommon and is seldom convincing.

As much importance attaches to the appreciation of a fæcal mass, a word may be said as to the examination of the abdomen when such a tumour is suspected.

The patient must lie upon the back with the shoulders raised and the knees bent. The mouth should be open and the patient be told to take several very deep breaths, in order to get the abdominal muscles lax. The surgeon's hand should be warm, and should be laid gently upon the abdomen. The examination must be made with the whole row of fingers at once. They must be gradually pressed deeper

* *New York Med. Record*, 1888, p. 723.

† Wien klin. Woch., Oct. 1, 1896.

and deeper, and must be continually moved to and fro. The abdominal muscles soon become accustomed to the pressure and cease to resent it.

The cæcum is easily examined. In examining the ascending or descending colon the left hand must be placed in the corresponding loin and be made to push the tissues forwards towards the right hand, which is placed on the abdomen. The segment of the colon is thus brought between the two hands. In examining the two flexures the patient must be made repeatedly to draw a deep breath.

The patient should be turned upon first one and then the other side, while the loin, which is uppermost, and the dependent part of the belly, which is lowermost, are being examined.

The abdomen should also be well manipulated while the patient is on his hands and knees. In this attitude an examination proves often to be of the greatest service.

A thorough digital exploration of the rectum is most essential.

The mass when discovered will be found to have the degree of mobility which is to be expected in the particular segment of bowel occupied. This mobility is not very great.

It is most desirable to take the utmost pains to satisfy oneself that the mass is really in the colon, or that it can reasonably be assumed to be in the colon.

The tumour is practically always rounded upon its presenting surface. The sarcomatous growth of the omentum, which is often so like a fæcal mass, is quite flat on that surface which is in contact with the anterior abdominal parietes. The growth, moreover, often has great mobility, and slips out of the way on a mere touch. It is, moreover, seldom tender, whereas the fæcal mass is very often tender on handling. Scybalous lumps when in the sigmoid flexure often stand out with quite remarkable clearness.

In conclusion, two things have to be remembered. In the first place, any one of the conditions which have been mistaken for a fæcal mass may be in existence at the same time as the fæcal tumour. I have many times seen a large fæcal mass above a cancerous stricture of the colon. The fæces could be felt, but not the stricture. I have known the utmost confusion in diagnosis to arise in a case in which a dermoid cyst of the ovary was associated with an enormous collection of fæces in the transverse and ascending colon.

I have removed gall stones from a gall bladder, in front

of which was a large mass of old impacted fæces which had been confidently regarded as representing the fundus of the gall bladder. The real fundus of the gall bladder could never have been felt in the case in question.

In the second place, a perfectly astonishing amount of fæcal matter may be stowed away in the abdomen without presenting any physical signs sufficient to attract the notice of the surgeon.

CHAPTER VIII.

THE COURSE AND PROGNOSIS IN CHRONIC INTESTINAL OBSTRUCTION.

1. **Stenosis of the Small Intestine.**—It is well known that a non-malignant stricture of the small intestine may exist for years, or probably for a lifetime, and yet cause no symptoms, provided that it does not encroach too much upon the lumen of the bowel.

The present section is only concerned with such cases of stricture of the bowel as are so narrow as to produce definite symptoms of intestinal obstruction.

The duration of the case is reckoned from the onset of obstructive symptoms to the termination of the trouble by operation or death.

An examination of recorded cases shows that the average duration of examples of all kinds, both simple and malignant, is from three to six months.

In instances in which the stricture has become suddenly blocked, or the narrowed bowel kinked, the total duration of the symptoms has been as short as eight days. These cases have been acute, and the obstructive symptoms have appeared suddenly in patients who have exhibited no bowel derangement. In another series of examples the patient has—in cases of non-malignant stricture—continued to present obstructive symptoms for as long a period as eighteen to twenty-four months. Such a course has been rendered possible by the most careful treatment, especially in the matter of dieting.

In Kœberlé's case (page 528) the symptoms of stricture had existed for two or three years before the patient was relieved by operation.

The prognosis in stricture of the small intestine is absolutely unfavourable unless the case be relieved by operation;

and when the stricture is due to malignant disease an operation can only be expected to act as a palliative measure.

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 there are few cases where continued relief has been obtained by these means, yet many cases show that it is quite possible. As examples of this I may quote an instance of stricture of the ileo-cæcal valve where this method of spontaneous cure had taken place. In this instance the ileum above the stricture had communicated with the colon below it.*

In another case in which the transverse colon was occluded by cancer, a communication had been effected between the colon and the ileum.†

It is possible also for a fæcal fistula to form above the stenosed part, which, by a communication with the surface, plays 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 tuberculous 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.

In stricture of the small intestine death is due to many causes.

Some die of acute obstruction depending upon the blocking, kinking, or twisting of the stenosed bowels.

Others die of exhaustion or succumb to the remote effects of the malignant growth. Peritonitis and intestinal septicæmia mark the closing scenes in many instances. Death has been ascribed to septic pneumonia and to heart failure.

I have seen a case in which death was due to the diarrhœa which is an occasional feature of these cases, but which in this instance became persistent, acute, and uncontrollable.

2. **Stenosis of the Colon.**—What has been said about stricture of the small intestine applies, with little modifi-

* Path. Soc. Trans., 1870, p. 171.

† Ibid., 1889, p. 111; Dr. Raymond Johnson's case.

cation, to the like trouble in the colon. The duration of the disease dates from the onset of symptoms of actual obstruction.

The average duration of the symptoms in stricture of the colon is from three to nine months. This includes cases of all kinds. In a few instances the earlier symptoms are so insignificant that the patient has made no complaint until the final obstructive attack has occurred. Such cases appear to afford examples of stricture which are fatal in sixteen days or even less. The fallacy in such cases is obvious.

On the other hand, it may be said that the duration of life in cancer of the colon may extend from six months to two years. In this estimate it is assumed that an operation has been performed to relieve obstruction symptoms when they occurred, but that there has been no such radical measure carried out as excision of the affected segment of the bowel.

Death is due to many causes. The majority succumb to the direct effects of intestinal obstruction, some perish from operations, and not a few from peritonitis and intestinal septicæmia.

Perforation of the bowel above the stricture is not uncommon, and in some cases the ulcerated gut in this position has been described as "giving way" or as being "ruptured." Some patients have died from the abscess formed about the stricture, such a focus of foul suppuration being capable of leading to death in many ways.

Among other and less common causes of death must be placed persistent diarrhœa, septic pneumonia, and what is vaguely termed heart failure.

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 preternatural anus. Thus a fæcal abscess may form in the subserous connective tissue and be evacuated externally either by nature or art.* Such abscesses are comparatively common; I have evacuated them in both the cæcal region and in the loins. 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; or, lastly, the fistulous opening

* Dr. Dickinson's case; Path. Soc. Trans., vol. xxiii., p. 161.

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.

Moreover, if the stricture be due to cancer, as it usually is in such cases, the course of events is not materially affected by these natural attempts at relief.

3. **Chronic Intussusception.**—The prognosis of intussusception in general has been considered on page 379, and to this section the reader is referred.

It only need be said here that chronic intussusception is a very fatal malady. Out of the fifty-nine examples of chronic intussusception collected by Rafinesque no less than fifty-one died.

The course of chronic intussusception and its possible duration have been already alluded to (pages 351 and 380).

As to the modes of death, 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.

4. **Fæcal Accumulation.**—The course and duration of cases of obstruction due to the impaction of fæces within the bowel have already been fully dealt with (page 423).

With regard to the prognosis, it may be said to be upon the whole good. Theoretically no person should die of the mere accumulation of fæces in the bowel.

The condition, when it exists, should be capable of being relieved by treatment. Probably in the majority of cases it is successfully relieved by treatment.

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.

Of this accident there are very many recorded cases. The

* Mr. Simon's, case; Path. Soc. Trans., vol. i., p. 264.

part of the bowel which has most usually given way is the cæcum, and next in frequency the sigmoid flexure.

As a rule, the perforation has been into the peritoneal cavity, but it has, in rare instances, been extra-peritoneal and a fæcal abscess has resulted.

In a few cases the patient's death seems to have been due to interference with the action of the heart depending upon an enormous distension of the abdomen.

In not a few examples the termination of the case has been marked by the symptoms of intestinal septicæmia, the patient being poisoned by the products of decomposition absorbed from his own bowel.

In the more rapid cases death may be due to 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 (page 128).

CHAPTER IX.

CHRONIC INTESTINAL OBSTRUCTION ENDING ACUTELY.

THERE is not one of the many forms of chronic obstruction described in preceding chapters in which all the evidences of acute occlusion may not abruptly develop.

If the acute obstructive attack appear 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. Laparotomy has been performed for what was supposed to be a subacute intussusception and nothing discovered beyond a mass of malignant disease in the colon.

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 which 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 fæcal accumulation symptoms very closely resembling those of acute intestinal obstruction may appear if a little peritonitis arise about the greatly distended and perhaps nearly perforated bowel. There will be suddenly presented the symptoms of intense pain, with some collapse, with frequent vomiting and with absolute constipation and marked distension of the abdomen.

Or in other cases the bowel, which has long been loaded,

may become absolutely blocked so that even flatus cannot pass; or acute symptoms may depend upon the kinking or the abrupt bending or the twisting of the greatly elongated and distended colon.

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 obstruction, 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.

Unfortunately, it is not very uncommon for the phenomena of acute obstruction to appear without there having been any noteworthy symptoms of intestinal trouble antecedent to the acute attack. In certain of these cases the acute symptoms appear to seize a patient who is at the time of the occurrence assumed to be in good health.

I have just alluded to the fact that a little peritonitis arising in a case in which there is some chronic obstruction of the bowel may precipitate events and lead to quite acute manifestations. The following is an example of this: A hale-looking man of seventy was admitted into the London Hospital under my care with all the symptoms of acute intestinal obstruction. He was seized with violent pain in the abdomen while at his work two days before admission. He is said to have fainted and to have vomited almost directly. He was too ill to walk and had to be carried home. The pain continued and increased, and the vomiting was frequent and very distressing, and in a note, sent up to the hospital with the patient, the doctor who had seen him before admission stated that the vomited matter had been fæculent. There had been no rise of temperature. The patient was seen some few hours after admission. He was a well-developed man, and was evidently very ill. His temperature was subnormal, his pain had been subdued by morphia; the vomiting, however, continued, the amount ejected was small and the odour of the vomited matter would be described as "intestinal." There was some distension of the abdomen and some tenderness of it, but the latter symptom was not marked. The constipation had

been absolute since the onset of the symptoms and the enemata given had been returned.

The patient was actually at work at the time of the onset of the symptoms, and he said that before the attack his bowels had "given him no trouble."

The abdomen was opened on the third day of the illness on the assumption that there was acute strangulation of the bowel. No such condition, however, was found. There was a cancerous stricture of the sigmoid flexure. Above it there had evidently been some extensive ulceration, for at this spot there were manifestations of recent peritonitis. An artificial anus was established.

In cases of stricture of the bowel in which distinct symptoms of chronic obstruction are present, acute manifestations may follow the administration of a smart purgative.

I have also seen a case in which acute manifestations appear to have followed the giving of morphia. In such an instance it may be that the morphia arrested the activity of the greatly hypertrophied and ever-active intestine, and so led to some condition of mechanical blocking which would be possible with loaded coils which had become inert and passive.

In the less common forms of chronic obstruction like 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 partial 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 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 an account 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 which will be absent in cases of primary acute obstruction. In the former variety of case this 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 cases, as has been already stated, 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 definite obstructive 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 which assume at once an acute character. An acute attack occurring in 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 X.

THE DIFFERENTIAL DIAGNOSIS. ERRORS IN DIAGNOSIS.

The diagnosis of intestinal obstruction is not always easy, especially in acute cases and in the early stages of the trouble. Errors are common, and the number of abdominal affections which have at one time or another been mistaken for intestinal obstruction are very numerous.

In the present chapter the more common of these sources of error are dealt with.

1. **Acute Abdominal Troubles other than Acute Obstruction.**—Almost any acute trouble within the abdomen may, during the first few hours of its existence, be mistaken for acute intestinal obstruction.

As examples of such troubles, may be given the passage of a gall stone or of a renal calculus, the twisting of the pedicle of an ovarian tumour, the perforation of the intestine or stomach, the rupture of a cyst, and like accidents.

In all these abruptly appearing conditions, as well as in acute intestinal obstruction, there is one common and predominating factor—viz. a sudden painful impression has been made upon the sensitive and widely connected abdominal nervous system.

From a clinical point of view, it matters little whether this painful impression is produced by the sudden infecting of the peritoneum by escaping noxious germs and their products or whether it is due to the crushing of the nerves of the biliary passages by the forcible thrusting of a gall stone along a tube whose diameter is about one-third of that of the intruding substance.

This violent disturbance of the abdominal nerves produces certain symptoms which are practically constant. These are intense pain in the abdomen, localised vaguely about the umbilicus if it be localised at all, a varying degree of collapse,

vomiting, and possibly cessation of the action of the bowels. As already pointed out, to these common symptoms has been applied the term "peritonism," that term representing the clinical outcome of a violent disturbance of the abdominal nerve system (page 290).

The symptoms just named are the commencing symptoms of acute intestinal obstruction.

These early symptoms are not due in the least to the fact that the bowel has become obstructed, but to the circumstance that the bowel wall has been violently and abruptly injured (as by strangulation) and that an intense impression has been made upon a sensitive system of nerves.

It is no matter of wonder that at the onset of the trouble the strangulation of a loop of ileum under a band has been mistaken for severe hepatic colic in a patient who had repeatedly passed gall stones, or that the twisting of the pedicle of an unsuspected ovarian tumour has been mistaken for volvulus of the sigmoid flexure in a patient who was the subject of habitual constipation.

Twice I have been called upon to operate on young lads for strangulated inguinal hernia who had no rupture at all. They had been seized with violent abdominal pain, had become collapsed, and had vomited. The pain and prostration had continued, and the vomiting had become frequent and persisting. No action of the bowels had been obtained in spite of enemata. Here, then, were the symptoms of acute intestinal obstruction, and the diagnosis of such obstruction was in both cases encouraged by the discovery of a painful swelling in the inguinal canal which had no impulse on coughing and was irreducible. The symptoms in each instance were due to the torsion of an imperfectly descended testicle, and the bowel was in no way interfered with. The testicles, however, are well supplied with nerves, and these nerves are in very close relation with the great solar flexus—in as close a relation, indeed, as would be the nerves of the colon. The symptoms present were the symptoms which attend an abrupt and violent impression upon any section of the abdominal nerve system, and it is a matter of little moment (so far as the character of the commencing symptoms are concerned) whether that nerve disturbance depends upon a crushing of the testicle or upon the strangling of a loop of bowel.

Although these acute troubles bear a close clinical resemblance to one another at the very commencement, there soon appear in most cases differentiating signs which make a correct diagnosis possible.

A pelvic examination and a careful inquiry into the past history of the case reveal the ovarian tumour whose twisted pedicle has given rise to such severe disturbance; a distending gall bladder and the onset of jaundice mark out the case of hepatic colic, and blood in the urine and other symptoms the case of renal stone.*

It will suffice at first to diagnose the acute case as a case of "peritonism." A few hours will probably make clear the cause of the abrupt impression upon the abdominal nerves.

2. **Acute Peritonitis.**—Among the most frequent errors in diagnosis in connection with abdominal disease must be placed the mistaking of acute peritonitis for acute intestinal obstruction.

In association with this common difficulty in diagnosis it is to be noted that when errors are made it will be found that peritonitis has been mistaken for intestinal obstruction rather than intestinal obstruction for peritonitis.

In the next place the form of peritonitis which has been most often the basis of the error is that due to disease of the vermiform appendix, and next in frequency to this, but very much less common, is peritonitis due to perforation of the stomach or bowel.

Duplay, in an excellent monograph upon the subject, has collected fourteen recorded examples of this error in diagnosis,† and more modern literature teems with instances.

In each instance in Duplay's collection 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 was only discovered when the abdomen had been opened. The great majority of the cases were examples of peritonitis following upon mischief in the appendix. In two instances the cause of the trouble was a perforation of the gall bladder. In an example 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.‡

In not a few of the reported cases of laparotomy in which a "volvulus of the small intestine with peritonitis" was discovered, there is little doubt but that the surgeon was

* Mayo Robson reports three very interesting cases in which hepatic colic was diagnosed as acute intestinal obstruction; Diseases of the Gall Bladder, 1897, p. 25.

† Archives gén. de Méd., vol. xxviii., 1876, p. 513; and ibid., 1879, p. 709. (*See* also Henrot's monograph.)

‡ Bull. de la Soc. Anat., July, 1878.

dealing with peritonitis due to appendix disease, and with an arrangement of the coils of small intestine which was probably not abnormal.

The resemblance between the cases of 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 are constipation, vomiting which may become stercoraceous, and great prostration.

The following points may be noticed in the differential diagnosis.

Mode of Onset.—In both it is usually sudden, and more commonly there are no definite distinguishing symptoms. The past history is often of much value in revealing repeated attacks of perityphlitis or the passing of gall stones or the occurrence of pelvic peritonitis, hernia, enteritis, etc.

Rigor.—A rigor may usher in acute peritonitis, but this symptom is exceedingly rare in association with 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 of peritonitis 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, on the other hand, 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. The pain is often described as burning or tearing.

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. The pain is usually described as a griping pain which would be relieved if flatus could be passed.

The actual pain in peritonitis tends to diminish, the pain in acute obstruction is longer maintained in its intense form.

Vomiting.—In both maladies vomiting appears early, but in acute strangulation it is a much more prominent symptom than in peritonitis.

In the obstructive condition it is more copious, more persistent, more distressing, and more apt to become stercoraceous. In peritonitis the vomited matter may never become stercoraceous, or only towards the end of the case.

Constipation.—Constipation is absolute in the obstruction cases. In peritonitis it may be absolute also, but not infrequently slight motions are passed or flatus is discharged by the anus.

State of the Abdomen.—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.

Intestinal movements may occasionally be appreciated in the early stages of obstruction, but no such movements will be apparent in peritonitis.

Attitude of the Patient.—In acute peritonitis the patient lies quiet. The knees are drawn up and the hands are often held above the head. In acute obstruction the patient is often very restless, and the attitude just described is not observed.

3. **Tuberculous Peritonitis.**—Cases of tuberculous peritonitis have been mistaken for chronic intestinal obstruction. In such instances some swelling can be usually felt in the abdomen, and this has been assumed to be a new growth or an intussusception.

The progress of tuberculous peritonitis is well known to be uncertain, and to be marked by occasional acute developments. In the differential diagnosis of these conditions, however, the temperature and the history of the case are of the greatest assistance.

In chronic tuberculous peritonitis coils of intestine can often be seen through the thinned parietes, and constipation may alternate with diarrhœa. These are also two prominent features in chronic obstruction.

There is, however, an acute form of tuberculous peritonitis 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.* M. Lionville has given a good example of mistaken diagnosis in this variety of tuberculous peritonitis. The subject was a man, aged twenty-three, who was taken suddenly ill 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 fæculent, 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 again passed off. The patient died in three months, and the autopsy revealed nothing but the ordinary evidences of tuberculous peritonitis.†

In the differential diagnosis of these affections it is especially to be noticed that the tuberculous 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 spot that has been especially the seat of pain and tenderness.

During the progress of any case of tuberculous peritonitis, genuine intestinal obstruction may occur from matting together of the coils of intestine, or from bending or kinking of such hoops as are adherent.

4. **Other Diseases which have been Mistaken for Obstruction of the Bowels.**—Under this heading I propose merely to enumerate a few of the maladies which 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. Moreover, these examples of error are exceedingly uncommon.

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

* Bauer; Diseases of the Peritoneum. Ziemssen's Cyclopædia of Medicine, vol. viii., p. 328.

† Bull. de la Soc. Anat. de Paris, 1875, p. 726.

all the features observed in cholera. At the same time there have 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, and 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 in which error in diagnosis had occurred, the cases had been met with during an epidemic of cholera.

Another form of obstruction which may resemble 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-fæculent, and has the peculiar whey-like appearance so often described.

* Fournier and Ollivier; *Gaz. Méd. de Paris*, 1868. The motions were not arrested until two days before death. *See* also Touchard; Note sur un cas d'occlusion intestinale avec diarrhée; *Progrès médical*, No. 5, p. 83, 1892.

† Dr. Todd; *Med. Times and Gazette*, vol. ii., 1865, p. 195. M. Fernett; Bull. de la Soc. Anat., 1863, p. 296.

‡ *Med. Times*, vol. i., 1866, p. 443.

§ L'Union Méd., 1867, p. 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, p. 698; and Vassor, Thèse de Paris, 1862; and Savopoulo, Thèse de Paris, 1854.

Error is most likely to occur when an example of ultra-acute occlusion is met with during an epidemic of cholera.

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 was at first supposed, but to partial obstruction from shrinking of the mesentery.

I have seen a case of lead colic which had been diagnosed at first as hepatic colic, and later in the day as acute intestinal obstruction.

Poisoning by arsenic.—In several instances cases of acute strangulation have excited suspicion of poisoning by arsenic, and the doubt has only been cleared up at the autopsy. Leichtenstern alludes to several examples.

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.† There was possibly, therefore, real obstruction.

Sarcoma of the omentum has simulated true obstruction,‡ and the tumour formed has been mistaken for fæcal masses.

A cyst of the mesentery has been mistaken for an intussusception tumour,§ and an intussusception tumour for a new growth, a mass of fæcal matter, or other swellings.

Tumours formed by fæcal masses have been mistaken for a number of affections (*see* page 426), and notice has already been taken of the numerous diseases which have been confused with chronic intussusception. (*See* page 418.)

The confusion between acute or subacute intussusception and *dysentery* or *enteritis* has been of frequent occurrence.

Hysteria.—It is scarcely necessary to mention that in the more perverse form of neurotic subject the phenomena of intestinal obstruction of a chronic type may be imitated. The imitation is, however, never very close and would deceive no one but a fond mother.

* Guy's Hospital Reports, vol. xiv., p. 272.
† Progrès Médical, 1879, p. 545.
‡ De l'Occlusion Intestinale. Thèse de Paris, 1897, No. 363.
§ Bull. de l'Acad. de Méd., p. 831. Paris, 1880.

Thrombosis of the mesenteric veins.—This condition may imitate intestinal obstruction. A good illustrative case has been furnished by Dr. Rose Bradford.*

The patient was a carman, aged twenty, who was admitted into hospital on August 26th, having suffered from pains in the abdomen, some sickness, slight diarrhœa, and headache for six days.

The pain in the abdomen was referred to the umbilicus. The abdomen was neither tender nor distended, and presented no abnormality on examination. The respirations were rapid, shallow, and jerky. The temperature fluctuated between 100° and 101°. The sickness continued, and the diarrhœa was replaced by constipation. On September 1st the vomiting became severe, and the pain in the abdomen more intense. The temperature sank to 99·6°. The vomiting became stercoraceous; an indefinite mass like a coil of bowel was felt in the left iliac fossa; the bowels ceased to act. On September 3rd the temperature was 96°; the vomiting was still severe; there was a rigor followed by collapse. Laparotomy was performed, no obstruction was found, and the patient died very shortly after the wound was closed. The autopsy revealed phlebitis and thrombosis of the superior mesenteric vein. The jejunum was congested for several feet from its commencement, and one coil, eighteen inches in length, was greatly thickened and swollen, and of a dark purple colour. The cause of the thrombosis was not clearly demonstrated. There seems to have been a little peritonitis present.

See also papers by Barth† and Koster.‡

Thrombosis of the mesenteric arteries.—This condition may lead to quite acute symptoms, and may imitate acute intestinal obstruction. In thrombosis of the mesenteric veins more chronic types of obstruction are imitated. As examples the following cases may be alluded to. Dr. T. E. Gordon§ reports the case of a woman, aged forty-nine, who was suddenly seized with severe abdominal symptoms, closely resembling those of acute strangulation of the bowel. Laparotomy was performed and a thrombosis of the superior mesenteric artery was discovered with hæmorrhagic infarction of a portion of the small intestine. Two feet of the bowel were resected with success.

The following case is reported by Dr. Monro: ‖

* Clin. Soc. Trans., 1898, p. 203.
† Semaine Médicale, 1897, page 395.
‡ Deut. med. Wochen., 1898, May 26.
§ *Brit. Med. Journ.*, vol. i., 1898, page 1447.
‖ *Lancet*, vol. i., 1894, page 147.

A man, aged fifty-one, while lifting a weight felt a peculiar sensation in the lower part of the belly, followed by pain and exhaustion. A few hours afterwards he passed from a pint to a pint and a half of blood by the bowel.

The symptoms then took the form of colicky pains with marked constipation and great weakness. There was some vomiting, the tongue was foul and the temperature sub-normal. The bowels at last failed to respond to purgatives.

The abdomen was distended and a hard mass, the size of an orange, was found in the left iliac fossa. Laparotomy was performed after the symptoms had existed for three weeks.

The mass in the iliac fossa was due to an infarction in the sigmoid mesocolon. The colon was enormously distended and dark in colour. The principal lesion was evidently a thrombosis of the inferior mesenteric artery. The patient died twenty hours after the operation.

PART III.

TREATMENT.

CHAPTER I.

THE GENERAL TREATMENT OF ACUTE INTESTINAL OBSTRUCTION.

THE bases of the treatment of this condition may be considered under the following headings: 1. Rest. 2. The administration of morphia. 3. The evacuation of the lower bowel. 4. The question of feeding. 5. The use of measures other than operation; and 6. The treatment by operation.

The first five of these measures will now be dealt with. The operative treatment of acute intestinal obstruction will be considered in the next chapter.

1. **Rest.**—It is probable that the patient when first seen will be already in bed. It is needless to say that he must be kept at rest in the recumbent position. It is not necessary to insist that he should keep motionless, as after an abdominal operation. The subjects of acute intestinal obstruction are often very restless, and there is no purpose in restraining their movements. Some, indeed, are more comfortable when lying upon one side, with the knees drawn up.

The majority lie flat upon the back, and this is the posture to be encouraged. A bed-cradle adds to the patient's comfort. It removes the weight of the bed-clothes from the abdomen and knees, and rids the much-oppressed sufferer of a feeling of restraint.

If an abdominal operation be carried out, the bed-cradle becomes a necessity.

The bed should be narrow and the mattress firm. It is hopeless to attempt to deal with patients wallowing in the trough of an enormous feather bed. When so placed they cannot be properly examined, or properly nursed or properly handled, and such a bed—which is often a feature

of the modern "best bedroom"—is an impossibility after an abdominal section.

2. **The Administration of Morphia.**—Morphia is an absolute necessity in acute intestinal obstruction, and should be administered with as little delay as possible.

It eases the agonising pain and gives the patient a respite from what is without doubt one of the most terrible forms of human suffering.

Pain, moreover, may be taken as some measure of the degree of shock, and with the subsidence of the pain the more striking manifestations of collapse become less marked or disappear. The drug 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 95·5°; 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 forty-eight in the minute. After an injection of morphia, the tension of the abdomen diminished, the skin filled with blood, the pulse rose gradually to seventy-six, and 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 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. 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 urine is one of the commonest evidences of its beneficial effects.

So remarkable may be the effect of one injection of morphia in acute intestinal obstruction that I have known

* Ziemssen's Cyclopædia of Medicine, vol. vii., p. 499.

a case—which ultimately ended in death from strangulation—in which the symptoms were supposed to have been due to colic and to have passed away under the influence of the drug. Under this impression the patient was allowed to get up.

Morphia, moreover, restores for the time being a state of peace within the disturbed abdomen The disordered peristaltic movements which are associated with the onset of the attack are brought to rest, and the symptoms due to reflex nerve disturbance are reduced to temporary insignificance.

Thus it happens that under the influence of the drug the vomiting may cease or become quite trifling, and the sense of disturbance within the belly cavity may almost vanish.

The part which disordered and excessive peristaltic movements may play in the production and aggravation of certain forms of acute obstruction makes it most desirable that these movements should be checked as soon as possible. A coil may be lightly held beneath a loose band, but under the influence of violent peristalsis in the adjacent loops a large amount of intestine may be drawn beneath the now tense cord and strangulation of a severe type be produced.

Dr. Hoar has recorded the case of a middle-aged lady upon whom I operated for repeated attacks of intestinal obstruction of a subacute type. The laparotomy showed that there was a remarkable gap in the sustentaculum lienis through which there could be no doubt, from the situation of the pain, etc., that bowel had been snared.

In this instance the attacks which had occurred previously to the operation had yielded to atropine or morphia, and it must be inferred that as soon as the disturbed intestine was brought to a state of rest the engaged bowel could withdraw itself from its hazardous position.*

A case of a different type is reported by M. Le Fort. A young man received a kick upon the belly from a horse. Some days afterwards 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

* *Brit. Med. Journal*, April 20, 1895.

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.*

It is easy to imagine also that a volvulus in process of formation may be arrested by the prompt administration of morphia, or even that the untwisting of a volvulus when once formed may be rendered possible by the arrest of all movement in the disturbed bowel.

In the history of certain cases of volvulus of the sigmoid flexure there are accounts of "previous attacks," or at least of attacks of severe intestinal pain, which vanished under morphia, and it is at least conceivable that some of these attacks might have been due to an abortive twisting of the bowel.

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, depends upon disordered peristaltic movements. Some of the most distressing symptoms of the affection are due to these 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.

Some of the reported cases of obstruction that have spontaneously yielded under the effects of opium are not easily explained. As an example 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 administered, but only with the effect

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 635.

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.*

While morphia is of great value in relieving the more urgent and distressing of the symptoms, it must also be observed that its use may seriously obscure the diagnosis in any 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 absent or 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 needed for a proper 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 the more conspicuous evidences of strangulation. In both there was 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 utterly blurred, and serious errors in the diagnosis result in consequence.

* *Lancet*, vol. ii., 1874, p. 726

Examples of this obliteration of the phenomena of disease by morphia must have come under the notice of every hospital surgeon. I have been called to see patients who were actually dying, and in whom an autopsy revealed a coil of strangulated and utterly gangrenous bowel. These patients had been dosed from the first with morphia, and had died without giving a sign. The suggestion that they were dying of strangulation of the bowel has been met with the question, "Where are the symptoms?" It has been pointed out that there was no pain after the initial attack, and little, if any vomiting after the patient came under treatment. The belly was not grossly distended, an enema had led to one or more evacuations of the bowels, and it was stated that until the phenomena of death appeared the patient was cheerful, the tongue moist, and the pulse good.

Yet morphia can do all this and more.

It can disguise the very image of death, and make almost a mock of dying. And it is evident from such cases as are now under consideration that the delusions and the visions begot by morphia are not limited to the takers of the drug.

It must also be remembered that the initial symptoms of acute intestinal obstruction are not always very well marked. These initial symptoms are those which have been described under the title of "peritonism" as symptoms which may mark the onset of any acute and painful accident within the abdomen. Here is a patient in sound health, who has been suddenly stricken with an agony in the abdomen, with vomiting and with collapse. In most cases time alone will show whether the symptoms are due to an internal strangulation, or to the passage of a gall stone, or to the twisting of the pedicle of an ovarian tumour, or to some other acute mischief. If there be a history of an ovarian tumour, or of the passage of previous gall stones, or if an irreducible hernial tumour exist, the diagnosis, with the aid of some few additional facts, may be easy enough. But in many instances there are no guiding lights and the surgeon must wait for differentiating signs before he can be sure of his diagnosis. In the meantime the patient is in the direst pain and morphia must be administered. If, however, there be not caution in this administration those differentiating signs may not be clearly manifest, or may, at least, be rendered less emphatic.

In the employment of morphia in acute intestinal obstruction the rules should be as follow:

1. Morphia must be given to relieve the pain.

2. The least amount which will effect this end should be the amount given.

In the case of an adult with quite acute symptoms, one-fourth of a grain of morphia should be administered hypodermically at once, and if the pain be not subdued the subsequent doses should be not more than one-sixth of a grain given at as long intervals as are possible.

In the case of an adult with symptoms not of the extremest degree, the initial dose may be one-sixth of a grain, to be repeated in one or two hours if absolutely necessary. It is to be remembered that patients vary greatly as to their susceptibility to this drug.

One-sixth of a grain may restore a strong man from a state of agony and collapse to a condition of comparative comfort and apparent well-being.

A small dose can always be added to, but a large dose cannot be taken from.

The surgeon, impressed with the fearful sufferings of the patient and the alarmingly sudden onset of the trouble, is apt to give at once a heroic dose, suited, as he thinks, to heroic conditions. Under the influence of this impression I have known one-half of a grain of morphia to be given at once, followed in twenty minutes by another half grain, because the patient was still groaning. These two doses have reduced the patient to the clinically negative condition of a deeply stupefied individual.

Some surgeons advise that in any case the dose be small—one-tenth to one-sixth of a grain—on the grounds that a small dose will give as certain relief as a large one. This, however, has not been my experience, and I think the advocacy of the small dose is possibly based upon an exceptional experience of susceptible patients in whose cases the dose of one-tenth or one-eighth of a grain may be amply sufficient to secure ease.

I have certainly seen more harm from giving too much morphia than from giving too little.

My impression is that quite a small dose will usually suffice to arrest irregular peristaltic action. In any case it is safe to say that the less morphia given the better. Morphia has the ultimate effect of rendering the patient unduly sensitive to painful impressions. This undoubted effect is to be noticed as soon as the immediate narcotic influence of the drug is passing away. The confirmed morphia taker under the influence of the contrast between the morphia state and the non-morphia state is very apt to exaggerate his miseries when the effect of the drug has passed off in order to enlist the sympathies of the surgeon with the much-worshipped syringe; but in the case of the sufferer from intestinal obstruction, who has experienced only the blessings of a few doses, there can be no

doubt that his account of his state when he has recovered from the drug is not wholly fictitious.

The drug, after it has allayed his sufferings, renders him more acutely sensitive to all conditions of discomfort, and this morphia hyperæsthesia is often very pronounced in "abdominal cases." For this reason, again, the rule must be observed of giving as little of the drug as possible. Moreover, morphia in large doses is an ill preparation for an abdominal operation. It induces a state of paralysis in the alimentary canal. The bowel, when relieved of the obstructing cause, has no power to avail itself of its freedom, nor ability to empty itself of its foul contents. It remains lethargic and inert with dilated vessels and an embarrassed circulation, and I think that the prospect of an operation for acute intestinal obstruction is much marred if the body at the time is saturated with a drug whose energies are so marked by extremes.

The morphia employed in the hypodermic injection should always be given in the "tabloid" form. The tabloid secures an easy administration, and an accurate dose. The solution of morphia is apt in time to become altered in strength by concentration and to undergo certain chemical changes associated with, it is said, the production of apomorphia. Apomorphia is well known to be a ready emetic, a drug, therefore, which is certainly not desirable in the cases now under consideration.

In my opinion morphia is better employed if administered alone, and I have seen no advantage attending the use of a mixture of morphia with atropia. The atropia is apt to add greatly to the sense of thirst—which is often of itself a very distressing symptom—and to the painful dryness of the mouth.

3. **The Evacuation of the Lower Bowel.**—As soon as the patient is becoming under the influence of the morphia it is well to clear out the lower bowel by means of an enema. An injection of salt and water of the strength of two drachms of table salt to a pint of warm water is probably the most efficacious. I would only say that such evacuation of the bowel is desirable, not that it is absolutely essential.

Often the colon is found to be loaded, and the ridding of the body of the mass of fæces contained therein is certainly most desirable ; often great temporary relief is afforded by such evacuation of the bowel. In any case undesirable matter is got rid of, and the tension within the abdomen is diminished. It is singular what great mental relief such a clearing out of the bowel will often give to the patient, whose one idea of improvement is bound up in an action of the bowel. More-

over, if nutrient enemata are to be administered, or if thirst is to be controlled by injections of water, or if drugs or stimulants are to be given by the rectum, it is obvious that this part of the gut should be first emptied of its contents.

The treatment of intussusception also by rectal injection, or by insufflation, is certainly rendered more efficient if the lower bowel has been already emptied.

The enema to be effectual must be given early in the case. When the patient is well under the influence of morphia, or when days have elapsed since the onset of the attack an evacuation of the bowel is less to be expected. In many cases the enema produces no effect, no matter at what period in the case it is employed. It is very commonly returned without alteration, or is retained entirely, or for an indefinite time. Sometimes it distinctly aggravates the pain and I have known the pain to be so much increased by the enema as to demand an additional dose of morphia. Such ill results are, however, more than counterbalanced by the occasions on which the injection is followed by a complete evacuation of the loaded lower bowel. The injection should be small in amount and should be introduced without force. With such precautions it can at least do no harm and may, on the other hand, do much good. In view of a possible operation I am sure that all surgeons will agree with the axiom that it is well to start with an empty colon. There is no object to be gained in repeating the enema. If it fails to act the first time it will probably fail to act on the second occasion, and if its use is followed by an evacuation the purpose of the treatment has been secured.

It is common, however, to find that the surgeon, in response to the never-ending prayer of the patient that his bowels may act, or under the influence of doubt as to the nature of the obstruction, has persisted in repeated injections once or twice in the day without doing more than adding to the patient's already heavy burden of discomforts.

The use of enemata in intussusception belongs to a method of special treatment with which the present subject has no concern. Those who have in their minds a vivid conception of the pathological conditions which underlie acute intestinal obstruction (intussusception being excepted), will appreciate that an enema can have no effect upon such an obstruction when once declared, and can do no more than possibly wash away any fæcal matter which may occupy the bowel below the situation of the block.

While dealing with this subject it is perhaps needless to say, that in no circumstances whatever should any aperient

or purgative be given in a case of acute intestinal obstruction. The use of such medicines is to be absolutely condemned without reservation of any kind. Let those who have any doubt upon this subject conceive the case to be one of a tight strangulation of a coil of ileum by a rigid band, and ask themselves what effect a "brisk aperient" is likely to have upon such a condition. It will merely excite increased peristaltic action, and at once aggravate all the symptoms. It will intensify the pain, will deepen the collapse, will render the vomiting more severe and do the patient nothing but the utmost amount of harm. I have no doubt whatever that in cases of lax snaring of the bowel an aperient may have the effect, by setting up increased peristalsis, of making an obstruction, from which the bowel might possibly free itself, absolute and irremediable. Illustrations are not lacking of the unfortunate effect of purgatives in acute obstruction because they are not infrequently administered by the patient's friends before the doctor is summoned.

Fortunately, in most 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 stercoraceous after the use of an aperient. Profound collapse, with sudden intense pain, has also followed this treatment, and it has, in many instances, I am convinced, brought about a threatening perforation of the bowel. Aperient medicines in these maladies have rendered subacute cases acute, and have caused even 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 effects of aperients in cases allied to those now under notice is 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 death may be fairly ascribed to the effect of the treatment.

* Path. Soc. Trans., vol. iv., 1853, p. 151.

In acute and subacute forms of intussusception, also, aperients can do nothing 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 hopelessly compromised the prospects of the case.

In volvulus of the sigmoid flexure and of other parts it is needless to say that aperients not only do infinite harm, but also tend to increase and not to diminish the distortion of the bowel.

The question of aperients in acute intestinal obstruction often brings the practitioner into conflict with the patient's friends on the subject of treatment. As soon as the case is declared to be one of obstruction of the bowels there are not a few—even among the educated—who consider that such an obstruction can only be dealt with by aperients, and who decline to gauge the progress of the case except by what passes from the rectum.

To such individuals a cathartic is the only "means of grace." I have known the friends of patients who have been possessed with this creed to administer secretly to the sick man some special aperient of their own, or some subtle and much advertised pills, which, according to printed testimonials, have saved many hopeless persons from the grave. It is a happy circumstance, in connection with such unenlightened measures, that a prominent symptom of acute intestinal obstruction is vomiting.

4. **The Question of Feeding.**—In dealing with acute intestinal obstruction it may be said, in general terms, that the question of feeding does not arise. The patient should be starved, not fed. In a typical acute case nature's distinct effort is to relieve the patient by emptying his alimentary canal. If he dies, his death will most probably be due to the absorption of poisonous material from the loaded bowel.

It is a pressing matter, therefore, that the canal should be emptied. The contents of the gut cannot pass downwards owing to the obstruction in its lumen. They pass upwards and pour themselves into the stomach. The patient vomits, the vomiting is copious and incessant, and the vomited matter is represented at last by the foul and decomposed contents of the disturbed bowel. It is well that the patient should be rid of this, for the one great danger which threatens him is self-poisoning from his own bowel.

There is some purpose in "symptoms," and many of the phenomena of disease are expressions of attempts at affording

relief. If nature's indications are to be followed, the hint given in acute intestinal obstruction is that the alimentary canal should be emptied, and not filled. The patient is decidedly not relieved by putting food into his stomach, but he is for a time greatly relieved by the emptying of his stomach by washing it out.

Apart from any general considerations it is obvious that it is worse than useless to attempt to feed these patients by the mouth. 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 a while be only sick after he has taken food.

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 putrefying contents, and is certainly not in a condition further to elaborate or even to absorb any food matters that may reach it from the stomach.

There is still one other aspect of the question. In some cases of acute 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 not be administered by the mouth. Inasmuch as any food taken is, almost without exception, rejected by vomiting, and is, if retained, made no use of by the patient, it is desirable, in cases of acute intestinal obstruction, entirely to abandon feeding by the mouth.

Three minor questions remain to be considered:—

1. If the patient is not vomiting, may he take food?

2. How is the strength of the patient to be maintained without food? and

3. How is the intolerable thirst to be relieved?

1. *If not vomiting may food be taken?*—In certain cases the vomiting is not marked, and in patients who are well

under the influence of morphia that symptom may be, for a while at least, in abeyance.

In such exceptional instances food may be given by the mouth, but it must be administered in very minute quantities and be given rather to meet the sentiment of the case, or to relieve the distressing symptom of thirst.

The patient himself feels that he must be taking something to "keep up his strength," and there is an overwhelming prejudice among those who practise domestic nursing in favour of constantly plying the sick with food. All sorts of messes are prepared by the anxious mother or the distracted wife, which have the reputation of being "supporting" and the forcing of these upon the sick man relieves the intense desire to be doing something. Oysters and other delicacies appear upon the scene, turtle soup is sent for and obtained in circumstances, perhaps, of heroic difficulty; beef-tea "which is quite a jelly when cold, and in which a spoon will stand upright" is introduced by some over-impulsive relative who has a reputation—probably well deserved—of being "wonderful in cases of sickness." All these efforts are the expressions of a natural anxiety which must have some vent for its eagerness and activity, and if only the patient can swallow a tea spoonful some watcher at the bedside is made happy for the moment. The patient, moreover, has often a morbid appetite and begs for a glass of beer, or for some cherished cordial, or for a lemon or a sponge-cake. Against all these abnormal tendencies the surgeon must set his face with suitable sympathy and appropriate argument.

The patient may take hot water in doses of one drachm to half an ounce, or may replace this by equal quantities of hot weak tea. The fluid must not be warm but must be as hot as can be taken. Now and then a little hot, sterilised milk may be given, or a little jelly as a palliative to the feelings of the friends, but beyond this it is not safe to go. I have met with a few instances in which food in larger quantity and of more substantial quality has been taken without discomfort, and have seen an instance in which an infant with acute intussusception took the breast without vomiting from the commencement of the case until relief was afforded by operation. It is in cases of intussusception occasionally that quite a quantity of fluid may be taken by the mouth without apparent inconvenience. It may be argued that as an operation is almost certainly pending, such indulgence may be excused, especially as what is taken is very nearly certain to be rejected in time by vomiting. Such an argument, however, is not a valid one. The object is to get matter out of the stomach and not to put

more into it. It is doubtful if anything that is taken is made use of, and if even the water which is swallowed is absorbed.

If some relaxation of the rule of starvation be observed in cases in which food can be taken, it should not go beyond the very narrow limits indicated, and should be regarded rather as a matter of policy than as a question of right treatment.

On no account should beef-tea, or meat juices, or meat extracts be given. The patient can certainly not dispose of these. They merely add more material to the slough of decomposing fluid with which the upper part of the alimentary canal is already only too full and add wofully to his embarrassments.

Objection is also to be taken to brandy or to champagne administered by the mouth. If a stimulant be needed it can be given in other and more efficient ways, and I have noticed that stimulants taken by the mouth are apt to engender a filthiness of the mouth of which the patient soon complains. Unfortunately there is always someone at hand who has access to brandy of remarkable age and power, or who shares the quite common belief that no sick man in a civilised country should be allowed either to recover or to die without taking champagne.

As to the sucking of ice I have only to say that in my opinion the practice is to be condemned without reservation. When the first edition of this book was written it was the custom to advise the use of ice in these cases.

I have seen a good deal of this little item of treatment and have learnt to condemn it absolutely. It introduces an unknown quantity of cold fluid into the stomach of a patient who is already probably not quite recovered from collapse, and the readiness with which it is returned, and the manifest discomfort it occasionally induces, leads one to think that it is a measure which might well be allowed to be forgotten.

The rule, therefore, should remain that the patient with acute intestinal obstruction should take absolutely nothing by the mouth, except possibly a little *hot* water or a little *hot* weak tea, but even of these the less the better.

I have, so far, been considering really acute cases. In subacute cases the rule as to starvation may be relaxed with discretion, and in instances of subacute intussusception this relaxation may proceed to some degree. Still here, however, the observation remains good, that it is useless to introduce food into the stomach of an individual who persists in vomiting. If vomiting continues all food must be discontinued.

2. *How is the strength to be maintained?*—The question

as to the maintenance of the patient's strength is one rather which concerns the friends of the patient than the patient himself, as it is from them that the question—tediously repeated—usually comes.

In the abstract it is desirable that the patient's strength be maintained, but this is not effected by introducing food into a stomach which will not retain it, or which will not make use of it if it be retained. It is well to remember how long the human being can go without food without any disastrous results, so long as he be supplied with fluid.

The possibilities in this direction have been illustrated by well authenticated accounts of imprisoned miners who have been kept entirely without any food, except water, for seven or more days, and who, when liberated, have walked with no uncertain step. In most examples of really acute obstruction the progress of the case is so rapid that the question of supporting the patient by food does not require to be entertained. The symptoms are often ended by death or are relieved by operation before the problem of maintaining the patient's powers by food need even be considered. In the frankly acute case the forcing of nourishment into the stomach does, without doubt, very much more harm than good.

In subacute cases the question of feeding does obtain a certain degree of importance. Now and then, in cases which are long extended, there is little doubt but that one of the factors in the exhaustion which leads to death depends upon the patient's inability to take or to retain food.

A long enforced abstinence from food renders the body, no doubt, less able to resist the toxic influences which are spreading from the disordered bowel and modifies injuriously the result of any operation. In certain instances of intussusception a process of spontaneous relief has been found to be nearly complete at the time of death, and to have been arrested by a fatal exhaustion which, although often due to septicæmia, may certainly have been encouraged by an inability to take food.

It is in the subacute cases, then, that an attempt at feeding may be made with caution. If there be no vomiting some feeding by the mouth may be attempted, and even in cases in which there is some vomiting a certain amount of food may be retained by the stomach if that viscus be periodically evacuated by washing out.

If vomiting be persisting feeding by the mouth is absolutely contra-indicated.

In the cases under consideration rectal feeding may be resorted to. Enemata composed of one ounce and a half of

peptonised beef-tea with half an ounce of brandy, given every three or four hours, appear to answer as well as do most of such injections. In any case the rectum must be washed out daily with warm water.

The question of rectal feeding is further dealt with in a later chapter (page 524). Other enemata are composed of peptonised milk, pancreatised meat, peptones, or other of the numerous substances advised for this method of feeding.

Personally I am not so impressed with the value of rectal feeding as are some. Those who are strong in its advocacy are a little unmindful of the remarkable length of time during which a human being lying motionless in bed can do without food if only the proper amount of fluid be introduced into the body.

When cases are reported to show how long an individual has been kept alive by nutrient enemata I am disposed to think that the interest of such cases tends rather to demonstrate how long a man can go without nourishment of any kind except water.

That the fluid part of the nutrient enema is absorbed admits of no doubt, and if a stimulant be embodied in the injection its effect upon the patient is unquestionable. The same may be said of most soluble drugs (for example, laudanum) which are, for one purpose or another, introduced into the bowel.

But whether the solid part of the enema is digested, absorbed, and made use of as food is a matter upon which a legitimate difference of opinion may still be permitted. I am especially disposed to be sceptical about the nutrient suppository. I have been much struck with the quantity of material which can be washed out of the rectum of patients who are being fed on nutrient enemata and suppositories, and I am a little disposed to ask if the quantity of solid matter returned by such washing out of the gut is much less than the amount of solid matter introduced.

As in the majority of examples of acute obstruction the small intestine is involved, nutrient enemata are for the most part well retained. Sometimes they cause pain and distress and have to be discontinued.

In cases of volvulus of the sigmoid flexure nutrient enemata are seldom retained, and I think it will be found that they are usually either rejected or are unabsorbed in instances in which the rectum is ballooned.

There are other circumstances besides these in 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 is 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.

One must, in concluding this part of the subject, still return to the proposition that in acute intestinal obstruction the question of maintaining the patient's strength by food does not arise, and in subacute cases it rarely assumes a pressing position. The treatment of these conditions is by immediate operation, and if the food question has come to be considered there must be—in any instance in which the diagnosis is undoubted—a suggestion that the proper treatment is being unnecessarily delayed.

In certain of the acute and subacute cases there may be a doubt as to the real nature of the condition, and in the latter type of case there may be a history of recovery from a precisely similar attack. In such circumstances delay may be occasionally justifiable, and the question of feeding may then come to the front.

3. *How is the intolerable thirt to be relieved?*—This symptom is best treated by an occasional enema of warm water. The amount administered is half a pint, and the temperature of the fluid is about 99° F. As a rule the injection, if repeated every three or four hours, will almost entirely relieve this distressing symptom.

In the place of plain water some advise an enema of the physiological salt solution.

The patient may be allowed to rinse the mouth out with cold water as often as he thinks well.

Much complaint is made of the foul taste in the mouth and of the dryness of the tongue. These conditions are met by keeping the mouth very clean, by the frequent use of the tooth brush, by the employment of a mouth wash such as one composed of 1 in 80 solution of carbolic acid, or of a mixture of eau de cologne and water. There is no harm in allowing the patient now and then to chew a minute piece of lemon.

If the tongue be dry, the discomfort which it occasions may be relieved by occasionally painting it over with boroglyceride and water.

In cases in which the thirst is maddening and the craving for a "big drink" intolerable, I have seen no harm now and then in allowing the patient to take a copious draught of fluid, to the amount of a pint or less. This should be hot, if possible. The fluid so taken is almost immediately rejected, but it serves to wash out the stomach, and makes the patient for a while, at least, more comfortable and more contented.

Curschmann says that thirst may be relieved by subcutaneous injections of saline solutions, but I have not found this measure so successful as the enemata of warm water.

No evidence has been induced in favour of intravenous injections as a means of allaying intense thirst.

5. **The Use of Measures other than Operation.**—These measures—which are quite numerous—call for very little comment. They are for the most part feeble excuses for avoiding or delaying an operation. Previous to the introduction of antiseptic surgery there may have been an excuse for their employment which they no longer can present. They may be roughly divided into three categories, viz. those which are absolutely harmful, those which are probably harmless but inert, and those which contain some element of distinct therapeutic value.

Among those measures which may be condemned as harmful are *massage of the abdomen* and *abdominal taxis*, including, if need be, the inversion of the body.

When a coil of bowel is strangulated within the abdomen and is becoming gangrenous, or when it has become bloodless from extreme torsion, or when it has become invaginated, it may well be asked what other effect than harm can come from massage of the abdomen. Such manipulation may stimulate peristalsis and increase the gravity of the condition, or it may rupture an already moribund bowel, or make effective a threatened perforation. Those who are familiar with the operation of laparotomy for acute intestinal obstruction will realise the delicacy with which the distended bowel has to be handled, and the terrible ease with which the tense peritoneal coat is torn; they will also have made themselves familiar with the difficulty which attends the liberation of a snared loop or the reduction of an invagination even when the parts are well exposed and are under the fingers. Those who have most experience of these conditions are fully conscious that nothing save disaster is likely to follow the

pummelling and rubbing and compression of the abdomen by a rubber.

Massage has indeed 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.

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.†

It is only fair to say that massage has been used with good effect in some acute cases of obstruction by gall stones. 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 and ten smaller stones were evacuated.‡

"Abdominal taxis" is a term which covers a greater departure from rational treatment and involves in the hands of some manipulations and movements which, but for their

* See case by Dr. Gillette, *New York Med. Journ.*, 1882, p. 261.
† *L'Union Médicale*, 1882, p. 433.
‡ Bull. de la Soc. Anat. de Paris, 1875, p. 195.

iniquity, would merely be termed stupid. These extreme and blindly applied measures of treatment belong to the Dark Ages, and in efficacy and reason must rank little above the "faith cure" of the modern miracle worker, and the incantations of the Indian medicine man.

Among measures which may be classed as harmless are the methods of treatment by *warm applications* and *by ice* and possibly *the treatment by electricity*. A warm application to the abdomen is often employed and is often very agreeable to the patient. If it gives him any kind of relief there is no substantial argument against its employment. It satisfies in a harmless way the craving for something to be done.

The application of ice to the abdomen, as advised by Priessnitz and others in certain cases, has, I think, little to commend it. The ice is applied to the surface of the abdomen in bags, or the surface is cooled to the desired temperature by means of Leiter's tubes.

This measure of treatment is probably based upon the treatment of irreducible or strangulated hernia by ice-bags. So far as the efficacy of a local application is concerned the two conditions are, however, not comparable. The patient in acute intestinal obstruction is often a little collapsed, and very much resents any cold application to the belly. One would have thought it not improbable that the emptying of the surface vessels of the abdomen by cold would merely have added to the engorgement already existing within.

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 heroic plan of treatment. There are probably many who would not rank this method of treatment as harmless.

The treatment by electricity—which is occasionally advised in acute cases—may also not always be classed as useless but harmless.

It is very difficult to understand how electricity can have the least curative effect in acute strangulation due to 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 must do harm rather than good.

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. (*See* page 554.)

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.†

The methods of treatment now under discussion, for which some definite value under certain conditions can be claimed, are *the washing out of the stomach* and *the puncture of the intestine.* I have not, in this place, considered the treatment of intussusception by enemata or insufflation. That valuable procedure is dealt with under the heading of operation (page 501).

Washing out of the stomach gives very marked, and, indeed, often very remarkable relief. It is especially to be recommended when the vomiting is copious and distressing, and particularly when it is stercoraceous.

The process must be conducted very slowly and with great care. The patient should be brought close to the edge of the bed, and should be well propped up in a sitting position. A soft stomach-tube is used, is well warmed, and is passed

* Medical and Surgical Electricity, by Beard and Rockwell, p. 484. New York, 1871.

† Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 564.

slowly. It is guided into the gullet by the groove formed by two extended fingers placed upon the tongue. The head must be straight and the chin raised. The fluid employed is hot water or a hot salt solution. It is introduced by means of a glass funnel, and is removed by a syphon action.

The washing out should be persevered with until the fluid returns quite clear.

As will be mentioned subsequently, this treatment is especially to be advised immediately before the patient is anæsthetised preparatory to an operation.

As already stated, the effect usually is very admirable. In some cases, however, but little fluid is removed. In other instances such violent retching and distress are produced, or such alarm is occasioned, that the treatment has to be abandoned. For the latter reason it can but seldom be adopted in the cases of children. Considering the noxious and septic character of the material which usually occupies the stomach in acute obstruction, the treatment under discussion has much to recommend it. It not only empties the stomach, but it relieves the state of tension within the abdomen and helps to empty the upper part of the small intestine by encouraging the over-full bowel to once more pour its putrid contents into the stomach, whence they can be removed.

It certainly also tends to relieve the pain, and to improve the pulse and general condition.

The measure is, of course, attended with the best results when the obstruction occupies the small intestine, and especially when it is located high up in that bowel. When it gives relief it may be advantageously repeated every three or four hours.

The measure can only claim to be palliative, and to place the patient in a more favourable condition for operation. Kussmaul, however, claims that it may lead to the complete cure of the patient. He gives two cases in illustration of this which are certainly hard to interpret. In one instance there was complete obstruction for eight days with "fæculent" vomiting. The patient made a good recovery after the stomach had been washed out five times in twelve hours.

In another example the obstruction had lasted for nine days, and recovery followed upon one washing out of the stomach. My experience of the measure is such that I should advise it as a routine detail of treatment in every case in which the little operation can be tolerated.

The other measure which remains to be considered is puncture of the distended bowel. 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.

It must, if it be considered a means of treatment at all, be regarded as a palliative and not as a curative measure.

In some forms of obstruction great distress is occasioned by the distension of the abdomen. By such distension 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 great 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 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 with an acute ending.

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

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 641.

fluid and flatus escaped. Next day a stool was passed, and the patient made a good recovery.*

Curschmann reports three cases of cure of definite intestinal obstruction after the puncturing of the bowel by a fine hollow needle, the size of a Pravaz's syringe.

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 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

* *Brit. Med. Journ.*, vol. ii., 1882, p. 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., p. 272.

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 instances the trochar has entered the bowel below the obstruction.

It must further 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.*

In more than one instance the patient has been saved from peritonitis, but a fæcal fistula has formed at the seat of puncture.

The conclusion one must come to is this, that puncturing of the distended bowel in acute intestinal obstruction is not a rational method of treatment and is not justified as a measure of common practice by the few instances in which it has been reported to have led to a good result.

If it be deemed desirable to puncture the bowel, the abdomen should be opened and the puncture made definitely and precisely. The opening need but be small, provided it is decided that nothing more is to be done. In short, if the bowel is to be tapped let the operation be done on sound surgical principles. In pre-antiseptic days there was some excuse for a halting, timid, and speculative measure like that now under notice; at the present day there is no excuse. If I were called upon to tap a distended intestine I would prefer first of all to see the particular coil which I intend to puncture, and I should consider such a procedure less dangerous than the blind plunging of a trochar into the midst of a collection of distended loops of gut. It may be said that the trochar can be used without an anæsthetic and that an incision cannot. To this it must be replied that with the use of eucaine the small cut needed to perform the operation with precision

* *Medical Times and Gazette*, vol. ii., 1872, p. 482. *See* also Paper by Prof. G. MacLeod; *Glasgow Med. Journ.*, March, 1884, p. 167.

involves no more pain than it would be humane to call upon the patient to endure. The cases concerned, it must be remembered, are for the most part desperate cases.

I think that puncturing of the bowel with a trochar through an intact abdominal wall is only justified in instances in which any major operation is absolutely declined by the patient.

CHAPTER II.

THE OPERATIVE TREATMENT OF ACUTE INTESTINAL OBSTRUCTION.

1. **The Necessity for Operation.**—There is one measure for the treatment of acute intestinal obstruction, and that is by means of laparotomy. The operation should be performed at the earliest possible moment—as soon, indeed, as the diagnosis is reasonably clear. In cases of acute abdominal trouble in which the diagnosis is not clear the better and safer course is to operate. I am assuming that the symptoms in these doubtful instances are showing no improvement, and that there is at least a reasonable suspicion that the cause of the trouble is intestinal obstruction.

The worst feature of all in the management of a case of acute intestinal obstruction is delay. The operation may be dangerous, and is, indeed, very dangerous, but delay is worse. The one perpetually reiterated comment upon the fatal cases of laparotomy performed for acute obstruction is this—"the operation was performed too late." There can be no purpose in delay, the expectant treatment has had a very extended and very deadly trial in the past, and the age for miracles is past. There is no avoiding the fact that acute intestinal obstruction if unrelieved ends in death. It is perfectly true that there are isolated instances of spontaneous recovery in cases of acute obstruction, and that among examples of acute intussusception the number of cases of spontaneous cure is not in the aggregate small. Some very faint reason for delaying operative interference may be pleaded in the case of acute intussusception because there is no denying that patients have recovered from that affection without operation. But when the whole mass of the cases is considered the number of those examples of recovery is so miserably few that they form no kind of ground for depriving the patient of a hope of life by operation.

There can be no shadow of doubt that the risk of the operation in intussusception is infinitely less than the risk of leaving the case alone. I have known a patient recover spontaneously without any operation from strangulated hernia and from the fæcal fistula which resulted, but that fact would be no argument for delaying the operation of herniotomy in the face of the knowledge that the overwhelming majority of the subjects of strangulated hernia die if left untreated. There is at least one instance in which a person has jumped from the Suspension Bridge at Clifton and escaped with life and a few minor injuries, but this would not justify a feeling of hopefulness in others who might wish to perform the feat and return alive to their homes.

In forms of acute intestinal obstruction other than acute intussusception the prospect of spontaneous recovery is so utterly insignificant that it must absolutely be disregarded by those responsible for advising the patient. Those who are enamoured of statistics could, I have little doubt, show that it is less dangerous to leap from the Clifton Suspension Bridge than to suffer from acute intestinal obstruction and decline operation.

The circumstances of a case of acute obstruction are circumstances of almost tragic gravity. A young man in robust health is seized with symptoms of strangulation in the early morning, and before the night has come an operation is advised, which is acknowledged to be attended with an enormous risk to life.

It is little to be wondered at that the surgeon may waver when pressed as to the certainty of his conviction that there *is* a strangulation of a loop of bowel. It is impossible not to be influenced a little by the arguments of the patient's friends to the effect that so few hours have passed since the attack began, that no time has been allowed for the "case to be watched," that no remedial measures of any kind, except morphia and starvation, have been resorted to or tried. The awkward questions come up "Has there never been a case known in which a patient has recovered without operation?" and "How many of those who submit to the operation escape with their lives?" In the midst of this terrible crisis and this desperate conflict of hopes and fears there is sure to arise the evil whisper, "Why not wait until to-morrow and see how the patient is then?" and so that delay which, as a rule, means death, is tacitly sanctioned, and the case enters into a direr pass.

The position of the surgeon in these distressing cases should, I think, be this. After he has given the matter the

fullest consideration and has concluded that an operation must be performed, he should advise that course, should point out precisely what are the risks involved, and should leave the entire responsibility of modifying that advice with those who are in a position to accept such responsibility.

It must be remembered that the average duration of life in intestinal obstruction of a definitely acute type is only about six days. The success of the operation depends comparatively little upon the precise species of obstruction and still less upon the *modus operandi*, the age of the patient, and the previous treatment or neglect of treatment. *It depends upon the position of the gut*, and that condition is influenced above all things by the lapse of time. The degree of degeneration in the gut is most fitly to be measured by the number of hours which have elapsed since the attack began.

Operation in these cases is too often regarded as a last resource. It should be regarded as the *first* resource, as it certainly is the *only* resource.

It must not for one moment be supposed that the operation for acute intestinal obstruction is a trifling one. It cannot be spoken of as "little more than an exploratory incision." The ordinary exploratory incision, carried out, for example, in the case of a doubtful tumour of long standing, is attended with but a trifling risk, and probably at the present day does not involve a mortality of more than 1 per cent. It would be utterly wrong and utterly misleading to compare such an exploratory incision with the simplest incision made in acute intestinal obstruction. It may be that in the latter case the wound is only one inch and a half in length, and that immediately the abdomen is opened a constricting band is found and divided, and that the incision is at once closed without the least disturbance of parts. So far as the actual operation and the actual cutting are concerned, such a measure cannot be said to be more grave than is the ordinary exploratory incision, but so far as risks are concerned it is perhaps thirty or even fifty times more serious. In the case of acute intestinal obstruction the surgeon is dealing with distended bowels which are filled with septic matter, and very little disturbance of the wall of the gut is required to allow that septic material to reach the peritoneum, and to cause death from peritonitis and septicæmia. I have had just such a case as has been now described. The operation was done early and under favourable conditions; a thin band was at once revealed and divided, and the abdominal wound was closed. The operation

did not occupy more than fifteen minutes, and yet the patient died of a low type of septicæmia, in which, no doubt, the poison had reached the system through the peritoneum.

2. **The Anæsthetic.**—In all operations for acute intestinal obstruction a special degree of danger attends the administration of any anæsthetic, and it may be at once said that the less anæsthetic administered and the shorter the duration of anæsthesia the better. Danger especially attends those cases in which operation has been unduly delayed, in which there is considerable distension of the abdomen, in which the stomach is full of foul matter that has ascended from the intestine, and in which much morphia has been given. In such instances it is unfortunately no rare experience to find that as soon as the reflexes are abolished by the anæsthetic there is a gush of vomit from the mouth and nostrils, and the patient is dead. Several of such cases have come under my own notice.

Another danger met with in the same class of patient depends upon the inhalation of vomit into the lung. This accident may lead to almost immediate death, and if the patient leave the operating table alive may be followed by a fatal septic pneumonia. Incidentally I may here mention that not a few of these operation cases die of such a pneumonia. I do not think that the lung trouble is always due to the inhalation of vomited matter, as in many instances it appears rather to be the outcome of a general septicæmia.

The dangers attending the anæsthetic, to which allusion has been made, may be, to a great extent, met by washing out the stomach before the patient is placed upon the table. I am so impressed with the value of this measure that I think it should be adopted, whenever possible, as a routine preliminary to operation. It is also to be recommended that some little time before the operation an enema containing brandy should be administered by the rectum, and also that a hypodermic injection of strychnia (to the amount of $\frac{1}{60}$th of a grain for an adult) should be given before the operation is commenced. The value of strychnia in these circumstances is, I think, undoubted.

As to the choice of the anæsthetic employed I would prefer to leave that to the administrator. The comparative value of anæsthetics depends largely upon the comparative experience of the administrator in one or other of the drugs employed. That anæsthetist will, as a rule, do best who gives, not the drug ordered, but the drug with the use of which he is most familiar. Should no such choice be expressed it has appeared to me that ether or gas and ether

have distinct advantages as to efficacy and safety over chloroform. It is impossible and unreasonable to insist upon absolute relaxation or even upon absolute immobility of the patient in these anxious and urgent cases. The subjects of these operations are often so exhausted and so stupefied by morphia that but a very trifling degree of anæsthesia, hardly amounting even to mental insensibility, is required.

In some extreme cases in which the distension is considerable and the patient very feeble, or in which operation has been long postponed, it may appear dangerous to give an anæsthetic of any kind. In such desperate examples I have performed both enterostomy and even a fully completed inguinal colotomy without any anæsthetic beyond the local application of cocaine or eucaine. When once the skin incision is made singularly little pain is complained of by these almost moribund patients. I need not say that in such cases nothing is attempted beyond the opening and evacuation of the first fully distended coil which presents. The surgeon's aim is merely an attempt to save a fast-ebbing life by relieving that which is causing death, namely, an overloaded bowel with septic contents.

3. **The General Details of the Operation.**—Before the operation the whole of the skin of the abdomen should be prepared as in the most precise aseptic operations.

These preparations are often of necessity imperfect, owing to the urgency of the case and the inability of the patient to submit to the tedious and probably not painless scrubbing and cleansing of the skin which are essential. These preliminaries to the operation have had to be abandoned on account of the amount of pain and the increased vomiting produced. They should, however, be carried out with the fullest detail whenever possible, as during the operation numerous coils of bowel may be lying upon the surface of the abdomen. The skin in these cases has often been reduced to a very undesirable condition of uncleanness by the use of linseed-meal poultices and the liberal inunction of belladonna. It is no kindness to the patient to relax these essential preparations on the ground that they cause temporary inconvenience. If owing to the neglect of such preparations the peritoneum is going to be infected during the operation, this procedure may as well not be performed. The final cleansing of the surface may be carried out while the patient is being anæsthetised, but it must be remembered how precious is every moment in these cases when once the patient is on the table. The pubic hair should be shaved and the bladder emptied by catheter.

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.*

Care should be taken that the patient is kept very warm during the operation.

The Incision.—The incision should be made in the median line between the umbilicus and pubes. Through an incision so placed the most efficient examination of the abdomen can be made and the conditions most commonly met with be most readily dealt with. The median incision can be enlarged to a greater extent and with less disturbance of parts than can a lateral one. The simplest cut for the opening of the abdomen is undoubtedly through the median line, and the closure of such incision can be effected with the least expenditure of time and trouble. If an artificial anus or fæcal fistula has to be established, it will probably only be a temporary one and it is by no means inconveniently placed if located in the middle line.

Experience is decidedly against the making of the incision over the supposed seat of the obstruction. Such a procedure assumes a very accurate diagnosis, and in dealing with cases of acute obstruction such precise diagnoses are not to be depended upon. Thus, swellings have been cut down upon which have had no connection with the intestinal trouble. An incision has been made in the left semi-lunar line, and the site of the obstruction has been found to be in the right iliac fossa. 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. †

There is no variety of intussusception which has not at one time or another been reduced through an incision in the median line.

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 over the seat of the hernia. A cut in the abdomen through the region of the inguinal canal 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. ‡

* Dr. Atherton; *Boston Med. and Surg. Journ.*, 1883, p. 531.
† *Lancet*, vol. ii., 1882, p. 1036.
‡ Ibid., vol. i., 1878, p. 493; Mr. Bradley's case.

A median incision made below the umbilicus may, of course, prove to be wrongly placed, as, for example, when such an incision is made in a case of hernia into the foramen of Winslow. There is no reason, however, in this or any parallel case against a second incision being made into the abdomen at a more convenient spot. I have several times made two such wounds—through one the diagnosis of the site of the trouble was made, and through the other the trouble was treated.

These exceptional cases afford no argument against the rule that the incision is best placed in the median line below the umbilicus.

In cases attended with great distension of the bowel the peritoneum must be divided with the utmost care, as the bowel is very easily wounded. I have known an instance in which the wall of a greatly attenuated coil of ileum, filled with flatus, was mistaken for the peritoneum and opened. The serous membrane had been already divided, and as no cavity was made apparent the gut was mistaken for the peritoneum bulging into the wound.

The incision should at first be made large enough to admit two fingers. These two fingers are cautiously introduced. In some few fortunate cases the diagnosis may be made at once; a band may be detected about the right iliac fossa or a Meckel's process may be discovered passing from the umbilicus, or the case be made evident to be one of volvulus of the sigmoid flexure. When the symptoms of acute intussusception are present the invagination tumour may at once be detected by the exploring fingers.

Such cases are—as has just been said—fortunate. They are also very rare.

The Operation in Extreme Cases.—In the most extreme type of case it is possible that the exploration may not be safely extended beyond what is discoverable by two fingers very gently introduced and very gently passed through as wide an area as the distension of the abdomen will permit. If the cause of the obstruction be happily discovered in this very casual examination, it may there and then be dealt with, and in any case, whether the cause be found or not, the most distended of the coils which present is opened by the operation of enterostomy (page 488). This represents all that is done in the most extreme cases. The patient will stand but little, and an enterostomy carried out after the most superficial examination represents the maximum. It is a well-known fact that these operations in which a small incision has been made, and in which, without further inquiry, or after the most trivial

examination, the first presenting coil has been secured and opened, have been attended with apparently excellent results. The comment upon that fact is twofold: firstly, that the evacuation of the distended bowel is a very essential thing; and, secondly, that the less the interior of the abdomen is disturbed the better.

When the first edition of this book was published the best results as regards mortality after laparotomy for acute intestinal obstruction attended those cases in which an enterostomy had been performed with or without previous searching for the cause of the trouble.

In most of these cases the small intestine had been opened; in some few the colon.

It is a fact, and it is a very fortunate one, that the most distended coil, whether it belongs to the large or the small intestine, tends to make its way to the front, and thus it happens that the coil which presents, or which a slight examination brings to the front, is very often indeed the most dilated coil, and the one most in need of opening.

This operation for the extreme type of case is very slight, occupies but a few minutes, and may be performed, under pressing circumstances, without an anæsthetic (page 479).

Against this very rough-and-ready operation a vast array of arguments may be advanced.

In a simple enterostomy the cause of the obstruction is left untouched. There may be within the abdomen a volvulus of bowel, which is on the point of gangrene, or a coil of strangulated intestine which is left unrelieved, and which will certainly become gangrenous in due course, or there may be an unreduced intussusception which will in time attain the same undesirable end.

In the case of the intussusception a spontaneous cure *may* follow, but in the other forms of strangulation there is little to be said beyond this: that if such conditions as are just described be present the cases are hopeless, and can, so far as we know, only end in death.

Such arguments are to be answered by the knowledge that the condition of the patient is such that he could not survive a protracted operation, involving a long search for the strangulated loop, and including measures for its relief and for the final formation of a fæcal fistula.

Such a complete measure is no doubt desirable in the abstract, but in the extreme cases with which we are now dealing it is absolutely impossible.

Above all arguments remains the fact that this undoubtedly uncouth measure has been the means of saving

life. Unfortunately, we know very little of the condition of the intestine in those cases which have made a complete recovery after a hurriedly performed enterostomy. From an examination of certain of the cases I am convinced that not a few (and possibly the majority) have been the subjects of erroneous diagnosis.

In some there has been peritonitis, due probably to mischief in the vermiform appendix, and no acute intestinal obstruction has existed at all. It is easy to understand that in such examples a good recovery may follow the opening of the belly and the evacuation of the gut. I am afraid that a good number of the cases of "cure" of acute intestinal obstruction by simple enterostomy come under this category, and are really cases of peritonitis.

A series of cases in which laparotomy was performed for acute obstruction, and in which there was no obstruction found, but only the manifestations of peritonitis, has been collected by Duplay.* Another marked case of this type is placed on record by Dr. Buchanan of Glasgow:

A woman of twenty-nine 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.†

In this instance it is very probable that the trouble started in a diseased vermiform appendix.

In some of the examples of enterostomy the case was possibly not so urgent as appeared at the time. I am aware of a case in which an adult, said to have been free from gross abdominal symptoms, was seized with acute intestinal obstruction. In a few days he was believed to be *in extremis*. A hurried enterostomy was performed without preliminary examination, and a coil of ileum was opened. The patient died of marasmus, and the post-mortem revealed a quite unsuspected stricture at the termination of the sigmoid flexure. The acute attack had been due to the sudden blocking of the stricture, or more probably to the kinking of the bowel at the

* *Archives Gén. de Méd.*, 1876, p. 513.
† *Lancet*, vol. i., 1871, p. 776.

narrowed part. Such a case as this is not an encouraging comment upon the operation now under consideration.

However, as surgery advances there is no doubt but that this extreme, irrational and blindly-devised operation will become less and less frequent, partly because operation in cases of acute obstruction will not be delayed so long that the patient can merely undergo this minimum measure, and partly because more precise information will increase the doubt as to the efficacy of this procedure in *genuine* examples of acute intestinal obstruction.

All that can be said at present is that such evidence as we possess is in favour of the operation in extreme cases in which the patient can only be submitted to a procedure of the slightest magnitude.

The Search for the Obstruction.—To return to the performance of the operation in what may be considered to be the average case. A small incision has been made in the median line and a superficial examination of the parts beneath has been very gently made by two fingers introduced through such incision (page 480). Such examination has not revealed the cause of the obstruction and the patient's condition warrants a further search after that cause. The median incision is freely enlarged and—if the distension be not considerable—the four fingers are introduced gently into the abdomen and carried into the right iliac fossa. The cæcum is felt for or possibly exposed, and if it be found to be much distended the obstruction is probably in the colon; if it be found to be empty and flaccid the strangulation may be assumed to concern the small intestine. A band or a Meckel's diverticulum, or a hernia through a slit in the mesentery or an intussusception may be discovered, as the right iliac fossa is a common site of the trouble in acute obstruction. Failing any such discovery, the fingers are passed into the pelvis, where possibly bands or adherent organs may be met with, or collapsed coils of small intestine below the obstruction discovered. Such coils, if drawn forwards, may lead to the seat of trouble. If the examination so far be negative, the fingers are passed on to the left iliac fossa, which is in like manner examined, with the proviso that no force is employed. During the process of this investigation the hernial orifices are examined, especially the obturator canal. In this inquiry there must be no rough manipulation of the distended bowels and the fingers should keep throughout between the intestines and the parietes, so far as is possible. The whole hand should not be introduced. Assuming that in spite of this examination no

case of obstruction be found, the surgeon is brought face to face with the most difficult and the most dangerous features of the operation.

Further examination is hindered by reason of the distended coils of intestine, and such is the state of these intestines that they have to be handled with the very utmost care. Indeed, in some cases it seems almost impossible to touch them. The serous coat of the dilated coils is very much on the stretch and tears on the least traction. It is rent by a mere touch of a rough finger-nail.

In drawing a dilated coil forwards through a too small incision I have seen three or four rents develop in the serous coat. These rents mean three or four channels through which the peritoneum may be infected by the septic matter within the bowel. The distension of the bowel is mostly due to flatus, and two courses are now suggested: one is to puncture the dilated coils, and so remove the distension; and the other is to enlarge the incision without reservation and allow the mass of distended intestines to protrude. In the early days of intestinal surgery there was a great outcry against the allowing of the intestines to protrude and much prejudice in favour of the smallest possible incision. Under the influence of these prejudices the whole hand was forced into the distended abdomen and the forearm introduced often half way to the elbow. There was then made a blind exploration of the abdomen, the ever-moving fingers being forced in and out among distended coils which were on the verge of bursting. It was soon made evident that this examination possibly involved a hundred rents in the peritoneum and reduced the patient's chance of life to a vanishing point. It will now be accepted as a fact that the allowing of the whole mass of the intestines to gush forth is—if suitable precautions be observed—not so grave a matter as the examination of the abdominal cavity by means of the whole hand introduced through an incision only just large enough to admit it.

To return to the two possible courses of treatment which have just been mentioned and to consider, first, the question of puncture of the bowel. If the whole distension could be relieved by one puncture this measure would have no doubt much to commend it; but, unfortunately, so far as the small intestine is concerned, one puncture will not relieve the distension, and probably even twenty punctures will not effect that end. The puncture will relieve the coil dealt with, and possibly one or two connected with it; and that is all. The trochar used must be small, the process of evacuation is very

slow, time is precious, and each puncture, after it has been made, must be closed by a suture, as it is—in these particular cases—very likely to leak. If, as is probable, the surgeon intends to complete his operation by an artificial opening (enterostomy), it may be argued that he should make a free incision into one coil of small intestine and evacuate the gut through this large aperture. But through such a hole the fluid contents of the gut will escape, and that is not a desirable circumstance in the middle of an abdominal operation. Then, again, even through a large opening made in the small intestine the relief of the distension is very slow and often very imperfect, and, finally, when the obstruction has been found, it may be discovered that the enterostomy has been made in a very inconvenient place, or the revelation of a gangrenous knuckle of gut may demand a second fæcal fistula to be formed.

It therefore happens that when the distension involves the lesser bowel, search for the cause of obstruction is not likely to be satisfactorily helped by puncturing the dilated coil or coils. There *may* be exceptions to this in cases in which it is apparent that the dilatation of the bowel is limited in extent, and in which a ready and satisfactory evacuation could be obtained through one small puncture with a fine trochar. After such puncture the minute wound should be sequestered by a point of Lembert's suture, unless it be intended to make it the seat of an enterostomy opening. (Fig. 116.)

When, however, the dilatation concerns the colon, and is practically limited to that bowel, evacuation by puncture is to be advised. If this be made at the summit of the most prominent coil, it will probably be shown to be, later, the best situation for an artificial anus; and if a good-sized trochar be used, it will be found that in most cases the whole of the larger bowel can be relieved by one such puncture. In volvulus of the sigmoid flexure the gigantic coil—apparently filling the whole abdomen—which is discovered in such a case, can be emptied by one puncture.

If, then, in the progress of the operation the dilated coils are found to be made up, wholly or in the main, of loops of the colon, the most prominent coil should be punctured, and after the gut is evacuated there will be little difficulty in reaching the cause of the trouble. The puncture must be guarded against leakage, and a temporary, or perhaps permanent closure of the little opening may be indicated.

In advising this course when the colon is concerned, it must not be implied that the incision in the abdominal wall

is to be of the smallest dimensions. The incision must be as large as is necessary to deal with the condition without unnecessary handling of the distended coils.

When the small intestine is concerned, and when it is evident that efficient means of investigation will not be provided by any evacuation of one or possibly two coils, the bowels should be allowed to protrude. For this purpose the incision must be prolonged. There must be no stinting in this direction. More patients have died of a too small abdominal incision than of a too large one. Kümmel advises, in doubtful cases, an incision from the symphysis pubis to the xiphoid cartilage, but such a wound is certainly not called for in any ordinary case. Very especial preparations, however, must be made for the reception of the protruding bowels. For the covering of the prolapsed intestines a cloth is needed which is of ample proportions, of perfectly smooth surface, and of some thickness. An excellent material is provided by two very fine linen towels, which are used the one over the other. A single towel does not provide a sufficiently thick and substantial covering for the protruded mass. The fringed ends of these towels should be cut off, and they should be so disposed about the parietal wound that the bowels do not touch the skin; do not, in fact, escape beyond the towel, and are as little as possible exposed to the air. One double-towel may be placed on one side of the wound and one on the other, and their margins may be united above and below the extremities of the incision by safety-pins.

As the viscera protrude they are wrapped up from either side. The towels used should be very well boiled beforehand, and should be kept in the steriliser or in hot sterilised water until required. They should be wrung out as nearly dry as possible, should be without creases, and should be of the temperature of 100° F. They are most conveniently prepared by passing them through a sponge wringer.

Free retraction of the wound is necessary, and, above all, the bowels must be protected from undue handling and undue pressure.

When the cause of the obstruction has been discovered and dealt with, the intestines are returned. To allow this to be readily done the wound must be large. A blunt hook is introduced into the upper angle of the wound and another into the lower (if it be not too near the symphysis). By means of these hooks the anterior abdominal wall is held up. The bowels are pressed back by the hands, the parts being still covered by the towels. The process may be aided

by retraction of the lateral parts of the wound, or by puncturing the bowel at a spot which has been decided upon as best for the enterostomy opening, should such be deemed necessary. As a rule, however, any puncturing at this stage is better avoided.

It must not be assumed that in every case it is necessary to allow all the dilated bowels to protrude. Such a measure is called for in only a few cases; but the surgeon, if he is disposed to allow any coils to protrude, should be prepared to allow all to escape. Often enough, when the most prominent coils have been allowed to protrude, it is evident that one is being held back in the abdomen, and if this coil be followed towards its mesenteric attachment, the cause of the obstruction may be at once made evident.

The methods of dealing with such forms of obstruction as may be found are considered in a subsequent chapter.

The Establishment of an Opening in the Bowel.—Let it be assumed that the abdomen has been opened, and that the cause of the obstruction has been found and relieved. It may be that a band has been discovered and divided, or that a hernia has been revealed and has been reduced.

The question arises, Does the operation end there, and can the abdominal wound be at once closed? In some instances it may be; but, in my opinion, the operation *in advanced cases* is not completed until the distended gut has been evacuated, and, consequently, I consider that before the abdominal wound is sutured in such cases an opening should be made in the bowel above the obstruction, so that its contents may be readily discharged. By "advanced cases" may be understood those in which the operation has been delayed beyond forty-eight hours from the onset of the attack, and in which there is much distension of the abdomen, with marked prostration and stercoraceous vomiting. If the symptoms have been throughout acute, and if the patient has been well dosed with morphia, further arguments for the opening of the bowel are added. The great indication for this measure is an engorged small intestine, loaded and distended with fluid contents. These contents are utterly noxious, and the bowel must be freed from them.

The need, therefore, for the evacuation of the distended bowel applies especially to cases in which the small intestine is involved. As a matter of fact acute intestinal obstruction usually implicates the lesser bowel, and the reasons for the course just advised will be evident from what has been already said in dealing with the clinical features of the trouble.

In acute obstruction when the symptoms are at all advanced the real danger to life lies rather with the poisonous material in the intestine than with the actual obstructing cause beyond its walls. The patient is dying, not because his bowel is occluded, but because the distended gut above the obstruction is producing a poison which is sapping his strength. It has unfortunately been too many times demonstrated that the successful relief of the obstruction will often fail to save life, and, indeed, it is of more moment to relieve the patient of the trouble within his bowel than of that which is without it.

This measure of treatment, by evacuating the gut, is by no means new; it was most vigorously advanced by Travers in his remarkable work on the intestine which was published over eighty years ago. Travers supported his views by experiments upon animals and by the observation of many cases in the human subject, and he elaborated his proposition by arguments which have not been affected by the scientific advances of a century.

The establishment of an artificial opening in the small intestine is a measure attended with risk although the aperture is, of course, closed by a second operation at the earliest possible moment. The artificial opening is particularly fatal in the cases of infants and young children, and is to be avoided in cases of intussusception.

It can be dispensed with also in a great number of instances of acute obstruction in which the colon is snared, especially if, in such cases, the small intestine be free from fluid distension. In certain acute cases implicating the colon —as in volvulus of the sigmoid flexure—an opening into the gut has to be established for other reasons than those now under discussion.

There is no doubt whatever that the operation for the relief of acute intestinal obstruction has been rendered infinitely more successful since it has become the practice to empty the bowel of its contents after the obstructing cause has been removed.

I believe that this addition to the operation has reduced the mortality of the measure by 50 per cent.

If in any advanced case the surgeon fails to evacuate the distended small intestine he has distinctly failed to complete his operation. In hesitating as to the performance of this necessary measure he must remember that he is dealing with a case which is absolutely desperate.

When the obstruction is high up in the lesser bowel the need for opening the gut may be avoided when there has

been a liberal washing out of the stomach. To establish an artificial opening high up in the jejunum is a measure of course very distinctly to be avoided, and should an obstruction in this place be discovered at the operation, the contents of the gut may be squeezed back into the stomach and removed by washing out the stomach on the operating table. By such means an enterostomy may be averted, and cases such as these afford an additional argument in favour of the excellent measure of washing out the stomach whenever possible.

The concluding of an operation for acute obstruction by an enterostomy is very usually an evidence of surgical neglect, an evidence that the operation has been performed too late. To avoid an enterostomy in acute intestinal obstruction the abdomen should be opened at the very earliest possible moment. Every hour delayed adds to the gravity of the case. The one point to be urged incessantly in these cases is the need for early operation. The earlier the operation the less the need for an enterostomy. Laparotomy should be performed at an early enough period to render an opening into the bowel unnecessary.

The rule should be this—the moment the diagnosis is made or the condition of obstruction suspected the stomach should whenever possible be washed out and the abdomen immediately opened. When this rule is recognised the need for the enterostomy will vanish.

The best method of performing enterostomy when it is needed is by means of a Paul's glass tube of suitable size. The loop of gut to be opened is brought into position and the abdominal wound is closed around it until only the dome of the loop is presenting. The gut is now secured in place by means of six or eight sutures which involve the whole thickness of the parietal wound, the peritoneum and the serous and muscular tunics of the bowel.

The gut is incised, the tube, blocked with cotton wool, is introduced and secured by a single thread, which is buried in the groove around the base of the tube. The parts are dried and well dusted with iodoform. A layer of cotton wool is applied, through the centre of which a hole is made for the tube to pass through. The cotton wool is sufficiently thick almost to bury the vertical part of the tube. A piece of oiled silk, or jaconet, with a hole in the centre, is now applied over the wool, the tube passing through the aperture made. Finally this simple dressing is kept in place by a wide flannel binder, in one part of which a suitable aperture is made for the passage of the tube. Over this again, to protect the

flannel binder, another piece of oiled silk, or jaconet, may be placed, with again a hole for the tube.

The cotton wool, the iodoform, and the lymph from the exposed bowel form a species of firm crust, which holds the tube in place. The cotton wool plug having been removed, the contents of the gut are allowed to escape into a suitable receiver. The contact of the bed-clothes is prevented by means of a bed-cradle. In from three to five days the tube is loosened by the inevitable process of necrosis, and is removed together with the indurated mass of cotton wool which still clings to its base.

The after-treatment of the case is that of a fæcal fistula, and the utmost care is needed to keep the part constantly clean and dry.

In due course this artificial opening is closed by a second operation.

There is nothing especial to be said about the after-treatment of these cases. It does not differ from that observed after other abdominal operations.

In the prostration which follows this measure, repeated hypodermic injections of strychnia, together with enemata containing alcohol, will be found of much service.

The Complication of Gangrene of the Bowel.—When the site of the obstruction has been discovered it may be found that the strangulated bowel is already gangrenous, or in such a condition that any vitality it may appear to possess cannot be expected to be maintained.

In such a case the bowel must be freed with care, because the actual line of gut under the constricting agent may be found to be so advanced in gangrene as to give way the moment the loop is set free.

The evidences of gangrene in the bowel, and the signs which may be taken to signify that the gut is in a precarious condition, or in a state in which its recovery is speculative, are the same as obtain in strangulated external herniæ, and the surgical rules which apply to that condition apply precisely to the one now under consideration.

The already gangrenous, or suspected loop is drawn entirely out of the abdominal wound, the healthy gut on either side of the damaged part is secured to the margins of the wound which are closed around the two ends of it. The necrosed, or necrosing. bowel is now incised, and through the cut thus made the contents of the gut are allowed to escape. The dead part of the intestine is removed in the course of the next few days. This is all that may be safe to do in cases of a severe and advanced type. In other examples, if the state

of the patient and the moderate extent of the gangrene encouraged it, the dead, or suspected bowel, together with a V-shaped portion of the mesentery connected therewith, may be excised, and, after all bleeding points have been secured and the gap in the mesentery closed by a few points of suture, the divided ends of the bowel (which have been previously clamped) are brought into the narrowed parietal wound to form the artificial anus which is essential in such cases. The two divided ends may be connected by a few points of suture applied to those portions of the gut margins which are about the attachment of the mesentery.

In cases in which gangrene exists experience is against any attempt to unite the divided ends of the bowel immediately after the necrosed portion has been excised.

Such a measure has been carried out with success in a few recorded instances, but it is a very hazardous proceeding, and neither the condition of the patient, nor the state of the intestine, would usually sanction this somewhat elaborate and possibly protracted plastic operation.

Operation during Peritonitis.—There was a time when the existence of peritonitis was supposed to contra-indicate any operative interference in acute intestinal obstruction. At the present day the question of peritonitis enters but very little into the problem.

Peritonitis *per se* is no bar to the operation, and its supposed existence should certainly not cause an operation to be abandoned. As a matter of fact it is by no means easy to state whether peritonitis does or does not exist in the advanced stages of acute obstruction.

In all advanced cases there is, no doubt, some degree of peritoneal inflammation present, and it is coincident with that general septic condition which tends to become more and more pronounced as time advances.

If a really extensive peritonitis of the usual low type exists the case is practically hopeless with, or without, an operation. The bowels are much distended, are paralysed, and are unable to empty themselves when drained; the condition of the patient also is, most probably, one of rapidly increasing septicæmia. In such a case an operation, if declined as hopeless, would be declined not on account of any peritonitis which may be present, but on account of the deplorable condition of the patient.

It may be said that when peritonitis is found to exist, the more brisk and more active its manifestations the more bright are the prospects of the operation. The cases which are the least satisfactory are those associated with that low

type of general peritonitis which presents but feeble manifestations, and which is a more or less inevitable feature in the last stages of any case of fatal intestinal obstruction.

Many examples of successful operation for acute obstruction associated with pronounced peritonitis have been recorded. I might select two—one performed in the early days of antiseptic surgery, and one in quite recent years. 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 patient made a complete recovery.

In the second case, reported by Mr. Robert Jones, the patient was a girl of fourteen. Symptoms of intestinal obstruction had existed for twelve days. The vomited matter was stercoraceous. A broad band was discovered and divided. Peritonitis was present as shown by the numerous adherent coils. The patient did well.†

In connection with this subject one can only repeat that the existence of peritonitis does not *per se* affect the question of operation, that measure being decided upon more general grounds than those concerned with this one pathological condition or accident.

* Bull. et Mém. de la Soc. de Chir. de Paris, 1879, p. 564.
† *Brit. Med. Journ.*, vol. i., 1894, p. 1123.

CHAPTER III.

THE OPERATIVE TREATMENT OF PARTICULAR FORMS OF ACUTE INTESTINAL OBSTRUCTION.

A. Strangulation by Bands or through Apertures, etc.—Under this heading are included the following conditions: (1) strangulation by peritoneal bands; (2) by omental cords; (3) by Meckel's diverticulum or a diverticular ligament; (4) by an adherent vermiform appendix, Fallopian tube, etc.; (5) strangulation through slits and apertures; (6) internal herniæ; and (7) certain rare cases of kinking of the small intestine, or sudden blocking of it by the displacement of a tumour outside the gut.

1, 2. **Strangulation by Bands and Omental Cords.**—Very slender bands may be torn. When more substantial they are divided between two ligatures. Bands should be cut as short as possible in order that they may give no further trouble. Membranous bands may need to be cut, and any vessels thereby exposed to be separately ligatured.

Great care should be observed in separating adhesions from the bowel, lest the bowel be torn, an accident which has frequently happened. Any small raw surface left by the separation of adhesions may be sequestered by a few points of suture, should bleeding persist. Bleeding vessels on such raw surface which cannot be ligatured, may be secured by stitching. A milliner's needle and fine silk are the best materials for these little operations, which are illustrated by the accompanying diagrams (Fig. 116). The bleeding depending upon the separation of adhesions is usually slight, and will for the most part subside on exposure to the air followed by suitable pressure.

Fine omental cords may be divided between two ligatures. They also should be cut as short as possible.

Some omental cords are very substantial and very vascular,

and may, indeed, consist of the whole or one-half of the omentum rolled up into a large band. Such cords should be ligatured in small sections with fine silk. Or they may be clamped and divided and the individual vessels secured. The former plan is the safer and in the end the shorter.

3, 4. **Strangulation by Meckel's Diverticulum, or by Adherent Structures.**—Diverticular ligaments are treated in the same way as peritoneal bands.

When the diverticulum persists as a small hollow tube it should be divided and the end secured by a circular ligature. The cut end should then be sequestered by means of one or more points of Lembert's suture whenever possible.

When a full-sized diverticulum exists, it should be divided at its distal extremity or narrowest point. This part should be sutured, any exposed mucous membrane cut away, and the divided surface sequestered by means of one or more points of Lembert's suture, as is done in excising the vermiform appendix.

It is undesirable to attempt to excise the full-sized diverticulum. The excision of such a process leaves a large hole in the bowel, which has to be closed by very careful suturing. The urgency of the patient's condition and the unwholesome condition of the bowel are very unfavourable for a tedious plastic operation. If a large diverticulum be gangrenous—as it is now and then—it must be brought out of the wound and the segment of bowel concerned be used for the enterostomy opening which will be inevitable.

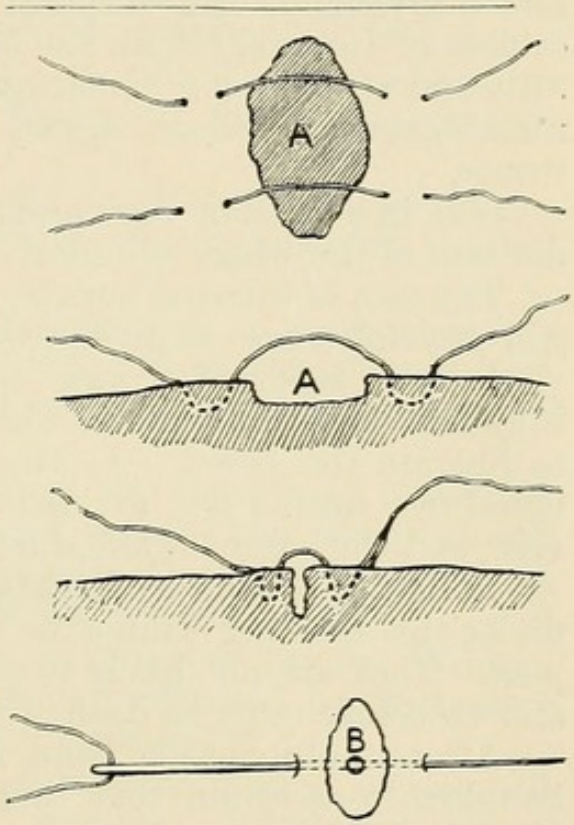


FIG. 116.—The three upper figures show the sequestering of a raw bleeding surface, A. The lower figure shows the securing of a bleeding point, B, by stitching.

There is no time available in laparotomy for acute obstruction for other measures than such as are absolutely unavoidable.

When the obstruction is caused by an adherent vermiform appendix, the appendix had better be removed. The excision occupies but a few minutes.

An adherent Fallopian tube should be set free from its adhesions, and in certain circumstances its removal may be advisable.

5, 6. **Strangulation through Slits and Apertures and Internal Hernia.**—The slit or opening causing the obstruction must be enlarged in order that the strangulated bowel may be withdrawn. In effecting such enlargement great care must be taken that no vessels are divided and their division overlooked. Blood-vessels often surround the slits in the mesentery, and the disposal of blood-vessels about the orifices of internal hernia has been already noted (page 112). Slits and rents in the omentum or mesentery, or in any wide membranous adhesions, should be closed by a few points of suture.

Slits in adhesions may probably be dealt with best by the division of the whole adhesion.

The sacs of internal herniæ, if well divided and opened up, will probably cease to give further trouble (page 115).

I have reported a case of strangulated hernia at the Foramen of Winslow upon which I operated, but was unable to liberate the bowel. At the autopsy I could not set the bowel free until I had divided the hepatic artery, the portal vein, and the common bile duct (page 117).

7. **Strangulation by Kinking, etc.**—The cases which come under this heading cannot be dealt with by any stereotyped plan. They are not likely to present any particular difficulty and each case must be dealt with on its merits.

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 and one band was divided, and in each instance it was the wrong band, or the one causing the less serious obstruction. Both patients, of course, died.*

Dr. Maylard† has collected thirty-three cases of successful operation for internal strangulation of the type now under notice. The operations were all performed during the years from 1891 to 1895 (inclusive). The average period between the onset of the symptoms was five days seven hours, the two extreme periods being fifteen hours and twelve days respectively. In one case only was an artificial anus formed. In one case four inches of bowel were resected.

B. Volvulus.—In most cases the volvulus concerns the sigmoid flexure. A sufficiently large incision must be made

* *Lancet*, vol. i., 1876, p. 773; and ibid., vol. i., 1873, p. 773.

† The Surgery of the Alimentary Canal, Lond., 1896, p. 363.

to expose the loop, or at least the greater part of it. The bowel should then be opened and evacuated of its contents. The opening thus made should be used as the opening of an artificial anus, the gut being properly secured in place.

In some cases the distended loop has been reduced with or without a preliminary tapping. The parietal wound has been closed and the case has done well.

Such an experience is, however, uncommon, and is mostly limited to volvulus of the small intestine. Maylard* has collected six cases of the successful treatment of volvulus of the small intestine by operation. In two the trouble was due to a gall stone, and in one there was a large mesenteric lipoma.

In all the bowel was simply untwisted, and no recurrence took place. In the case of the lipoma the tumour was removed.

If any part of the gut be gangrenous, in such cases the affected loop must be drawn well out of the wound, and, whether it be there and then removed or left, an artificial anus must be established.

Several cases are recorded—as has just been noted—in which a volvulus of the sigmoid flexure has been reduced after the loop had been evacuated. The hole made in the gut had been closed, and the parietal wound sutured. A good example of such an operation is provided by Dr. William Mayo.† Other successful cases are recorded by McArdle,‡ Senn,§ Finney,‖ Benham,¶ and Littlewood.**

Mr. Littlewood's cases are worthy of notice as they all occurred in the practice of one surgeon. He gives details of seven cases of volvulus in which he had performed abdominal section during three years; there were three recoveries: (1) Man, aged sixty-two, volvulus of large intestine, involving part of transverse colon, descending colon, and part of sigmoid; the volvulus was ten inches in diameter, and displaced the heart upwards into the third intercostal space; operation performed five days after onset of acute symptoms; death thirty hours later. (2) Man, aged sixty-one, volvulus of cæcum, part of ascending colon and part of ileum; the volvulus was about five inches in diameter; operation five days after onset; recovery. (3) Woman, aged fifty-seven, volvulus of sigmoid flexure; operation

* Loc. cit., p. 392.
† Annals of Surgery, 1893, vol. xviii., p. 28.
‡ *Dublin Journ. of the Med. Sc.*, 1893, p. 97.
§ Annual of the Universal Med. Sciences, 1891, vol. iii., C-37.
‖ Ibid., 1894, C-26.
¶ Trans. Clin. Soc., Lond., 1895, p. 180.
** *Brit. Med. Journ.*, vol. ii., 1898, p. 1820.

six days after acute onset; death forty hours later. (4) Girl, aged eleven, volvulus of sigmoid flexure; operation thirty-six hours after acute onset; general distension with peritonitis; recovery. (5) Woman, aged thirty-two, volvulus of small intestine about ten inches in length. Acute symptoms started about three weeks after confinement; operation six days after onset. General peritonitis with stinking blood-stained fluid in peritoneal cavity. The twisted portion of the bowel was deeply congested and adherent by soft adhesion to the surrounding bowels. Pelvis drained, the lower part of the wound not closed, and the twisted portion of bowel brought near the opening. Thirteen days later the volvulus, which had become gangrenous, separated and was removed. Two months later the intestinal fistulæ were closed by separating the parts from adhesions and suturing the upper and lower portions of bowel together. Patient made a good recovery. (6) Man, aged fifty-three; volvulus of small intestine involving several feet; operation five days after onset; death six days later. (7) Man, aged twenty; volvulus of small intestine about two feet in length; tuberculous mesenteric glands and adhesions; three days after onset operation performed; death four days later.

Mr. Greig Smith* reports a successful operation for volvulus of the sigmoid flexure in a man of eighty-five.

Unless some special means are taken the volvulus is very apt to return. Roux has performed three operations upon the same patient on account of relapses, and for the same reason Obalinski has had to carry out a second operation in no less than four cases of volvulus.

An artificial anus, established temporarily, is perhaps, on the whole, the best means of preventing such recurrence.

Roux† recommends that to avoid a recurrence the sigmoid mesocolon should be sutured to the abdominal wall, and Gould‡ has fixed the bowel itself to the parietes to effect the same end. Obalinski has suggested the resection of the loop.

In any case there may be considerable difficulty in the reduction. In one instance I could not untwist a volvulus of the sigmoid flexure through the wound, nor could I reduce it at the autopsy until after much disturbance of parts.

Mr. Greig Smith mentions that at an autopsy which he performed on a case of volvulus of the cæcum he could not undo the twist, although the incision extended from the sternum to the os pubis.

* *Brit. Med. Journ.*, July 20, 1895.
† *Centralblatt für Chir.*, 1898, p. 855.
‡ *Brit Med. Journ.*, 1895, vol. i., p. 979.

In several instances no reduction was possible until the whole of the volvulus had been allowed to protrude through the abdominal wound.

Mr. Greig Smith mentions a case of volvulus of the small intestine which he managed to reduce by operation. In seven days, however, it recurred, when by a second operation a small opening was made in the bowel, which it was found necessary to keep patent for nearly a year.

In a case of volvulus, dealt with primarily, a simple opening into the bowel, without a definite untwisting of the loop is, of course, not to be advised.

There are several cases of such a partial measure on record, and they have not been successful.

If gangrene of the bowel be present it must be dealt with on the lines already indicated (page 491).

It has been suggested that in some cases of volvulus a lateral anastomosis may be established at the neck of the twisted parts of the bowel. I am not aware that this measure has been carried into practice, and the probable condition of the bowel in an acute case, would render the performance of such an operation of very doubtful value.

The resection of the twisted loop has also been advised, not only as an immediate measure of treatment, but also to prevent recurrence. Such an operation would, however, not be advisable in a really acute case, and in any instance it could be only applied to examples in which the volvulus was very small. The smaller varieties of volvulus are capable of being treated by simpler measures. It must be remembered that the loop concerned in a volvulus of the sigmoid flexure may be literally enormous, and may appear when exposed to occupy the whole of the abdomen. The summit of such a loop is often found to be pressing up the liver.

C. Acute Intussusception.—The patient is placed in bed and is kept warm Brandy may be administered if there be much collapse. The bed-clothes may be kept from coming in contact with the surface of the abdomen by means of a bed-cradle, in the case of adults. Morphia or opium should be administered at once. The quantity given must be the least amount required to ease the pain, to arrest peristaltic movement, and to bring about a state of peace within the abdomen. So long as these ends are effected, the smaller the quantity given, and the less frequently the dose is repeated, the better.

In acute cases in which time has been allowed to elapse before the child receives any medical attention, an anæsthetic may be administered at once, and no more time wasted to observe the effect of morphia.

Aperients of any kind are to be most absolutely avoided

The amount of food given by the mouth must be reduced to a minimum and will consist of minute quantities of hot water or (in adults) hot weak tea or peptonised milk and hot water, or barley water. Thirst can generally be relieved by water administered by the mouth. If incessant vomiting be present all feeding by the mouth must be discontinued. As early operative interference is indicated in these cases the question of prolonged feeding does not arise, nor has the surgeon to give much attention to the problem of keeping up the patient's strength.

As warm applications to the abdomen often give considerable relief they may take the form of sterilised towels soaked in 1 in 30 or 1 in 40 carbolic solution made as warm as the patient can comfortably bear it.

A few instances are recorded in which rest and morphia combined with abstinence from food have led to the reduction of the intussusception. Such a result is, however, very uncommon and is not in any way to be depended upon. If such good fortune should befall the patient the improvement may be expected to be apparent as soon as the morphia has taken effect. The fact that cases of cure have been met with after no more elaborate treatment than that mentioned must not afford any excuse for persisting in these elementary measures. They only serve to indicate that the sooner the patient is brought under the influence of morphia the better.

Bloodless Methods.—Under the title of the bloodless methods of treating intussusception the following procedures, good and bad, are included. 1. Manipulation of the tumour, either with or without an anæsthetic. 2. "Abdominal taxis," including, possibly, the inversion of the body. 3. Electricity. 4. The use of copious enemata. 5. Insufflation with air or with certain gases.

1, 2, 3. The first three of these measures call for little comment and have nothing to recommend them. Manipulation of the tumour is a mere groping in the dark and is as likely to do harm as good. In any case which is at all advanced this treatment is more apt to be attended by disaster than by improvement. Abdominal taxis, with possible inversion of the body, needs only to be mentioned to be condemned. As a measure of serious treatment it can only be spoken of as stupid. The evidence that intussusceptions have been reduced by the use of electricity is very questionable. The measure appears to have done little more than afford an excuse for wasting time. The pathology of the disease would suggest

that the passage of an electric current along the bowel—should such a proceeding be possible—would add to the severity of the invagination rather than tend to unfold it.

4. **Forcible Enemata.**—Intussusceptions which have involved the colon, or which have entered that bowel, may be reduced by means of fluids forcibly introduced into the rectum or by the insufflation of certain gases made to enter through the same passage. It may be said at once that the injection of fluid is preferable to inflation. Fluid represents a more powerful and solid reducing force, and its employment can be graduated with greater accuracy.

"Many observers," writes Mr. D'Arcy Power, "have shown by experiments on living and on dead bodies that fluid can only be made to pass through the ileo-cæcal valve when over-distension of the colon has caused a mechanical separation of its two segments. Such an over-distension, however, is in the highest degree dangerous, because it is usually accompanied by a cracking of the serous coat of the large intestine, which is soon followed by rupture of the muscular and mucous layers if the force be continued."

In spite of instances in which intussusceptions have been reduced by enemata after long periods of time, experience shows that this measure, to be successful, must be employed at the earliest possible moment after the onset of the trouble, and that it is not likely to succeed in acute cases when more than forty-eight hours have elapsed since the commencement of the attack. (The contra-indications are given on page 506.)

The fluid usually employed is the ordinary salt solution at a temperature of 100° F. (one teaspoonful of salt to the quart).

The amount that has been introduced in cases of successful reduction varies considerably. In at least two recorded examples of success in infants, eight ounces sufficed. In another case three quarts of fluid under a head of five feet were injected into the bowel of an infant seven and a half months of age. One injection may suffice, or reduction may be accomplished after three, four, or five enemata. In one recorded case no less than nine enemata were required to bring about a permanent reduction of the invagination.* The patient was a male infant aged four months. Such repeated attempts at reduction by injection are not to be commended.

There is evidently a considerable difference in the amount of fluid the colon will accommodate in infants as the

* Dr. Andrew; St. Bart.'s Hosp. Reports, 1892.

following results of an inquiry by Mr. D'Arcy Power* will show.

Male	5 months	Capacity of colon	10 oz.
Male	5 „	„	13½ „
Female	7 „	„	30 „
Female	9 „	„	16 „
Male	15 „	„	28 „
Female	10 years	„	79 „
Female	14 „	„	40 „

The fluid is best introduced into the colon by means of hydrostatic pressure which allows of its entering the bowel by its own weight. Enemata given by an ordinary enema syringe are unsatisfactory. The fluid is introduced in jerks and the amount of force employed is difficult to estimate.

In employing irrigation a piece of rubber tubing is provided. To one end the nozzle of an enema syringe is attached, while the other end is connected with a glass funnel. The nozzle is introduced into the anus, and a measured quantity of salt solution is then poured through the funnel which should be raised to the height of three feet above the level of the patient's body. It is desirable that the patient should be anæsthetised during the process. The fluid should be allowed to remain in the colon for at least ten minutes before it is permitted to escape. The surgeon's hand should rest upon the abdomen during the process of the irrigation. No manipulation of the belly is required beyond such as is necessary to examine the tumour.

Nothing is to be gained by the inversion of the patient during the irrigation, but the head should be placed low and the whole pelvis raised upon a hard cushion while the fluid is entering.

Experience shows that long-continued distension under a low pressure is of more avail than rapid distension under a high pressure.

If no improvement follows upon the first irrigation it is useless to repeat it. An immediate laparotomy should be carried out

As to the amount of fluid which should be introduced, Dr. Wiggin † concludes after a full investigation of the subject that in the case of an infant at least one pint and a half of fluid may be placed in the funnel, the elevation of which will not exceed three feet. The amount of this fluid which will enter the bowel must, of course, vary in different cases.

Rupture of the bowel may readily occur if the amount of pressure employed be too great.

* *Edin. Med. Journ.*, June 1897.

† *New York Med. Record*, Jan. 18, 1896.

Upon this point I cannot do better than quote the remarks made by Mr. D'Arcy Power in his Hunterian lectures delivered at the Royal College of Surgeons in 1897.*

"The valuable experiments of Mr. Mortimer† in London and Mr. Mole‡ in Bristol have greatly increased our scientific knowledge of the effects of irrigation in the treatment of intussusception. They have shown that the results depend partly upon the obstruction to be overcome within the intestine and partly upon the external support. The greater the pressure within the abdomen the more is the distending force neutralised, for the intestinal wall is then compressed between two opposing forces. Mr. Mortimer experimenting upon the unopened bodies of children, points out that in an irreducible intussusception the large intestine is distended by almost the whole force of the stream when the abdominal walls are lax, as is usual in children under chloroform, and when there is not much tympanites. The intestine may kink if fluid be allowed to enter the bowel too suddenly or too forcibly, and the distending force is then prevented from acting upon the intussusception, so that the colon may become sufficiently over-distended to rupture. A similar accident may happen as a result of a sudden peristaltic contraction taking place whilst the pressure is being applied. There is apt to be cracking of the serous coat of the large intestine when the resultant pressure of the fluid distending the colon is about two and a half pounds—that is to say, when the irrigator is raised five feet above the body of the patient, and this accident usually happens when the irrigator is raised to eight feet, though the bowel may be completely ruptured when the reservoir is only raised to a height of six feet.

"Mr. Mole used a slightly different method of experiment, but he arrived at substantially the same results, and, as he worked with the abdomen open, he was able to see the exact manner in which the intestine ruptured as a result of its over-distension. When this accident is imminent the peritoneal coat of the bowel splits longitudinally for a considerable length ; the fluid then begins to leak through the wall of the gut, a small jet issues, and at last, if the pressure be continued, a large rent takes place, with forcible expulsion of the contents of the bowel into the peritoneal cavity.

"Rupture of the large intestine is most likely to occur in the transverse colon, at or near to the splenic flexure, whilst in the small intestine it takes place in the unprotected portion of the bowel which is situated between the two layers of the mesentery.

"It should be borne in mind, however, that these results are derived from experiments upon dead bodies and upon animals. It is impossible for the surgeon to estimate the capacity of the colon in any individual case of intussusception, nor can he judge the amount of pressure that may be applied with safety to the inflamed and softened intestinal wall at the neck of the tumour. A pint of fluid was sufficient to rupture the bowel in a child,§ aged three months, though the injection was made by one of the most careful and experienced surgeons in the profession ; whilst in another child,‖ aged seven and a half months, three quarts

* *Brit. Med. Journ.*, Feb. 13, 20, 27, 1897.
† *Lancet*, vol. i., 1891, p. 1144.
‡ *Bristol Med. Chir. Journ.*, 1894, p. 65.
§ Trans. Clin. Soc., 1888, p. 244.
‖ *New York Med. Record*, 1899, p. 83. Dr. Wiggin.

under a head of five feet pressure were injected into the intestinal canal without doing any injury."

Mr. Knaggs * gives an account of seven cases in which rupture of the bowel took place. In six of these the ages were from five to seven months. In one only nine ounces of water were injected.

"A sudden and uniform enlargement of the whole abdomen," continues Mr. Power, "raises a strong suspicion that the bowel has been ruptured, because rupture of the colon almost always takes place before there is any great distension of the small intestine. A laparotomy must be done at once when this accident happens, and the seat of rupture should be looked for either on the left side of the abdomen or at the neck of the intussusception."

The length of the intussusception is no bar to its reduction by irrigation, for many cases are recorded in which an intussusception has been reduced even when the ileo-cæcal valve has protruded beyond the anus, and Dr. Mansel Sympson† cured a case by this means when six inches of the intestine were visible externally.

Unfortunately after an apparently successful reduction of an intussusception by distension a relapse is very liable to occur, and the invagination to form again. It is probable that in a large number of these cases complete reduction never was effected, and that the instances are not examples of genuine relapse.

Barker‡ gives details of fifteen cases of acute intussusception treated by himself within the last few years. In eight of these cases reduction by intestinal distension was attempted. It failed in all. In two instances no effect was produced on the tumour, and in the remaining six the reduction was apparent only.

Among these six cases the following may be selected as an example. The patient was a female infant, aged four months, and the invagination was ileo-cæcal. Air and water were injected twenty-eight hours after the onset of the symptoms with apparently perfect success. Nine hours later, however, the tumour was felt as before. Injection was employed again fourteen hours after the first trial, and again to all appearances with complete success. Two hours later the intussusception was again felt, and injection was employed a third time, and the tumour again entirely vanished. Some hours later the child died, and it was found that the invagi-

* *Lancet*, vol. i., 1887, p. 1125.
† *Brit. Med. Journ.*, vol. ii., 1896, p. 629.
‡ Clin. Soc. Trans., 1898, p. 61.

nation had never been completely reduced. The last little bit was too tight to yield, and gangrene was beginning.

On the subject of genuine recurrence I cannot do better than quote from Mr. Power's lectures.

"Dr. F. H. Elliott* has published the details of a case of recovery from intussusception in a child, aged eight weeks, in whom recurrence took place twenty-four hours after the first reduction, five days after the second reduction, and thirteen days after the third reduction. Dr. Chaffey† had a less satisfactory experience, for an intussusception recurred on five separate occasions until the patient—a boy aged three years—died of exhaustion. When recurrence is a very marked feature in a case, it is better to open the abdomen at once rather than to trust to repeated irrigation of the bowel, for it appears‡ that reinvagination can positively be prevented by shortening the mesentery at the point of invagination by folding it upon itself in a direction parallel to the bowel, and maintaining it in this position by a few catgut sutures. No absolute rule can be laid down, however, for a child is now under my care who apparently has been cured of intussusception, though irrigation had to be done on five separate occasions before the tendency to recurrence was overcome.

"There appear to be several reasons for this tendency to recurrence. The first and the least satisfactory is that the conditions which led to the original intussusception may persist. An intussusception would then recur after any method of treatment, but it is particularly likely to do so when the reduction has been brought about by distension of the large intestine. A rapid distension of the colon followed by its sudden emptying are exactly the conditions which lead to increased peristalsis of its active and as yet uninjured walls. All methods of treating intussusception by dilatation of the bowel are therefore open to the objection that they predispose to a fresh invagination of the congested, compressed, and partially paralysed portion of intestine which has just been released. A second objection to this method of treatment lies in the fact that the operator cannot see what he is doing, and that it is necessarily performed with uncertain guides. The reduction is therefore incomplete in some cases, for the last part of an intussusception is the most difficult to unfold, and in practice when the tumour has disappeared as a result of irrigation the operator is usually chary of continuing the process, and he is quite content to allow the fluid to escape as soon as possible. Cases are well known in which such an incomplete reduction has been found at the necropsy. Dr. Goodhart§ records one where a local œdema of the submucous tissue, with a slight invagination of all the coats of a part of the cæcum, remained after an intussusception had been reduced by inflation. He thought that the invagination was sufficient to start a fresh intussusception, though he confesses that it is more likely that the swelling would have subsided if the patient had lived a longer time. Professor Greig Smith¶ also quotes a case in which the appendix was found unreduced after death, and still invaginated within the cæcum. The ileo-cæcal valve, too, is sometimes a cause of trouble after the reduction of an intussusception,

* *Lancet*, vol. i., 1887, p. 67.
† Ibid., vol. ii., 1887, p. 17.
‡ Senn; Intestinal Surgery, p. 95.
§ Trans. Clin. Soc., 1883, p. 62.
¶ Abdominal Surgery, 1896, vol. ii., p. 678.

theoretically because a hæmorrhage into its substance may make its segments gape, or may so stiffen them as to predispose to a fresh invagination of the ileum, practically because it may be mistaken in its inflamed state for the tumour of an intussusception. This mistake has been made more than once, and on one occasion* it led the surgeon to open the abdomen of a child aged six months, in the full belief that a previous irrigation had failed to reduce the whole intussusception."

Some surgeons use—in the place of water—warm olive oil. Mr. Clubbe is an advocate of this substitute. He introduces the oil by means of an ordinary enema syringe, the patient being at the time under an anæsthetic. He relates three cases in which injections of oil succeeded after the symptoms had existed for forty-eight hours, thirty hours, and seven hours respectively.†

The after-treatment of a case in which an intussusception has been reduced by enemata, irrigation, or inflation, consists in keeping the child at rest, observing a careful diet, and giving for a day or two a little opium.

The patient must be carefully watched, as a recurrence of the intussusception is common.

The *contra-indications* in this measure of treatment are the following. Enemata and irrigation are useless in the enteric form of intussusception, and are not likely to succeed in the ileo-colic form. No attempt should be made to reduce the invagination by distension of the colon in very acute cases or in cases attended with much collapse or in which there is abundant hæmorrhage, or in which the symptoms have existed over twelve hours.

In certain chronic cases reduction has been effected by enemata many weeks after the onset of the symptoms, and in cases which may be called subacute injections have succeeded in reducing invaginations which have existed for six and nine days.‡ These cases are, however, not material to the present matter.

By many surgeons the method of treatment now under discussion is condemned, and this condemnation applies alike to injections of water, oil, air, or gas. The arguments used are these:

(1) The measure is very uncertain, and may fail absolutely in the most favourable type of case.

(2) It is dangerous, and a number of instances are recorded in which the bowel has been ruptured or rent by the injection.

* *Lancet*, vol. ii., 1892, p. 380. Another example of this mistake is detailed in the *Brit. Med. Journ.*, vol. ii., 1897, p. 1336, case xiv.

† *Brit. Med. Journ.*, November 6, 1897.

‡ *Lancet*, vol. ii., 1892, p. 1441, and St. Bart.'s Hosp. Reports, 1892, p. 115.

(3) It is uncouth and lacking in precision. The surgeon cannot see what he is doing.

(4) It involves a considerable waste of valuable time. The child when recovering from the anæsthetic (administered while the injection is being given) may appear to be free from pain and to have recovered. This appearance may be encouraged if full doses of opium have been given before the injection, and is promoted also by such shock as may be present, and by the absence of feeding. The intussusception may be still in existence and the prospects of an operation very considerably damaged.

(5) In many recorded cases there has been a great doubt as to whether the intussusception has or has not been reduced. Some swelling is felt in or about the bowel which has caused this uncertainty.

Under the influence of this doubt the abdomen has been unnecessarily opened, on the one hand, and the invagination found to be quite reduced; while, on the other hand, operation has been postponed, the intussusception being still in existence. The invagination may appear to be quite reduced, and no tumour of any kind may be felt on careful examination of the abdomen, and yet all the time a part of the intussusception may be still not unfolded.

(6) This method of treatment, even when it succeeds, is very apt to be associated with a speedy recurrence of the intussusception. There is no doubt but that in many of these cases of apparent temporary success the gut was never entirely reduced.

Those who are in opposition to this procedure say that its only advantage lies "in the slight parental opposition to its employment."

It will be desirable to supplement these criticisms by some statistical record of the results of the treatment of intussusceptions by rectal injections of any kind.

Dr. Wiggin* has collected 103 recorded cases of intussusception which were treated by intestinal distension or laparotomy. In seventy-two instances intestinal distension was practised. Of this number failure to effect reduction occurred in fifty-four instances, or 75 per cent.

It must be remembered that in this series cases of all degrees of severity are included. In thirty-nine of the seventy-two cases treatment by intestinal distension represents the only means employed; of this number sixteen recovered (41 per cent.) and twenty-three died (a mortality of 59 per cent.).

* *New York Med. Rec.* Jan. 18, 1896.

In the remaining instances out of the series of seventy-two, the treatment of intestinal distension was followed by laparotomy.

Mr. Murray* alludes to twelve cases treated by rectal injections, in which a good result followed in four only.

Mr. Barker† has collected twenty-eight cases in which injection was tried. In eleven of these cases the tumour was successfully reduced.

The old records of the treatment of intussusception by intestinal distension present a very dark picture. Fluid was in not a few cases pumped into the bowel until it burst, no regard being had as to the amount introduced or the force employed. Injections were now and then made while the narcotised child was held in the inverted position. The abdomen was often kneaded and pummelled until the possibly gangrenous gut gave way, or the child, while held in the inverted posture, was shaken as if it had been a bottle of medicine.

If the treatment by distension, however, be carried out with proper care at the earliest possible moment and in selected cases, it cannot be denied that it is of some service. The contra-indications for the measure have been already given, and it will be seen that they are numerous, and that the treatment of intussusception by intestinal distension is limited to but a very few cases.

Barker‡ in reviewing fifteen cases of acute intussusception which had been under his care, mentions that injection was tried in eight of these cases and failed in all. "Out of these fifteen cases, twelve could not possibly have been reduced by injection at the time they were first seen by me; in two, because they were of the enteric variety; in three, because they were ileo-colic; in two because gangrene was already present; and in the remaining five, because the strangulation and consequent œdema were too great to be overcome by pressure from below. It is plain, then, that in this series only one in three had the slightest chance of being relieved by injection when I saw them."

Mr. Barker would limit the employment of injection to selected cases seen within a few hours of the onset of the symptoms. On this matter of time, it is well to point out that in the series of cases collected by Dr. Wiggin, there are thirty-nine in which the *only* treatment was by intestinal distension. Of this number 41 per cent. recovered, and the

* *Lancet*, Nov. 18, 1898, p. 1324.
† Clin. Soc. Trans., 1898, p. 63.
‡ Ibid.

average hour, after the onset of the symptoms, at which the treatment was begun was the twenty-eighth, the extremes being five hours on the one hand, and forty-eight hours on the other. In Mr. Barker's series of forty-three cases (*see* page 521) injection *only* was employed in eleven cases, with nine recoveries and two deaths. In the cases which recovered, the average hour at which the injection was employed, after the onset of the attack, was the fifteenth, the extremes being two hours and thirty-one hours. In the fatal cases the average hour was the twenty-sixth.

I have suggested that the attempt to reduce the invagination should not be made when the symptoms have existed more than twelve hours (page 506), and I believe that that limit will be proved by experience, to err on the side of liberality.

The position with regard to the very acute cases is well illustrated by an instance of ileo-colic intussusception recorded by Mr. Godlee.* The patient was a male infant, six months old. The symptoms were very acute, and the abdomen was opened six hours after the onset of the symptoms. No inflation of the bowel had been attempted. The invagination was reduced with much difficulty; and, while it was safe to say that it could not have been reduced by intestinal distension, it was evidently a case in which a partial reduction might well have led to the impression that the whole invagination had been overcome.

Furthermore, the rule should be observed that in any case in which distension of the bowel has been employed, an immediate laparotomy should follow in all instances in which the reduction has failed or is reasonably suspected to have failed. There is nothing to commend the practice of repeated attempts at reduction by this method. The treatment should be limited to one attempt.

5. **Insufflation with Air or Certain Gases.**—It has been already observed that distension of the bowel with fluid is a more potent measure in the reduction of intussusceptions than is insufflation with air or gas. The remarks which have just been made as to the advantages and disadvantages of intestinal distension with fluid, and as to the dangers of the method apply equally to that now under discussion. The indications and contra-indications for these measures of treatment are the same.

The air has been introduced by means of a common bellows,

* *Lancet*, vol. ii., 1898, p. 1262.

to which an indiarubber pipe and a rectal tube have been attached.*

More usually an ordinary Higginson's syringe has been used. As an example of its employment may be quoted a case recorded by Dr. Cheadle.† The patient was a baby, aged fourteen months, and the symptoms had existed for six days. Air

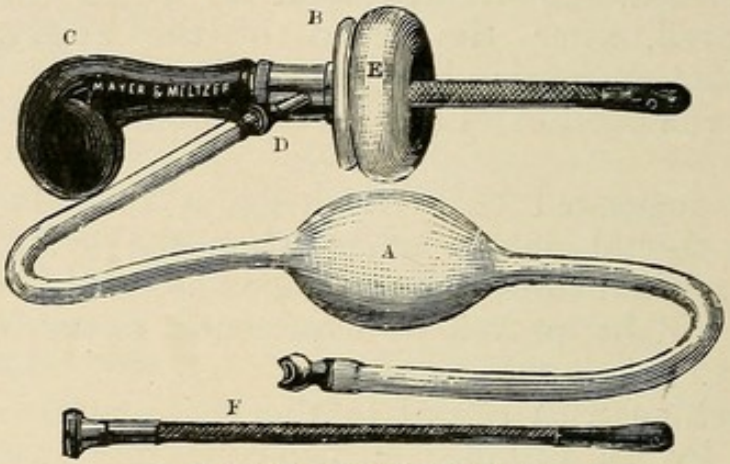


FIG. 117.—Lund's Innator.

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.

was introduced into the colon by means of Higginson's syringe while the child was under the influence of chloroform. The bowel was inflated until the abdomen was "decidedly tense." Three inflations were employed under the same anæsthetic, when the mass was found to be reduced. One drop of liquor opii sedativus was then given every three hours, and the child made a good recovery. Dr. Cheadle,‡ in another paper, alludes to three cases of success after inflation, the symptoms having existed for twenty-four hours, seven days, and ten and a half days respectively.

The best instrument, however, for the present purpose is that designed by Mr. Lund, of Manchester (Fig. 117). 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 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

* Dr. Trastour: Bull. gén. de Thérap., 1874, p. 107.
† *Lancet*, vol. i., 1889, p. 171.
‡ Ibid., vol. i., 1886, p. 766.

the air so injected is sure to escape by the side of the plug, the anus and the rectum being immensely expansible. . . . With the apparatus, when the hollow ring is compressed, the central hole in it is diminished in size, the skin around the anus, to which the indiarubber clings with great tenacity, is drawn inwards towards the centre, and the tightness of the air-joint thus formed can be well sustained."*

The Use of Carbonic Acid.—Distension of the colon by carbonic acid may be effected in two ways. In the first method the gas, suspended in water, 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.† Here the material injected is a mixture of water and of gas.

In the second method the distension is effected by introducing first a solution of bicarbonate of soda, and then a solution of citric or 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. Here also a quantity of fluid is introduced with the gas. Ziemssen, who has written in high praise of this mode of distending the bowel, says that for complete dilation of the colon in an adult twenty 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 asserts that under the influence of the carbonic acid it may yield a little, so as to allow gas to reach the small intestine.‡ Ziemssen expresses his belief that this form of injection is more efficacious in the reduction of intussusception than is the more usual enema of water.

* *Lancet*, vol. i., 1883, p. 588.
† *See* Bull. gén. de Thérap., 1887, p. 223; Dr. Garnier.
‡ Archiv für klin. Med., bd. 33, 3 and 4.

Williams* gives an account of an invagination which was reduced successfully by means of a carbonic acid enema employed after the symptoms had existed for twenty-four hours.

The Use of Hydrogen.—Senn† has advised the distension of the bowel with hydrogen gas.

"Hydrogen gas can be readily generated in a large wide-mouthed bottle, into which a small handful of chips of pure zinc is placed. The mouth of the bottle is closed with a cork with two perforations, through which two glass tubes are inserted, one for the purpose of pouring in water and sulphuric acid, and the other, which should be bent nearly at right angles, for leading away the gas. This glass tube and a rubber balloon, with a capacity of sixteen litres of gas, are connected by means of a rubber tube. In from five to ten minutes the requisite amount of gas can be generated, and everything is ready for the inflation. The rubber tube connecting the balloon with the rectal tip of an ordinary syringe should be interrupted by a stopcock, so that the escape of gas can be prevented whenever inflation is temporarily suspended. The return of the gas along the sides of the rectal tip can be readily prevented by an assistant pressing the anal margins firmly against it."

The inflation is carried out while the patient is under an anæsthetic. Senn states that the gas can be readily forced beyond the ileo-cæcal valve, and that the method is applicable to the enteric form of intussusception as well as to the other varieties.

So rapid, however, are the changes which take place in the bowel in enteric intussusception that it is a question whether, when once well established, they could ever be reduced by distension applied through the rectum. On this point Barker‡ writes:—

"From what I have seen in the living body in five cases in which I have opened the abdomen for intussusception above the valve I am convinced that no amount of distension from below, even if the valve could have been passed, would have undone the invagination."

The pressure upon the rubber balloon should be uninterrupted, and should never exceed two pounds to the square inch. The inflation must be conducted very slowly. There is no evidence to show that this method has any advantage over the usual mode of intestinal distension by means of water.

Treatment of Intussusception by Laparotomy.—Laparotomy to be successful in cases of intussusception must be performed early. The conditions have been detailed which would encourage the use of intestinal distension (page 501). If the case be considered unfit for this measure—and the

* *Lancet*, vol. i., 1894, p. 537.
† Intestinal Surgery, Chicago, 1889, p. 244
‡ Clin. Soc. Trans., 1898, p. 59.

majority of the acute cases are unfit—laparotomy should be performed without the least delay. Or if distension has been employed and has proved unavailing, the abdomen should be opened at once, while the child is still under the anæsthetic given to allow of the injection being administered.

The incision is most conveniently made in the median line. Some surgeons advise that the abdomen be opened immediately over the tumour or in the right semilunar line, but except in quite peculiar circumstances the median incision will be found to be the best. It is certainly the best in all cases in children. The tumour should be exposed and should be brought outside the wound. Reduction of the invagination should then be cautiously attempted. Considerable uncertainty attends this part of the operation. Reduction has been found to be impossible when the operation has been carried out within twelve hours of the onset of the symptoms, and to be readily effected when the symptoms have existed for several days. Experience of such instances is exceptional and it may be said that the earlier the operation the easier is the reduction. In reducing the bowel the tumour should be straightened so far as is possible, and an attempt made to force back the intussusception by squeezing the sheath just below the apex of the tumour. It is of very little use, in any but the most simple case, to drag upon the entering bowel. In marked and severe cases, such traction is distinctly to be avoided.

Sometimes after the reduction has been to all appearances effected a lump can still be felt within the gut, which may give rise to the impression that the reduction is incomplete. Mr. Pitts states that thickening about the ileo-cæcal valve may form a swelling which may readily be mistaken for an incomplete reduction. If any doubts exist, the bowel should be opened and the parts within examined. This incision into the gut should then be closed by sutures.

There would appear to be no need to attempt any fixation of the bowel by suture of the mesentery, as described on page 515.

After the reduction has been effected the wound in the abdomen is closed.

If the bowel be damaged, or if doubt exist as to its power of speedy recovery, a gauze drain may be introduced into the peritoneal cavity and be carried down to the injured loop.

The after-treatment of the case differs in no particular from that observed after an abdominal operation, save that it

desirable that the patient shall be kept under the influence of opium for some few days.*

If the intussusception cannot be reduced.—When this complication presents itself, the following courses have been advised by one surgeon or another:—

(1) The establishment of an artificial anus above the unreduced intussusception which is left in the abdomen.

(2) The establishment of a lateral anastomosis between the gut above the obstruction and the gut below, the unreduced intussusception being left in the abdomen.

(3) Resection of the intussusception and the formation of an artificial anus at the place of resection.

(4) Resection of the intussusception and immediate union of the divided ends of the bowel, followed by closure of the abdominal wound.

(5) Resection of the intussusceptum alone. Barker's operation.

Of these five measures, experience has shown that the last is the best and safest.

The first two methods are to be condemned because they leave the intussusception untouched and permit it to pass on into a state of gangrene. An artificial anus has been almost uniformly fatal in the treatment of intussusception.

I am not aware of a single case in which recovery has followed the employment of lateral anastomosis.

The objection to the third measure is based upon the extreme fatality which has attended the formation of an artificial anus in intussusception. The opening is usually in the lesser bowel and the majority of the patients are infants or young children. Rydygier† mentions one case which survived an artificial anus, but the almost universal result of this measure has been death.

The fourth measure, that of resection of the whole intussusception with immediate union of the divided ends of the bowel, has great attractions, and is theoretically perfect, but at present it has been attended with a fearful mortality. In Braun's series of cases there are twelve examples of resection without a single recovery. In Wiggin's list of operations for intussusception there are several cases, but they all ended in death. In Barker's series of forty-three

* Examples of this type of operation are afforded by cases in the *Brit. Med. Journ.*, vol. ii., 1896, p. 1113 (Dr. Renton); and the *Lancet*, vol. i., 1897, p. 1602 (Mr. Pitts).

† Verhand. der deutsch. Gesells. f. Chirurgie, 1895.

cases of intussusception there are four instances of resection, all of which were fatal. *

On the other hand there are examples of successful excision of an intussusception, but the number is still small.

Kocher† has resected the entire invagination in five cases. All the patients recovered. Rydygier has collected twelve examples of this measure with three recoveries. Other isolated cases have been published. One published by Mr. Clubbe‡ is of interest because the patient was only eleven months old. The intussusception was of the ileo-colic form, and the operation was performed on the ninth day. The union was effected by a double row of catgut sutures. In all, four inches of the ileum were removed. A gauze drain was introduced, and the child was reported to be well in fourteen days, in spite of a desperate attack of gastro-enteritis.

The fifth measure, that devised by Mr. Barker,§ appears to offer the best prospects of recovery and has so far been attended with the best results.

The principle of the operation is the excision of the intussusceptum through a cut made in the intussuscipiens.

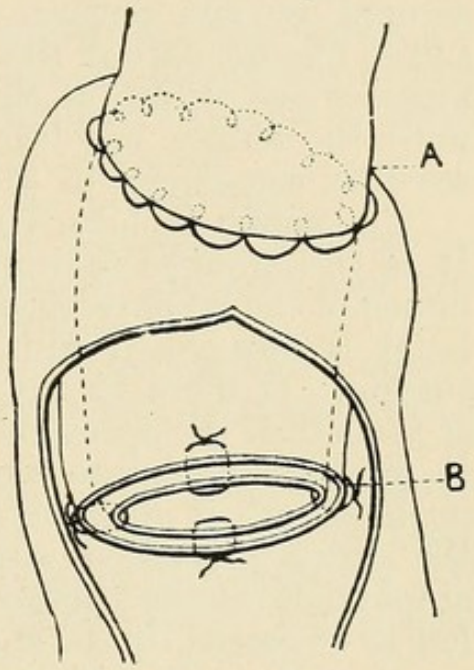


FIG. 118.—Barker's Operation for Irreducible Intussusception.

A, continuous suture at neck of the intussusception. B, suture of the divided layers of bowel after excision of the intussusceptum.
(From *Annals of Surgery.*)

At the neck of the invagination, *i.e.* at the point where the sheath receives the entering layer, the two portions of bowel are united by means of a continuous suture of fine silk. (Fig. 118, A.) This suture takes up the serous and muscular coats and is carried on to the mesentery. If there be any sign of gangrene about the neck, more gut is invaginated before the suture is inserted. A longitudinal incision is then made through all the coats of the intussuscipiens along its free margin or convex side. The intussusceptum is thus exposed, is drawn out through the incision made in the sheath, and is entirely divided as near as possible to its upper end. This involves, of course, the division of

* These various series of cases are alluded to in the next section, p. 521.
† *Brit. Med. Journ.*, Oct. 29, 1898.
‡ Ibid., Nov. 6, 1897, p. 1336.
§ *Lancet*, Jan. 9, 1892, p. 79.

two layers or rings of bowel. Stout silk ligatures are passed through all the walls of the stump, and are tightly tied so as to keep the serous surfaces in contact and to control all bleeding from the vessels entering at the mesenteric attachment. (Fig. 118, B.) The earlier sutures are introduced before the section of the bowel is complete. Indeed, as soon as a convenient portion of the intussusceptum has been divided, the two cut layers of gut, which are thereby exposed, are secured by silk sutures. From four to six sutures will suffice for this part of the operation. The last of the sutures includes the stump of the mesentery, which is not divided until the suture has been tied. Care should be taken to see that the lumen of the intussusceptum is clear.

The stump is cleaned and dried, and dusted with iodoform. It is then allowed to drop back through the incision into the lumen of the intussuscipiens. The longitudinal incision in the latter is now closed and the abdominal wound adjusted by sutures. If there be any suspicion as to the state of the gut at the site of the operation a gauze drain may be introduced. If the intussusceptum cannot be drawn out through the cut in the sheath, it must be divided *in situ*, and the suturing of the stump proceeded with. In a case of Leszczynski's the amputated intussusceptum could not be extracted and it was left to be passed by the stools.

Many modifications of this operation have been devised, but they are of little moment and appear to offer no material advantages over the original operation.

If the intussusception, including the intussuscipiens, be gangrenous.—In the face of this deplorable evidence of a too long delayed treatment there is nothing to be done but to excise the whole mass. If it be possible this excision should be followed by immediate union of the divided ends of the bowel. In the case of adults some hope may attend this measure, and in such patients a temporary artificial anus may be entertained in the most extreme cases.

"When gangrene is present in young children," writes Mr. Pitts,* "the condition is almost hopeless. Complete resection and end-to-end union, whether by Murphy's button or suture, so far has been practically without success. Perhaps rapid resection, with lateral implantation of the small bowel into a healthy portion of the colon, and bringing the cut end of the large bowel to the surface as a temporary vent for the escape of flatus, would be the quickest and safest method to adopt. Safely, however, as infants stand a short operation, a prolonged one under such circumstances seems almost beyond their power."

D. ACUTE OBSTRUCTION OF THE BOWEL BY FOREIGN BODIES, GALL STONES, ETC.—In these cases, as soon as the

* *Lancet*, June 12, 1897, p. 1602.

symptoms of obstruction are pronounced laparotomy should be performed. If the obstruction be high up in the jejunum it is especially desirable that the stomach be well washed out beforehand. When any part of the small intestine is involved this preliminary measure is desirable. When the upper jejunum is concerned, it is necessary to empty the bowel as much as possible, as in a neglected case a temporary artificial opening in that position can hardly be entertained.

It must be borne in mind that smooth foreign bodies are often passed even when obstruction symptoms have been induced, and that in cases of impacted gall stone 52 per cent. of the patients have recovered without operation.

The incision should be made in the median line.

In a few instances in which the position of the foreign body is particularly marked an incision directly over the obstructing substance may be preferable.

A gall stone impacted in the lower ileum has been squeezed through the ileo-cæcal valve by the surgeon, the parts having been exposed by laparotomy.

Mr. Clutton* reports such a case. The stone was in the ileum eight inches from the cæcum. It was left in the colon, and was passed per anum five days after the operation. It measured one inch and a quarter by one inch. The patient did well.

In most instances the foreign body must be cut out. The bowel is opened just above the site of the obstacle by a longitudinal incision on the border of the gut most remote from the mesentery. It is better to divide the more healthy bowel above the obstruction than that part of the gut wall which is actually compressed by the foreign substance. There is no object in breaking up a gall stone preparatory to removing it, and there is little to commend the practice of breaking up the stone by needling it through the bowel wall, and allowing the fragments to be passed spontaneously. The latter procedure may well do more harm than good.

After the substance has been removed it is desirable that the bowel above the obstruction should be allowed to empty itself so far as is possible. The state of the gut at the site of the obstruction must be inquired into. If it be viable the incision in the gut is closed by a double row of sutures, a continuous suture of the mucous membrane and Lembert's sutures for the two outer coats.

Should the gut be hopelessly damaged a temporary artificial anus may be demanded, or the damaged part may be

* Trans. Clin. Soc., 1888, p. 99.

excised and the bowel either at once united or a temporary opening established.

If there be great distension of the bowel the latter course is to be advised. Indeed, in any neglected case with great distension of the small intestine and marked stercoraceous vomiting, it is better that a temporary enterostomy should be carried out.

The surgeon should be prepared to encounter adhesions and other evidences of local peritonitis.

The foreign body may have caused a penetrating ulcer of the bowel, or there may be a localised abscess just outside the gut and into such an abscess the foreign body may have escaped.

The abscess, when it exists, must be opened through the skin by the most direct route and to effect this a second incision in the abdominal wall will probably be required. When the foreign body has been removed the abscess cavity is drained with gauze.

In these cases attended with suppuration the less done the better.

It is needless to say that nearly all the operations in this section have concerned the small intestine.

Korte,* however, reports a case of acute obstruction due to the impaction of a gall stone in the colon. The patient was a woman aged seventy-two; the gut was opened and the stone removed. The patient died.

Numerous examples of the removal of impacted gall stones have been reported in recent years.

Maylard† has tabulated ten successful cases of this operation.

Khalopoff‡ reports a case of the successful removal of two enteroliths from the colon by colotomy.

* Berlin. klin. Wochens., 1892, p. 690.
† Surgery of the Alimentary Canal, Lond., 1896, p. 408.
‡ Annual of the Universal Med. Sci., 1888, vol. xxix., p. 131.

CHAPTER IV.

THE PROGNOSIS AFTER OPERATION FOR ACUTE INTESTINAL OBSTRUCTION.

It is difficult to obtain reliable statistics which will display the real mortality after operations for acute obstruction. A collection of recorded cases is open to the objection that there is a great tendency to publish all the cases which succeed and a natural disinclination to place on record those which fail.

It thus happens that a collection of recorded cases selected from various Transactions and journals is apt to represent the operation as more successful than it really is.

On the other hand, the enumeration of cases collected from one or more hospitals will hardly give a fair picture because it will include a number of quite desperate cases which came under notice too late, and will give the impression that the risk of the operation is greater than it really is.

Taking all things into consideration I should place the mortality after operations for acute intestinal obstruction at about 50 per cent. The death-rate is becoming every year less heavy, and when the absolute necessity for operation at the earliest possible moment becomes more generally recognised there is no doubt but that the mortality after the operation will gradually diminish.

Curtis * collected 328 cases of acute obstruction operated upon since 1873, with a mortality of 68·9 per cent. In over one hundred of these cases the patient was practically moribund at the time of the operation. In forty-five of the examples there was excision of the bowel and suture, with a death-rate of 86·6 per cent. In 190 cases in which the operation consisted simply in relieving the constriction the mortality was 57 per cent.

* Annals of Surgery, May, 1888.

Schramm* has published a collection of 193 operations for acute obstruction, with a death-rate of 64·2 per cent.

Holmes† gives an analysis of all the operations for acute obstruction performed at St. George's Hospital between the years 1888 and 1894 (inclusive), with this result:—

	Total cases.	Death.	Recovery.
Intussusception . . .	5	5	—
Volvulus	3	3	—
Kinking	1	—	1
Bands	11	7	4
	20	15	5

Obalinski‡ furnishes an account of sixty-six operations for acute obstruction, performed by himself, with the following good results:—

	Total cases.	Death.	Recovery.
Intussusception . . .	7	7	—
Volvulus of sigmoid flexure .	19	10	9
Volvulus of Ileum . .	19	14	5
Kinking	4	1	3
Bands	11	6	5
Internal Hernia . . .	6	3	3
	66	41	25

Kocher,§ in like manner, alludes to the cases of acute obstruction upon which he has himself operated. The total number is twenty-seven:—

	Total cases.	Death.	Recovery.
Intussusception . . .	6	1	5
Volvulus	6	5	1
Bands	15	7	8
	27	13	14

In the five cases of intussusception which recovered the whole invagination was excised.

Naumyn‖ has collected 228 cases of operation for acute obstruction, with 116 recoveries, *i.e.* 51 per cent. In twenty-four of the cases the patient was operated upon within forty-eight hours of the onset of the attack. Of these eighteen were cured, making the proportion of recoveries 75 per cent. Thirty-five cases were operated upon on the third day, with twelve recoveries, the recoveries being thus reduced by delay to 34 per cent. Operations after the third day yield recoveries in from 30 to 45 per cent. of the cases.

* Langenbeck's Archiv, Bd. xxx., Heft 4.
† *Brit. Med. Journ.*, July 20, 1895, p. 125.
‡ Langenbeck's Archiv, 1894.
§ *Brit. Med. Journ.*, Oct. 29, 1898.
‖ Mitteil. aus den Grenzgeb. der Med. und Chir., Bd. I., S. 98.

The best results in the operations for acute obstruction have followed those for the removal of foreign bodies and gall stones; then come the operations for intussusception, and lastly those for volvulus and strangulation by bands. Naumyn gives twenty-three operations for impacted gall stones with sixteen deaths, a mortality of 70 per cent. Most of the cases had been dealt with too late.

Eve collected eighteen recorded cases of this operation which had taken place between the years 1889 and 1895. Of these nine had died, a mortality of 50 per cent.

The statistics in connection with intussusception are overwhelming.

Dr. Wiggin* has collected 103 recorded cases of operation for intussusception. In thirty-nine the treatment was by intestinal distension only, with sixteen recoveries, a proportion of 41 per cent. In the remaining sixty-four a laparotomy was performed, with twenty-one recoveries, showing the proportion of recoveries as 32·8 per cent., and the mortality at 67·2 per cent. Dr. Wiggin points out that if only the operations are considered which have taken place since 1889, and among that number only those which were completed, the mortality sinks to only 22·2 per cent. He believes that that mortality "is a fair estimate of the risk to-day of abdominal section performed upon a young infant for the relief of intussusception, if performed within the first forty-eight hours of the onset."

Rydygier† deals with thirty-six cases of operation for intussusception. In twenty-four of these the exposed invagination was reduced, with sixteen deaths and eight recoveries. In the remaining twelve the gut was resected, with nine deaths and three recoveries.

Mr. Clubbe‡ reports nineteen cases of laparotomy for intussusception, all in his own practice. Of this number nine recovered and ten died.

A very valuable series of cases has been published by Mr. Barker.§ It includes all the cases of acute intussusception treated at University College Hospital from the beginning of the year 1877 to the end of 1897. The total number is forty-three.

	Total cases.	Deaths.	Recoveries.
Treated by injection only	11	2	9
Laparotomy after injection	16	8	8
Laparotomy without injection	15	8	7
Manipulation under chloroform	1	—	1
	43	18	25

* *New York Med. Record*, Jan. 18, 1896.
† Verhandl. der deutsch. Gesells. für Chir., 1895.
‡ *Brit. Med. Journ.*, Nov. 6, 1897.
§ Clin. Soc. Trans., 1898., p. 67.

The average time after the onset of the attack at which treatment was commenced, was fifteen and a half hours in the cases of recovery after injection, and twenty-six hours in the cases of death after injection.

In the cases treated by laparotomy it is equally evident that success is in the main dependent upon early operation.

Maylard has tabulated twenty-five examples of successful operation for intussusception.

Reference has been made already to the result of operation in cases of volvulus and of strangulation by bands.

Nothnagel has collected thirty instances of volvulus treated by abdominal section. Of this number nineteen died and eleven recovered.

CHAPTER V.

THE TREATMENT OF CHRONIC INTESTINAL 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. Obstruction from shrinking of the mesentery. 7. Some forms of internal hernia. 8. Obstruction by neoplasms. 9. Some cases of obstruction by gall stones and foreign substances. 10. Pressure of a tumour outside the gut.

Feeding.—The feeding of the patient is a matter of extreme importance throughout the whole progress of the case and demands early attention.

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 the management of the case, therefore, the utmost care must be paid to the digestion. Food should be given a little more frequently than usual in order to avoid a "hearty meal." The patient must rest after each meal, and the process of digestion may be aided by the use of artificial digestives.

The food must be such as the patient can most easily dispose of, and such as will leave the minimum of débris in the bowel.

As the stenosed part becomes narrower and narrower the pain attending this form of obstruction is no longer occasional and due to the accidental blocking of the gut by a large mass of undigested food, but it appears more or less constantly after everything that is taken.

The patient at the commencement of the trouble has only to avoid distinctly indigestible articles of food such as nuts, pineapple, tough meat, etc. Later he has to be most careful in the selection of all the solid food he takes. Meat gives pain and is discontinued, and the patient falls back upon fish and chicken which has finally to be minced in order to pass the stricture with the minimum of discomfort. Sooner or later, if no operation be performed, the diet becomes wholly fluid and consists of soups, beef-tea, meat extracts, jellies, raw eggs, peptonised milk, koumiss, Benger's food, and the various preparations of "infant's food." The stages through which the feeding passes are very like those observed in dealing with a progressive stricture of the œsophagus.

With the utmost care in the feeding it is surprising how long a condition of freedom from actual distress can be maintained in these cases.

In due course, however, if the patient be left still unrelieved by operation, all food gives distress. The digestion is disturbed by opiates and possibly by frequent aperients. Vomiting becomes a prominent symptom. The patient wastes and becomes markedly enfeebled from want of food.

It now becomes desirable to supplement the feeding by the mouth by *rectal feeding*.

Before the first nutrient enema is given the rectum should be washed out with warm water.

The fluid is introduced through a rectal tube of good length, connected by means of an indiarubber pipe with a funnel. The patient should lie upon the left side, with the buttocks well raised. The elevation of the funnel above the body should be about two feet.

The amount of the enema should be from two to three ounces, and its temperature that of the body.

An enema can be given every four hours, and at least once in two days the rectum should be well washed out with warm water to which a little salt has been added.

The material of the nutrient enema is capable of almost unlimited variation, since the ingenuity of the physician has been for years past employed upon inventions and improvements in this direction.

Preparations of fresh ox-blood have been used by some, while others have advocated "emulsions of meat" made up with finely-divided pancreas or with an extract of the fresh pancreas, and preparations of fresh meat artificially digested by hydrochloric acid and pepsin.

The more commonly employed enemata consist of peptonised milk or peptonised beef-tea, of various "peptonoids," and of specially prepared suppositories of milk, beef, etc.

If a stimulant be needed, alcohol can be added to the injection.

As I have said elsewhere (page 464), the value of nutrient enemata has probably been somewhat exaggerated. Water and substances in actual solution are readily absorbed by the rectum, but the power of the bowel to deal with many of the substances introduced into its cavity is very doubtful.

An individual—and notably an adult—who lies motionless in bed, who is kept warm, and who is well supplied with water, can maintain life for a considerable period, and the value of the nutrient enema is not entirely separated from this wonderful power of endurance in the human body.

My impression is that nothing is absorbed by the rectum that is not in absolute solution. The solid material of the "emulsion" and the solid particles which are merely held in suspension in many ingenious preparations probably remain in the rectum after the fluid of the injection has been absorbed.

In a case of stenosis of the small intestine the commencement of rectal feeding may generally be regarded as the beginning of the end, and it is a question as to whether a patient should have been allowed to reach that stage without an abdominal operation.

Opium.—There is a good deal of pain in advanced cases of stenosis of the small intestine. It is due to excessive peristaltic action, and represents the struggle of the hypertrophied gut to force material through the narrow strait in its lumen.

Coils of hypertrophied intestine in movement will be

visible through the attenuated parietes, and accompanying such movements there is pain.

Attacks of severer pain also occur which are due to the actual temporary blocking of the narrowed bowel.

The pain, whatever its cause, can only be stayed by opium, and yet every grain of opium given adds to the patient's trouble. Reduction in the substance and solidity of the food, or the cessation of feeding by the mouth, will, of course, modify the pain considerably, but it will not cause peristaltic movement to cease entirely, and peristalsis in these cases means pain.

The most hopeless course to pursue is to allow the patient to eat what he likes and then to allay the pain caused by such indiscretion by the use of opium. Fortunately, a time comes when unsuitable food is usually vomited.

Opium stills the movement of the bowel throughout its whole course, and thus it encourages an accumulation in the intestine above the obstruction on the one hand, and discourages the emptying of the bowel below the obstruction on the other.

In the management of a case of stenosis of the small intestine an increase in the amount of pain is an indication to diminish the quantity of food taken by the mouth, and not to increase the amount of opium given.

Food excites peristalsis, and peristalsis in these cases represents pain. The relief of the pain is best sought for in the removal of its cause.

In every case, however, opium cannot be long withheld, and when it is given the rule must be observed to give it in the smallest possible quantities sufficient to ensure ease.

Without this narcotic the patient becomes soon worn out. The pain worries him all day and keeps him awake and restless at night.

No ordinary sedative will suffice. Belladonna is of little avail and is not to be recommended. After many experiments in this direction have been tried the surgeon will find that it must be opium or nothing. The drug is always best given as a hypodermic injection of morphia.

Aperients.—Having disposed of the questions as to the feeding of the patient and the relief of his pain, another prominent matter relates to the evacuation of the bowels. These cases are generally associated with constipation. Aperients given by the mouth cannot be long tolerated. They induce violent peristalsis and cause great pain. Indeed, I have seen a patient collapsed from pain following a brisk purgative given in a case of stricture of the bowel. In the

early stages of the case aperients can be tolerated, and then it will probably be found that salines are of the most service. The drug employed should be frequently changed, and the occasional use of castor oil or of calomel is advantageous.

In time, however, the main means of evacuating the bowels must be by enemata, and here also it is of benefit frequently to alter the composition of the injection.

In stenosis of the small intestine nothing is to be gained by the employment of massage or by the use of electricity. The narrowing of the bowel must be quite considerable before symptoms can be produced, and the measures employed do no more than excite peristaltic movements, and such movements involve pain.

Treatment by Operation.—When once the diagnosis is made in a case of stenosis of the bowel the sooner the abdomen is opened the better. There is, of course, no urgency, but it has to be realised that the condition cannot be remedied by medical measures and that, although life may be extended for months by means of careful treatment, the patient becomes gradually weaker and less well nourished and is slowly rendered a less and less fit subject for an abdominal section.

The abdomen should be opened in the median line, the cause of the obstruction sought for, and the involved loop drawn, whenever possible, outside the abdominal cavity.

What operative measure is carried out will depend upon the condition found.

Simple Stricture of the Bowel.—(1) A simple ring-like cicatricial stricture is admirably treated by the operation of *enteroplasty*. This measure is carried out in precisely the same way as is the very excellent operation of pyloroplasty.

The stricture is divided by means of an incision made along the margin of the bowel most remote from the attachment of the mesentery. This incision is parallel to the long axis of the bowel, and therefore at right angles to the line of the stricture. The incision is carried well into the bowel both above and below the stricture. The interior of the gut is examined, and if found sound, the cut made is united by sutures in such a way that the cicatrix is at right angles to the long axis of the bowel, and is parallel with the line of the original stricture. The wound before suturing is longitudinal, and after suturing is transverse. The central parts of the open wound become the ends of the united wound. The sutures employed are a continuous suture of the mucous membrane, covered in by a close line of Lembert's sutures, which take up the serous and

muscular coats. Examples of this operation have been recorded by Péan,* Allingham,† and others.

Several simple strictures of the bowel, if all of the ring-like type and not too close together, may be treated by this simple means.

(2) If the stenosis involve a more considerable surface of the bowel so as to take the form of a tubular stricture, or to produce marked deformation of the intestine, the operation of enteroplasty is not possible, and the involved segment of gut may be *excised*.

Excision, however, is not so essential in simple stricture of the bowel as it is in cases of malignant stricture. If many strictures exist the whole of the involved section of the bowel may be excised should the strictures be placed close together.

In such a case of multiple stricture of the lesser bowel, Koeberlé excised with success more than two yards of the gut.‡

It is scarcely possible that in a case of multiple stenosis all the strictures are of such a type that excision is demanded. One stricture may demand such a measure while the others may be treated by enteroplasty.

A slight degree of narrowing of the bowel may be satisfactorily treated by divulsion or stretching with the finger.

The method of resection employed must depend upon the individual taste of the surgeon.

The most perfect method is that by a clean excision of the part followed by a close suturing together of the divided ends.

The objections to this procedure are these: The operation involves a considerable expenditure of time; in one of the recorded cases—which ended favourably—the operation occupied three hours. The patients upon whom these operations are performed are seldom in a condition to stand a very long operation. They are worn out with pain and want of proper sleep, and are weak and mal-nourished owing to their inability to take or to digest sufficient food. In the second place, the difference in size and substance between the bowel above the obstruction and that below it renders union by direct suture difficult. The upper end of the bowel is dilated and of large lumen, while its walls are thick, hypertrophied and stiff. The gut below the stricture is empty, contracted and soft, and has comparatively thin walls. The gut therefore at the line of suture is very apt to kink or to become

* *Bull. de l'Acad. de Méd.*, 1890, p. 856.

† *Lancet*, vol. i., 1891, p. 1551.

‡ Bull. et Mém. de la Soc. de Chir. de Paris, 1881, p. 99.

bent in an angular manner, and at this point an undesirable degree of pressure is prone to take place.

To cope with these difficulties there has arisen the remarkable host of plates, discs, tubes, cylinders, buttons and bobbins which are used at the present day in the union of divided bowel.

This is not the place to discuss the merits of these various instruments. Briefly, I may say that Murphy's button presents advantages which cannot be overlooked. Its application is most simple, it can be fixed in place in a few minutes, and it holds the divided ends of the bowel together with admirable firmness.* Next to this metallic button may be ranked Mayo Robson's bone bobbin, which has many points in its favour, not the least being the fact that it is absorbable.

In the majority of instances of stenosis of the small intestine in which the strictured part is excised the two divided ends of the gut may be united at once and the wound in the abdominal wall closed.

If the operation be carried out at the proper time, *i.e.* as soon as the diagnosis has been made, this immediate completion of the operation should always be possible. In the neglected cases, however, it is very usually an undesirable or unattainable measure.

The patient in these long-delayed operations is in a feeble condition, the obstruction in the bowel is marked, the gut above the narrowed segment is distended and loaded with foul contents. There has probably been stercoraceous vomiting. In all such cases the operation must be brief, the conditions are not suited for an elaborate plastic measure, the distended bowel must be emptied of its contents and this without delay. To effect these ends two measures are available: it may be possible to short-circuit the small intestine, leaving the stricture untouched at the summit of the loop produced by the short circuit. In this way the distended bowel is relieved and the ill-consequences of an artificial opening in the small intestine are avoided. This measure may be carried out in cases which are not too advanced, and in those in which a fair emptying of the bowel has been obtained by means of the washing out of the stomach. At a subsequent operation the strictured part may, if need be, be excised.

The second measure consists in excising the stricture at once, and in establishing an artificial opening which is closed by a subsequent operation. This procedure is adapted for cases in which a considerable distension of the gut exists. With regard to the former of these two measures it

* The value of Murdhy's button is further considered on p. 547.

may be asked: Why not be content with the short circuit alone, and why trouble to remove the non-malignant stricture? It is possible that the short circuit alone may suffice, but it has become evident that the opening made between two parts of the small intestine in effecting a short circuit or lateral anastomosis is not always to be relied upon, especially when one limb of the bowel is much dilated at the time of the operation (*see* page 547). The opening thus made is apt to contract. Moreover, the bowel is formed into a loop, and this loop could very easily give further trouble. When the excision is contemplated the whole loop is excised, including the stricture, and the junction made by the short-circuiting; the divided extremities of the bowel are then united end to end.

The end-to-end union of the bowel is much more satisfactory and more certain than is any form of lateral anastomosis or short-circuiting.

It is only fair, however, to say that in many reported cases of short-circuiting for simple stricture of the bowel no further complications have appeared after the operation. The excision of a section of small intestine for simple stricture is a measure which must not be hastily decided upon. It is the best measure both in theory and in practice, but it may involve a more extended operation than that demanded by a mere lateral anastomosis.

(3) The strictured part may be unsuited for either enteroplasty or for excision. The bowel at the narrowed part may be bound down by numerous and complex adhesions, the division of which is undesirable or impossible; or, on the other hand, it may be considered essential to carry out the minimum measure which will give relief, in spite of the fact that the affected portion of bowel is excisable. In these two classes of case a short circuit may be made, and the bowel near to the stricture above united to the bowel below.

In cases in which excision is for any reason impossible this measure calls for no criticism; but in cases in which excision is possible it is well to remember that, as a complete surgical measure, excision with end-to-end union of gut is far preferable to a lateral anastomosis in which the narrowed part is left untouched.

Malignant Stricture of the Bowel.—When this condition exists every reasonable attempt should be made freely to excise the involved bowel, together with a V-shaped portion of the mesentery to which it is attached.

The excision may be performed at the first operation and the ends of the bowel at once united and the wound in the abdomen closed. This is the ideal operation, and is the

one which should be carried out in all suitable cases. If there has been long-abiding obstruction with much distension and overloading of the bowel, one or other of the following measures may be adopted: A short circuit may be made to relieve the pressing obstruction, and the abdomen be then closed. At a second operation the involved loop is excised and the ends of the divided bowel are at once united. On the other hand, the diseased section of the intestine may be excised at the first operation and an artificial opening established in the bowel to relieve the obstruction. This opening is closed at a subsequent laparotomy.

Stenosis of the Bowel produced by Adhesions.—In these cases the adherent gut may be bent upon itself (page 80), or a coil of bowel may be fixed into the form of a loop, (page 90), or adjacent coils may be matted together by numerous and dense adhesions (page 94), or the bowel may be compressed by contracting adhesions, or narrowed by shrinking of the mesentery (pages 88 and 100).

It is impossible to discuss in detail the various measures which may be carried out in the numerous combinations of conditions which are possible in these forms of obstruction.

In the simplest cases the adhesions are divided, and the intestine is restored to a normal condition. Bowel which has been acutely bent upon itself is set free; kinking is rendered impossible, and loops in the intestine which have been made by adhesions are broken down.

In less simple cases the involved part of the bowel may be excised. This course is to be commended in cases in which a comparatively short length of bowel is buried in adhesions which maintain it in a deformed position, and which cannot be satisfactorily dealt with by division. In some of these cases there is a fistula bimucosa (page 93).

In examples in which the adhesions themselves cannot be dealt with, and in which excision of the involved segment of bowel is impossible or undesirable, a short circuit or lateral anastomosis must be carried out, whereby the bowel above the obstruction is united to the gut below the narrowed part.

When the case has been long neglected, and when the bowel above the stenosis is much distended, a temporary artificial opening may be occasionally demanded.

Obstruction by Neoplasms or Foreign Bodies.—In these cases the neoplasm may be growing from the bowel wall (page 259) or it may have its origin entirely outside the intestine upon which it presses (page 269). Some cases of obstruction due to foreign bodies and gall stones may be chronic in type, and may come under the present category

(page 191). Under this section may be included certain very rare examples of internal hernia (page 102).

In the case of a tumcur growing from the bowel wall the coil of gut should be brought outside the abdominal wound and opened. Tumours with slender pedicles may be removed by ligature and division of the pedicles, and those with larger bases by excision of a portion of the bowel wall. For the latter measure, however, the area of attachment of the tumour must still be slight, or a stenosis of the intestine will result.

When the growth has an extensive attachment to the bowel the involved part of the intestine must be excised. This measure may or may not be associated with a temporary artificial opening. Such an opening is by no means to be desired in the small intestine, and should only be made when urgent necessity exists. Such a necessity would be present when the case had been long neglected, when the bowel was greatly distended and in a doubtful and precarious condition at the site of the obstruction, and when the patient was *in extremis*.

In less severe examples marked by obstruction symptoms it may be desirable to meet the pressing need of the case by performing a lateral anastomosis, and by removing the implicated loop at a subsequent operation.

In those cases of tumour of the bowel in which excision is impossible or inexpedient a short circuit should be established, and if the tumour be non-malignant the relief obtained by this measure will be complete.

When the obstruction is due to the pressure of a tumour outside the bowel the treatment will consist either in removing the tumour or in establishing a short circuit so as to avoid the part compressed.

When marked symptoms of intestinal obstruction are present it would be most undesirable to embark upon a tedious operation for the removal of a tumour outside the gut. In such case the immediate need of the case—the obstruction—may be met by making a short circuit, and at a later period the removal of the tumour may be undertaken.

In a certain number of cases the removal of the tumour may be impossible or inexpedient. If the growth be malignant it will probably be left and the operation limited to a restoration of the interrupted intestinal canal.

In the matter of the treatment of cases in which the obstruction is due to foreign bodies, nothing has to be added to what has been said upon this subject. The symptoms of obstruction are assumed in the present cases to be chronic, the treatment therefore to be more deliberate,

and the occasions in which it is necessary to establish an artificial opening in the gut to be very few.

The cases of internal hernia have been already alluded to on pages 106 and 115.

B. Stenosis of the Colon.—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. Obstruction by neoplasms; 5. Compression by a tumour outside the gut; 6. Some enteroliths.

Feeding.—In the early stages of stenosis of the colon, the importance of careful feeding is not so emphatically marked as it is in cases of stenosis of the small intestine. Where the colon is concerned, there is at first no immediate connection between the taking of food and the occurrence of pain. Later in the case, anything which excites peristaltic movements is apt to cause pain, and thus the patient feels more uncomfortable after each meal.

The pain in stenosis of the colon depends upon the excessive peristaltic movement which attends the attempt to force fæcal matter through the narrowed part of the colon. It will be evident, therefore, that the less bulky the fæcal matter in the gut and the more fluid its consistence, the less distress will be experienced by the patient.

As soon, therefore, as a case of stenosis of the colon has advanced to the stage of colic, the feeding of the patient becomes a matter of moment.

The diet must be of the most digestible character, and must be of such a kind as to leave the least possible débris in the bowel.

If the patient's teeth be imperfect, he should discontinue to eat meat.

Milk is seldom tolerated for long by adult patients. It is very apt to lead to scybala.

The patient should take his food in small quantities and often. He should take time over his meals and should rest after them.

Any existing dyspepsia must be attended to.

An attack of obstruction has very often been due to the blocking of the stricture by a mass of undigested food. I remember the case of a patient, who had been long under treatment, and in whom an acute obstruction, demanding immediate operation, was brought about by the eating of some pineapple. When I opened the colon a mass of undigested vegetable fibre was found completely to block the narrow stricture.

With care in the feeding, it is surprising for how long a time a patient can be kept in comparative comfort, and how narrow the lumen of the gut may be when the part is finally exposed by operation.

When regulating the patient's diet, it should be remembered that the residue of the food taken will ultimately have to pass through a strait in the colon which would probably not admit the little finger.

The patient is a little disposed to think lightly of the question of diet because, such pain as he has does not—at first at least—follow so closely upon the taking of food as to lead to the deduction that it is due to what is eaten.

The more solid the contents of the colon, the more marked is the pain, and the nearer is the time for operation.

Opium.—For the relief of the pain in stenosis of the colon, opium offers the only means. It is best administered in the form of a hypodermic injection of morphia. I think the morphia is best administered alone, and that no advantage attends the use of morphia with atropine.

The use of the drug should be delayed as long as possible, and the amount given should be the very least which will suffice to relieve pain.

An operation should be undertaken before the pain becomes a severe or pressing symptom.

In the early stages the slight colic present may be relieved by belladonna or hyoscyamus, or warm, dry applications to the abdomen.

Before the days of abdominal surgery opium played a very prominent part in the so-called treatment of chronic intestinal obstruction. Indeed, in not a few instances, this drug was supposed to have effected a cure. As a somewhat extreme instance of this reputed effect of the narcotic, the following case may be quoted. 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 fæculent 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

* *Lancet*, vol. i., 1868, p. 284.

of a man whose bowels were absolutely confined for no less 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.

Aperients.—It is very important in cases of stenosis of the colon to maintain as long as possible a free action of the bowels. If the utmost attention be paid to the feeding the bowels may be kept acting by aperients until the case is well advanced.

Aperients do not cause pain until the stenosed part has become quite narrow, or until some mass of undigested food has been rudely forced into the stricture. In this respect stenoses of the colon differ from like conditions in the small intestine. Towards the end of the case anything which excites peristaltic movement causes pain. There are a few exceptions to this, and I have known it possible for the patient to obtain some relief from aperients almost up to the period of absolute obstruction without experiencing notable pain. Those aperients which promote a liquid condition of the stools are the most to be commended. Thus all saline aperients are used with advantage; calomel and castor-oil are also of service. Liquorice powder and preparations of sulphur are among the least satisfactory of the aperients available. The patient soon learns from which aperient he can obtain the greater relief. Violent purgation is to be avoided. All that is desired is a daily loose action of the bowels. In many and many a case a condition of acute and abrupt obstruction has been brought about by too harsh purgatives. The violent peristaltic action induced has forced the more solid contents of the bowel into the strictured part, and has led to a complete blocking of the lumen of the gut.

In other instances the indiscreet use of aperients has led to a colitis which has added immensely to the patient's distress.

Indeed, in the following case it may not be unjust to ascribe the patient's death to the aperients 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.*

The bowel above the stenosed part is always, in advanced cases, in a condition of catarrh, and this catarrh is capable of being considerably exaggerated by the indiscriminate use of aperients.

I performed a left inguinal colotomy in an elderly man for intestinal obstruction depending upon cancer of the upper part of the rectum. He had for some time been treated by aperients which had been lavishly employed, and which had certainly maintained some action of the bowels without great discomfort. The bowel emptied itself after the colotomy, and then it became evident that the colon was the seat of a quite severe catarrh. Material more or less fæcal poured incessantly from the artificial opening, together with an increasing quantity of mucus. The amount of mucus became excessive, and I saw on one occasion a breakfast-cupful of perfectly clear translucent mucus collected from about the wound, and pressed out of the bowel at the morning dressing. This colitis continued in spite of all treatment, and led to the patient's death some ten days after the operation. There seemed reason to believe that the catarrh of the bowel had been at least aggravated by the powerful purgatives which had been so vigorously employed before the operation.

In maintaining an action of the bowels in cases of stenosis of the colon enemata are of considerable service. Indeed, they should be regarded as the main means of clearing the colon of its contents Aperients are needed to make the motions fluid, and enemata effect the emptying of the bowel by inducing peristalsis in the lower parts of it, and by actually washing its contents away. It is well, whenever possible, to rely more upon enemata in these cases than upon purgatives given by the mouth.

There are different methods of administering enemata. In the majority of cases the ordinary enema-pump, or syringe, is all that is required. A better instrument than this, however, 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. This solid tube should be about six inches in length. 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,

* Case by Dr. Moxon ; Path. Soc. Trans., vol. xx., 1869, p. 181.

knee-and-elbow, and lateral abdominal positions are the best. In the latter posture the patient should lie upon the left side with the buttocks well raised. 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. The height at which the funnel is carried above the level of the patient's body should vary from two to three feet.

The material used in the enema may consist of warm water or of warm soap and water. The efficacy of the injection is often much increased by the addition of a little turpentine to the soap and water enema. A very excellent enema for occasional use is the salt enema made by adding one tablespoonful of salt to one pint of warm water.

Injections of pure olive oil are often of service, and others advocate enemata partly composed of oil. I do not think that any advantage attends the use of enemata to which purgative drugs such as senna, or aloes, have been added. The enema of sulphate of magnesia acts merely as the salt enema. In the present class of case the use of glycerine as a rectal injection is of no service.

The amount of fluid introduced into the rectum must be regulated by the sense of discomfort experienced by the patient. When plain warm water is employed one to three pints may be used. The salt enema so soon stimulates the bowel that the amount introduced is usually limited to one pint. If oil be employed the quantity may be also limited to a pint. The weight of the oil is not inconsiderable, and it can be made to exercise considerable pressure upon the bowel. I have seen three pints of olive oil introduced into the colon without causing distress to the patient. These "monster" enemata are not to be recommended. They cause distress and lead to over-distension and consequent exhaustion of the bowel. They are also dangerous. It is needless to say that the bowel has been ruptured by forcible enemata, and in a case of advanced cancer of the colon low down on the left side a perforation of the bowel at the seat of the stricture could be easily effected by a quite

moderate injection. It should be remembered that the gut below the stenosed part is empty and contracted.

Enemata given by the "long tube" are most distinctly to be avoided. Considerable damage may be, and has been, done by the long tube. It has been already pointed out that the use of this instrument is founded upon a fallacy, and that it cannot be passed beyond the sigmoid flexure. In cases in which the rectum is obstructed by a uterine, prostatic or pelvic tumour a tube of extra length may be employed in order to get beyond the obstruction, but such a tube should never be of such length as to be beyond the control of the surgeon's fingers.

In long-standing cases of obstruction of the colon I have found that the action of enemata and aperients has been much promoted by hypodermic injections of strychnia. In the adult $\frac{1}{120}$th of a grain of strychnia may be injected three times a day when required.

The drug should be given hypodermically. I have not observed the same beneficial effect when the strychnia has been administered by the mouth.

In certain cases massage of the abdomen, carried out with the utmost gentleness and caution, may prove a valuable aid to the measures already described.

As an example of its use, I may give the following case: A gentleman of sixty-three came under my care with chronic obstruction of the intestines and with an obvious collection of fæcal matter in the descending colon. This was proved, at a subsequent operation, to be due to a cancerous stricture at the commencement of the sigmoid flexure. Severe colic was complained of; the abdomen was much distended, and there were nausea and hiccough. The patient was placed upon a very simple diet. Small and repeated doses of calomel were administered, and $\frac{1}{120}$th of a grain of strychnia was injected three times a day. Massage of the abdomen was employed for the purpose of pushing the fæcal mass backwards towards the cæcum, and so of relieving the block in the bowel. This measure succeeded, and with the aid of daily enemata the bowel was ultimately quite evacuated. Under careful treatment the patient remained in comfort for three months, when a second obstructive attack made imperative an operation which had been hitherto declined.

Puncture of the Distended Intestine.—In cases of obstruction of the colon from any cause extreme flatulent distension of the belly is not uncommon, and in this condition it has been advised that an aspirating needle or a

fine trochar should be thrust into the bowel. This measure has, indeed, been many times carried out, and considerable quantities of flatus and even of fæces have been evacuated. Moreover, the older records contain accounts of cases in which cure had followed upon this little operation. Even in recent times one now and then meets with such an account as the following: Mr. Worthington details a case of chronic constipation ending in an acute attack in a man aged twenty-eight. The symptoms were severe, there was great distension of the belly and stercoraceous vomiting. On the seventh day a fine trochar was introduced and retained for thirty minutes. Much fluid and flatus were passed, and the patient made a good recovery.*

It is probable that in this case the overloaded bowel was kinked or bent upon itself.

Dr. Blake has reported a case of constipation which was absolute for eighteen weeks, and in which the abdomen was punctured no less than 150 times, about half a pint of fæces being drawn off each time. The patient died.

This mode of treatment of a case of obstruction by puncture is unscientific, is casual and speculative, is not free from danger, and is, in most instances, only palliative. Before the use of puncture be considered the abdomen should be opened and the condition dealt with in a straightforward manner. The tapping of the bowel through an exploratory incision is less dangerous than the tapping through the skin, if the effect of an anæsthetic be put out of question. Tapping of the bowel may be carried out in cases in which further operation is declined, and in cases which may be regarded as hopeless. As an example of the latter condition, I may mention a case in which I opened the cæcum for an advanced malignant growth of the ascending colon. In the course of a few months the small intestine became involved in the growth, and great distension of that bowel followed. The patient was at the time saturated with morphia. No further operation could be considered, but the last days of life were rendered comparatively comfortable by the occasional relief of the distended gut by tapping.

Another example of the justifiable use of tapping may be afforded by the following case. I was called to see a very stout woman, in whom the symptoms of subacute obstruction had supervened upon symptoms of a chronic type. In due course it was discovered that a stricture of the sigmoid flexure had become blocked. The distension

* *Brit. Med. Journ.*, vol. ii., 1882, p. 167.

of the belly was enormous; the patient could not lie down, there was great dyspnœa and some cyanosis of the extremities. Much morphia had been given. It was considered out of the question to attempt to administer an anæsthetic. I therefore punctured the bowel through the median line, and allowed an immense quantity of flatus to escape. The distension subsided, and the patient was so relieved that an anæsthetic was given and the abdomen opened, the aspirating trochar having been retained in place until the gut was exposed.

It is quite obvious that in any case of stenosis of the colon or even of blocking of the bowel by a fæcal mass, puncture can only give temporary relief. If it were entirely without danger it may be practised without criticism, but as a matter of fact leaking of the over-distended gut at the puncture is quite likely to occur, and there must be few surgeons who have not met with cases of fatal peritonitis from this timid little operation.

Treatment by Operation.—Under this heading one can only repeat what has been written respecting operation in stenosis of the lesser bowel. When once the diagnosis is made in a case of stenosis of the colon, the sooner the abdomen is opened the better. There is seldom any urgency, but it must be realised that the condition cannot be remedied by medical measures, and that, although life may be extended for months by means of careful treatment, the condition of obstruction becomes more and more marked and the state of the patient less and less satisfactory. At any moment the narrowed strait in the bowel may become blocked, and a condition of acute obstruction be produced.

There is no possible excuse for delaying an operation, while every fact in the pathology and clinical phase of the affection is an argument in favour of early operation.

The earlier the operation is performed the easier it is to carry out. As time advances, the gut above the stenosed part becomes greatly distended and its walls greatly thickened. It becomes less easy to manage. In the resection of portions of the colon, the main difficulty lies in the disproportion in size between the bowel above the obstruction and the bowel below it. The existence of any degree of accumulation in the intestine undoubtedly adds to the risk of the operation and also to its difficulty.

If the stenosis be due to a malignant growth in the colon, delay of any kind is utterly to be condemned. The free excision of a portion of the colon, the seat of malignant disease, is an operation which has been attended with

admirable results. Indeed, it appears to me that the treatment of cancer by excision gives better results when applied to the colon than it does in almost any other part. The excellence of the result depends very largely indeed upon the early period of the operation. To delay a laparotomy in a case of cancer of the colon is to treat the patient very badly, and to deprive him of his only chance of recovery or of long immunity from disease.

The fact that delay of an operation is possible in these cases is no argument that such delay is immaterial.

This branch of abdominal surgery will have made a substantial advance when the rule is observed that the abdomen should be opened as soon as the diagnosis has been made or the condition is reasonably suspected to exist.

The observations already made upon the operative treatment of stenosis of the small intestine apply in great part to the present subject.

Stricture of the Colon.—The abdomen is most conveniently opened in the median line, except in instances in which the position of the stricture is well defined and a conveniently placed incision can be made directly over the affected part. It is well, however, to remember that almost any part of the colon, except perhaps the flexures, can be dealt with through a median incision. In stout patients the abdominal wound is better placed if made directly over the stenosed part. There is no doubt but that more errors have been made and more inconvenience produced by incisions placed over the supposed site of the stricture than by incisions made in the median line. The diagnosis of the exact site of the stricture cannot always be made with absolute certainty. The operations of excision and of short-circuiting are most conveniently carried out through a median incision. A median incision large enough to admit two fingers allows of a very fair exploration of the abdomen. If it be found to be inconveniently placed for the operation which is indicated it can be readily closed and an incision made in the place pointed out at the examination.

In favour of a median incision is the fact that strictures of the colon are sometimes multiple. In a reported case of obstruction in the rectum a lumbar colotomy was performed. It proved to be unavailing because an obstruction also existed in the small intestine. Had an exploration been made through the median line, that more important obstacle would probably have been discovered.

I am not aware that enteroplasty—or coloplasty as it

would be called—has been applied to the stricture of the colon, although it has been successfully performed in a case of stricture at the ileo-cæcal valve.

It is possible, however, that cases will be found in which this simple measure may be carried out.

To ensure success it is essential that the stricture should be non-malignant, that it should be of quite limited extent and ring-like, and that the bowel at the affected part should be free and well covered by peritoneum.

Assuming this measure not to be practicable, the treatment which may be carried out applies with almost equal appropriateness to both simple and malignant strictures.

The seat of disease having been exposed, the affected part of the bowel should be drawn without the abdominal wound whenever possible, and in any case brought as near to the surface as its attachments will permit.

The cæcum and the central parts of the transverse colon and sigmoid flexure can in most instances be drawn outside a median incision.

The ideal operation consists in the removal of the strictured part and the immediate union of the divided ends and closure of the abdominal wound.

If the stricture be malignant, the excision of the part of the bowel invaded is greatly to be desired. If the stricture be non-malignant, the best operation consists in the removal of the narrowed part, assuming coloplasty not to be possible or expedient.

In the case of a simple stricture, excision of the part with end-to-end union of the colon is an infinitely more satisfactory operation that the measure of short-circuiting. Many after-troubles may beset a case which has been merely treated by a short-circuiting operation. The immediate obstruction in the bowel is relieved, but the state of things left in the abdomen is hardly satisfactory.

The opening made by the lateral anastomosis is apt to contract, or, at least, is infinitely more prone to become narrowed than is the line of juncture in an end-to-end union of the bowel. Then material may readily pass into the loop which is excluded from the main intestinal passage. This loop may become a diverticulum in which fæcal matter may collect and may give rise to colic, to catarrh, to ulceration and the other evils which attend the retention of fæces. In this particular the colon differs materially from the small intestine. The contents of the lesser bowel are fluid, and such inconvenience as has just been mentioned is not likely to occur when a portion of that intestine is short-circuited. The

contents of the colon, on the other hand, are solid or semi-solid, and readily become inspissated when long retained. The stricture may, after the channel for fæces has been diverted, become practically impervious, and material finding its way into the loop may be unable to escape. It is remarkable how seldom troubles do arise after a short circuit has been made in the colon, but they do occur with sufficient frequency to make the fact undoubted than an end-to-end junction of the bowel after excision is an infinitely preferable method to short-circuiting.

Numerous instances, however, occur in which excision of the stenosed part and immediate suture are not possible.

(1) In the first place must be mentioned the cases which are associated with a marked degree of obstruction.

Such cases are not suited for a long operation nor for one of a plastic character. The colon above the stricture is greatly distended and is loaded with decomposing fæcal matter. The patient is probably prostrated by pain, vomiting, want of sleep, and want of food. The disproportion in size between the gut above the obstruction and that below is at its maximum. In these examples the first indication is to relieve the intestinal obstruction, and to do that with the least amount of disturbance to the patient. The bowel, therefore, may be short-circuited or a colotomy may be performed.

Of these two measures, the former is the one to be aimed at whenever possible. It saves the patient even a temporary artificial anus, and if a subsequent operation be carried out the excision is more easily done when a short circuit has been made than when there is—an addition to the resection—an opening in the bowel to be closed.

In the most extreme cases, those in which the distension is considerable, and in which the patient's condition causes the greatest anxiety, in cases, in fact, which have been grossly neglected, a colotomy alone must be done. It is the less severe of the two measures under discussion and can be carried out with the less expenditure of time. Indeed, in one extreme case I performed a left inguinal colotomy without any anæsthetic except a little cocaine under the skin.

I have effected a short circuit in cases attended with obstruction phenomena of an advanced type and have been very satisfied with the result. In operations done under these conditions the method by Murphy's button has certainly distinct advantages on account of the rapidity with which the union can be carried out and the security with which the portions of bowel may be fixed together. When the selected

portions of the colon are in position the operation of short-circuiting may be completed within ten minutes.

If the case be one of non-malignant stricture the one operation of short-circuiting may suffice, and the patient may remain free of any further intestinal trouble. If the stricture be malignant, then the excision which is essential can be, as already stated, more conveniently carried out when a short circuit has been effected, than when a colotomy wound exists.

(2) In the second place excision may be rendered impossible or undesirable on account of the condition of the affected gut. The colon may be very adherent, and it may be scarcely possible to set it free. The strictured part may be the centre of a mass of adhesions. In one case I was prevented from attempting an excision by the fact that coils of small intestine had become adherent to the surface of the affected gut, which was the seat of a cancerous stricture.

There may be a considerable mass of inflammatory thickening around the bowel the result of a threatened perforation, and with such evidences of inflammation an actual abscess may be associated.

To effect a ready and satisfactory union of a divided colon it is desirable that the serous coat of the bowel should be sound and complete. Indeed, when a very rapid operation has to be carried out a sound and normal peritoneal coat is demanded. If a large surface of the bowel has been deprived of peritoneum, very close suturing is essential, and even then the possibility of leaking is not inconsiderable.

The mobility of the colon is not great in parts other than the sigmoid flexure and transverse colon; and before the gut is excised it must be made manifest that the divided ends can be brought together without strain on the one hand, and without undue disturbance of parts on the other. Now and then, in the case of a non-malignant stricture, a considerable portion of the bowel is involved, is narrowed, is puckered and contorted, or is firmly bound down. To restore the canal in a satisfactory manner, the excision of some inches of the gut may be demanded, but so liberal a removal of parts may be inconsistent with a satisfactory joining of the divided ends.

If a malignant growth has invaded the tissues outside the bowel, it is needless to say that an attempt at excision is not justified.

The course to be adopted in those cases in which excision with immediate suturing of the bowel is rendered impossible by the condition of the gut, will vary. If the stricture be non-malignant, a short circuit will be indicated; and should

that be impossible, there is nothing to be done but to complete the operation by a colotomy.

There will be but few cases, however, in which this will be necessary. In the case of a malignant stricture two courses are open. The growth may, on the one hand, be left untouched, and a short circuit be established, or a colotomy carried out, according to the possibilities of the case; on the other hand, the mass may be excised, and a colotomy established, any attempt at union being out of the question. In the operation, the position of the colotomy wound must depend upon the situation of the growth. The involved segment of the colon must be drawn without the wound, must be liberally excised, and a permanent opening in the bowel established. It thus happens that when such an excision is carried out on the ascending and descending colon, the colotomy wound is best placed in the lumbar region.

It may be argued that if the affected bowel can be drawn outside the parietal wound a union by suturing could be effected after excision, but experience shows that this is not to be inferred. To carry out a sound and safe union of the divided colon considerable laxity in the two ends of the bowel is demanded. Moreover, in effecting a short circuit there must be no strain upon the parts which have been united. The two portions of bowel must come easily together.

The possibilities of effecting a short circuit are rendering colotomy for stenoses of the colon less and less common. In many cases of malignant disease of the colon, in which I was unable to excise the mass, complete relief has been given by a short circuit, and the patient has been spared the discomfort of a colotomy wound.

Colotomy.—The common and useful operation of colotomy has been greatly improved within the last few years and has been rid of most of the after-discomforts which made it at one time a measure to be greatly dreaded. The operation in the iliac region has entirely supplanted the colotomy in the loin, and the latter procedure has, indeed, become one of the rarest of abdominal operations. In inguinal colotomy pains have to be taken to select a proper spot for the opening in the sigmoid flexure, the bowel must be carefully fixed, and, in my experience, the best results have attended the immediate opening of the gut, the contents being evacuated through a glass tube. Little or nothing is now seen in practice of two after-troubles which were at one time the bugbears of colotomy—viz. the contraction of the orifice, on the one hand, and the prolapse of the exposed bowel on the other. The average colotomy gives the patient but a minimum amount of

trouble. In a large proportion of cases it is possible to secure a good action of the bowels every forty-eight hours, the artificial opening causing the patient but little or no inconvenience in the interval. If there be a degree of colitis present at the time of the operation it is true that the new opening may be the seat of not inconsiderable distress. But in the average case the administration of a dose of mistura alba very early in the morning on alternate days will secure an ample evacuation of the bowel, followed by a period of immunity from disturbance. This much-to-be-desired result is rendered possible by very careful feeding and, above all, by the utmost attention to the wound.

There is no doubt but that the troubles attending colotomy, as performed some years ago, were in large measure due to neglect of the wound. A pad of septic tow and a dab of vaseline were placed over the bowel and the requirements of surgery were considered to have been thereby fully met. The gross neglect of the part was excused on the ground that the operation area was already septic. As a matter of fact, few complicated wounds respond more readily to careful treatment and assiduous attention than does the colotomy incision, and the benefit to the patient from such care can hardly be over estimated. I am convinced that the troublesome catarrh of the colon which was not uncommon after colotomy was very often due to the filthy condition into which the wound was allowed to pass, and that difficulty with the bowel in the form of prolapse was often dependent upon the same cause.

The Union of Divided Bowel.—It would be out of place to discuss in such a work as the present the various methods of uniting divided bowel. This matter is fully considered in the numerous works on operative surgery. I would only venture upon a few points of criticism.

Of the methods of uniting divided bowel, either after excision or in the performance of a lateral anastomosis, the best theoretically is without doubt the method of simple suturing. In practice, however, this can seldom be advantageously employed. The simple suture involves a great expenditure of time; the differences in the segment of gut above the stricture and that below it render straightforward suturing almost impracticable; the bowel at the suture line is very apt to kink. To cope with these difficulties there has arisen the remarkable host of plates, discs, tubes, cylinders, buttons, and bobbins which has so disturbed the peace of the surgeon who hungers after the "last new thing."

Of the various appliances in vogue for the uniting of

divided bowel I think one of the best is Murphy's button. It is very far from being a perfect instrument, but it compares at least very favourably with the other forms of apparatus which compete with it.

I have employed Murphy's button in considerably over fifty cases with results which are certainly satisfactory. The button requires no elaborate preparation; it is always ready; its introduction is exceedingly simple, and is effected in a few minutes. The two parts of the instrument may certainly jam, but I think that this accident is the result of careless handling. I have never known it to induce a gangrene which has extended beyond the limit of the button.

The two definite and undoubted objections to the button are these: it may be indefinitely retained, and its separation may be followed by contraction of the artificial opening.

These two undesirable results are often in close relation to one another as cause and effect. In the cases of cholecyst-enterostomy in which I have used the button I have never known it to be retained and, so far as I am aware, the opening made has not undergone inconvenient contraction. In cases in which the button has been employed in the colon only I have never had it retained, but in some instances—a very small minority—there has been contraction of the new passage. In examples of gastro-enterostomy performed by means of this apparatus retention of the button for considerable periods or its absolute failure to appear at all seems to me to be the rule rather than the exception. In not a few instances there has been undoubted contraction of the artificial opening. In only two examples of gastro-enterostomy in which the button was retained has that instrument caused any trouble.

As an example of contraction of the colon after the use of the button I may mention the following case. A man, aged sixty-one years, who had had symptoms of chronic intestinal obstruction for some months, was seized with symptoms of acute occlusion of the bowel, attended by immense distension of the abdomen and stercoraceous vomiting. Laparotomy, performed in January, 1897, revealed an epithelioma in the centre of the sigmoid flexure. The urgency of the case and the great distension forbade any attempt at excision. I therefore effected an anastomosis, by means of a Murphy's button of the largest size, between the two extreme ends of the sigmoid flexure. The diameter of the button was one inch and a half. Fluid fæces were passed before the patient left the table, and he was at once relieved. The button, which had already been used in two previous cases,

was passed on the twenty-second day. The patient was walking out of doors at the end of the fourth week. In March, 1897, he had regained his original weight, and his bowels were acting well with aperients. I then performed a second laparotomy to remove the sigmoid flexure. Although only thirty-eight days had elapsed since the passing of the button I found the artificial opening I had made so contracted that it would do no more than admit my little finger. I removed the whole sigmoid flexure and united the descending colon to the rectum by means of the same button. This button was passed on the sixteenth day. The patient recovered rapidly and remains in sound and vigorous health.

The explanation of these cases of contraction, whether in the stomach or in the colon, is not far to seek. The button effects an opening between the two viscera by means of pressure gangrene. I have noticed that after-contraction has only occurred in cases in which the upper viscus was much dilated at the time of the operation. It is needless to say that in gastro-enterostomy for pyloric obstruction a dilated stomach is met with, and in intestinal anastomosis for stricture the upper segment of the gut is apt to be enormously distended. After the operation the dilated organ contracts and consequently the newly-made hole contracts. I can easily imagine that a hole in a dilated stomach made by pressure gangrene and of the size of half a crown may readily become an aperture of the size of a fourpenny-piece when the distended viscus has gradually contracted. It is, therefore, very desirable to have the viscera to be dealt with as empty as possible before the button is introduced. This end is very difficult to secure even in a partial degree. The stomach, for example, in old pyloric obstruction, even when kept washed out for many days, is slow to contract, and if at the time of the operation the viscus be still much dilated, retention of the button and some inconvenient contraction of the new opening may be regarded as possible. This association between previous distension of a viscus and the subsequent contraction of the aperture made in it is, of course, by no means limited to Murphy's button. It applies to nearly every method in vogue for carrying out the operations now under discussion.

In employing Murphy's button in the colon, it is desirable that the passage below the point of insertion should be clear. Thus, in one case in which I short-circuited the colon for malignant disease there was a stricture of the rectum near the anus, due to an extensive operation for fistula. This presented a serious obstacle to the final removal of the button.

In another example the growth for which the short circuit was made extended into the pelvis, and, had the large-sized button been used, it would hardly have escaped. In this instance a bone bobbin was employed. In any case the bone bobbin is a useful appliance, and in the hands of many surgeons has proved to be of great value.

Forms of Stenosis other than Stricture.—The varieties of obstruction of the colon which come under this heading are alluded to on page 408.

The colon may be adherent and be bent upon itself, and fixed in the bent position by adhesions, or the gut may be actually compressed by a mass of adhesions which pass across its free surface.

In such cases it may be possible to divide the adhesions and to set the bowel free. Care should be taken in carrying out this desirable operation to see that the colon is really set free, and it may be necessary by suturing the mesocolon or by other measures to fix the intestine in such a position that the distortion cannot be repeated. In one case in which a considerable raw surface was left after the division of adhesions I covered the area with omentum which was already adherent in the vicinity. This omentum was secured in place by fine silk sutures. A perfectly free omentum should not be employed for such a purpose, and I am not sure that excised portions of omentum ("omental grafts") are to be depended upon.

If the adhesions in these cases cannot be satisfactorily dealt with, the alternatives will have to be considered of an excision of the involved part with immediate suture, on the one hand, or a short circuit on the other. The case must be very exceptional in which one or other of these two measures cannot be carried out. I am not aware of a recent instance of this form of obstruction in which a colotomy represented the only means of treatment.

Obstruction of the colon by a neoplasm can be dealt with by a more or less obvious series of operations which will meet the various possibilities encountered. An innocent pedunculated tumour may be removed through an incision in the bowel wall, which incision is at once closed.

If the pedicle be broad, the operation may involve the excision of a part of the bowel wall, such excision being of necessity very limited in extent owing to the possibility of a stricture resulting therefrom. In the case of large and sessile tumours excision of the portion of bowel in which the neoplasm is growing is indicated. Failing such excision, nothing remains but a short-circuit operation or a colotomy.

In extensive malignant tumours, such as lympho-sarcomata, an excision of the colon will hardly be indicated.

When an excision has been carried out, a temporary artificial opening may be desirable in cases associated with advanced obstruction symptoms. Or, on the other hand, the bowel with the tumour may be excised, with the understanding that a permanent artificial anus will be unavoidable after the removal.

When the colon is obstructed by the pressure of a tumour outside its walls, the operation needed to give relief must be liable to much variation.

In a certain number of cases the obstruction is relieved by the entire removal of the tumour. At the time of the operation, however, the bowel must be fairly free. It is most undesirable to attempt the excision of a large extra-intestinal tumour at a time when the bowel is overloaded and actually obstructed. As an instance of this may be given a case in which a large uterine fibroid had so grown as periodically to obstruct the colon by pressure. For this and other reasons the removal of the uterus was considered necessary. Considerable care had to be expended in washing out the colon as a preliminary to the hysterectomy.

The removal of a large uterine tumour in the presence of even a mild degree of intestinal obstruction would be an unsurgical proceeding.

If the tumour which has caused the obstruction cannot be removed, nothing remains but to carry out a short-circuit operation or a colotomy. In these particular cases a short circuit can very rarely be effected, and a colotomy becomes the only measure of treatment.

In cases of obstruction due to enteroliths the bowel wall is incised and the stone removed.

The mode of completing the operation will depend upon the condition of the bowel. If it be sound, the incision is closed by suture and the bowel returned. If the bowel wall present evidences of injurious pressure, a temporary artificial anus may have to be made or a portion of the affected gut may have to be excised.

The need of an excision in these cases, however, will be very uncommon.

C. Chronic Intussusception.—This subject has been to some extent dealt with in the section on the treatment of acute intussusception.

In chronic intussusception, the feeding of the patient is a matter of extreme importance, and is carried out upon the lines already laid down in dealing with strictures of

the small intestine and of the colon (pages 523 and 533). Anything which excites peristaltic action excites more or less distress, and the higher up the small intestine is involved in the invagination, the more marked is the discomfort after food.

In one or two cases in which vomiting was a marked symptom considerable relief attended the washing out of the stomach.

Paroxysms of pain must be relieved by opium, the rule being observed to give the minimum amount needed to secure ease.

The bowels must be kept open. In some cases of chronic intussusception there is marked constipation, but even in the cases attended with diarrhœa there may be some overloading of the bowel above the invagination.

Relief to the constipation is usually to be afforded by enemata. Purgatives, as a rule, cannot be tolerated, and are to be avoided owing to the vigorous peristaltic action excited. Reference may be made to the treatment of constipation in the instances of stricture of the small intestine or of the colon (pages 526 and 535).

The bowel in chronic intussusception is narrowed and, so far as the treatment by aperient agents is concerned, may be regarded as strictured.

As soon, however, as the diagnosis has been made in chronic intussusception, operative measures should be employed. There is no possible excuse for delay. The cases treated by medical measures end in death, although the dying may be long protracted.

The use of forcible enemata in intussusception has been fully discussed in a previous chapter (page 501).

This measure is hardly applicable to the present type of invagination, although cases are recorded in which intussusceptions which have existed for some weeks have been successfully reduced by enemata.

As the efficacy of this measure in really chronic intussusception is very doubtful, and as its power to do harm is not so uncertain, it had better be dispensed with and laparotomy performed at once.

The operative treatment of intussusception has already been considered, and what has been said of acute invagination applies with obvious modifications to the chronic type.

The invagination has been reduced by operation after the symptoms have existed for forty-four days,* for seven weeks,†

* *Lancet*, vol. i., 1897, p. 1137.
† Ibid., vol. i., 1889, p. 171.

and for ten weeks.* Mr. Page reduced an invagination which is supposed to have existed for three months.† Reduction by operation at the end of six months is reported by both Czerny and Rydygier. The latter author records an instance of such reduction nine months after the onset of the symptoms.

It need not be said that in the majority of the cases reduction is impossible. In such examples the surgeon should carry out Barker's operation of partial excision or should remove the entire invaginated portion of the bowel, uniting the divided ends of the gut after such removal.

Should these measures be rendered impossible by the size of the intussusception, or by the presence of substantial adhesions, the question of short-circuiting has to be considered.

Small intussusceptions are best treated by total excision, and large ones by Barker's operation.

The instances calling for a short-circuiting operation as the only means of affording relief must be very rare indeed.

D. Fæcal Accumulation.—It is not necessary to discuss in a surgical work the treatment of chronic constipation. It will only be desirable to indicate in the barest manner the lines upon which that treatment is conducted.

In many cases of chronic constipation the trouble depends upon faulty digestion and upon the entrance into the colon of masses of ill-digested food.

In some of these examples the patients have defective teeth or are entirely lacking in masticating teeth, or the teeth, if perfect, do not come into efficient line.

In other cases the food is bolted, meals are taken at irregular times, and no attempt at resting after meals is observed; or, on the other hand, the food taken may be indigestible, and many cases have been recorded in which the bowel has been blocked by masses of chewed nuts, gooseberry skins, of pineapple fibre, and the like. The food taken may be of a digestible character in the abstract, but may not be capable of being efficiently digested by the particular person. For example, milk is an admirable article of food, but some adults appear to be incapable of digesting it if given in large amount, and in such persons the undigested milk will form hard, scybalous masses which have more than once blocked the bowel.

That form of dyspepsia which is common in neurotic subjects seems to be peculiarly favourable for the production of constipation.

* Obalinski.

† Trans. Med.-Chir. Soc., 1878.

Quite apart from imperfect digestion, constipation may be encouraged by the avoidance of such articles of food as excite peristaltic action, examples of which are afforded by certain fruits and vegetables.

Certain subjects of constipation drink so little fluid that the contents of the bowel cannot be maintained in a sufficiently liquid condition.

In other cases the line of treatment is indicated by observing that the patient's muscular condition is in a state of feebleness, that a proper amount of exercise is not taken, that the abdomen is flaccid and the bowel wall in a state of atony, and that a condition is present which may be remedied by massage and suitable exercises, especially exercises in the open air.

In the treatment of chronic constipation massage, combined with exercises and electricity, is of the greatest service.

If actual blocking of the bowel be produced by the accumulation of fæces in the colon, the following course of treatment is to be commended.

If the patient be troubled with colicky pains—as is most probable—such distress should be met by small doses of opium. The minimum doses necessary to relieve pain should be given. No more definite treatment can be undertaken until these disorderly movements of the bowel have been checked.

Rest in the recumbent position should be observed, and in most cases it is desirable that the patient should be confined to bed.

The diet should be restricted to the very simplest elements and should consist exclusively of fluid food.

If vomiting exists—and it will seldom be other than trifling—the quantity of food taken by the mouth should be reduced to a minimum.

Aperients can seldom be tolerated. They will probably have been given literally *ad nauseam* and will have had no effect upon the action of the bowels. Often the aperient is vomited and if retained it is apt merely to excite colic and ineffectual straining. Powerful aperients may do serious harm and in a case of simple fæcal impaction I have seen a heroic purgative reduce the patient to a condition of collapse.

It is desirable, however, that as much fluid as possible should be poured into the colon from the small intestine and the repeated administration of small doses of sulphate of soda, or sulphate of magnesia is often advantageous. These drugs should not be given in sufficient doses to cause colic.

In cases in which the colon is simply loaded and in which there is neither impaction of fæces nor the phenomena of intestinal obstruction, no purgatives are of greater service than castor-oil, on the one hand, and calomel, given in small and repeated doses, on the other.

In connection with this subject one cannot avoid some mention of the use of 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. Many cases are reported where patients suffering 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 published by M. Matignon, wherein this mode of treatment is once more advocated.* In any circumstances M. Matignon's paper cannot fail to be read with considerable interest, and it is from this production that the following remarks have in the main been gathered.

The cases for which this mode of treatment are best adopted are cases of obstruction due to fæcal accumulation.

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 fæcal tumour it is assumed to insinuate itself among the parts of the 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 has any evidence of mercurial poisoning been 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 which the metal may effect by its mere weight.

* Du Traitement de l'Occlusion intest. par le Mercure métallique à Haute Dose. Thèse de Paris, No. 340, 1879.

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 stercoraceous. 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, etc., the use of metallic mercury in large doses would seem to be worth considering, especially as the mode of treatment appears to be attended by no especial risk.

In cases of fæcal accumulation, it is obvious that the main feature in the treatment is to remove the fæcal mass, and this is to be done by means of enemata.

The mode of procedure varies a little, according to the position of the accumulation.

When the rectum is blocked, the mass may be removed by enemata, given with Higginson's syringe. The material used may be warm soap and water, or the salt enema, which consists of one tablespoonful of salt to one pint of warm water.

Failing these, the enema may be made to contain one or other of the reputed "solvents" of fæcal matter. The most common of these is the injection composed of soap and water, to which a little turpentine has been added. Another injection is composed of olive oil, or of olive oil and fresh ox bile, mixed.

Some medical men recommend enemata containing aperients, such as castor-oil, sulphate of magnesia, aloes, and the like.

Enemata of glycerine are not suited for cases in which the rectum is actually blocked. They produce much straining and unnecessary distress.

Failing the removal of the mass with enemata, the patient must be anæsthetised, the sphincter dilated by the fingers and the mass removed with forceps and scoops. After such

removal the rectum should be washed out by irrigation, while the patient is still under the anæsthetic.

When the fæcal mass is lodged in the sigmoid flexure or in the colon above it, the surgeon has to trust solely to enemata.

In these cases any form of syringe or pump is to be condemned. Such an appliance causes the fluid to be introduced in an intermittent and spasmodic manner, of which the bowel is very intolerant.

The injection should be given by means of a douche apparatus, by the use of which a continuous and easily regulated pressure can be maintained.

The douche can should be of glass, and should be graduated. It is convenient if it be large enough to contain two quarts. To the can is attached a rubber tube six feet long, provided with a tap near to the distal end. To the tube beyond the tap is attached a soft rubber anal tube of large calibre, six inches in length and with a terminal opening.

The best position of the patient is lying upon the left side with the buttocks much raised upon a sand bag or hard pillow.

Another position advised by some is the knee and left shoulder position. This position is, however, uncomfortable and irksome and cannot be long maintained. The dorsal position, with the buttocks well raised, has been proved to be efficient and not uncomfortable. After the anal tube has been introduced into the rectum, the tap is turned and the douche can is slowly raised above the level of the patient's body. The height to which the can is ultimately raised should be between two and three feet. An elevation of over three feet above the patient's body is not desirable. An elevation of one or two feet will be sufficient in the case of a child.

The fluid used for the injection should be the normal salt solution at the temperature of 100° F.

In the administration of this injection certain points have to be observed. The enema can effect the surgeon's purpose in two ways. The fluid may be made so to distend the colon as to provoke peristaltic movement and so encourage the natural discharge of the fæcal mass. In such case the escape of fluid from the anus must be as far as possible prevented, and to effect this end it is well that the anal tube should be attached to a handle and hilt similar to that belonging to Lund's insufflator (Fig. 117). On the other hand, the fluid may be made use of actually to wash out the colon. In

this case the anal aperture must be left free, and the anal tube should be double and arranged on the principle of a double-current catheter. A Turck's double colon-tube meets this end.

In the washing out of the bowel several gallons of water may be employed and the injection, if not at once efficacious, may need to be repeated every day until the bowel is cleared. There is no doubt but that the douching or irrigation of the colon is more efficacious than the "forcible enema." When the abdomen is much distended the forcible enema cannot be tolerated, while, on the other hand, irrigation of the colon does not add to the already existing distension.

It is well to remember that the dislodgment of long-retained fæcal masses is often attended with considerable constitutional disturbance. It would seem that septic absorption from the bowel is the cause of this disturbance. After the breaking up of the fæcal accumulation it is common for the patient to experience a condition of *malaise*, with headache and possibly nausea and a marked rise of temperature. In one or two of these cases severe urticaria has attended the febrile disturbance.

When once the removal of a fæcal accumulation is attempted it is well that the treatment should be persevered with until the colon has been emptied.

During the progress of such treatment gentle massage of the abdomen may be employed and, above all, hypodermic injections of strychnia ($\frac{1}{60}$th of a grain) may be given three times a day. There is no doubt but that the strychnia is of considerable service.

As a means of counteracting the septic absorption from the bowel the administration of salol in ten-grain doses night and morning appears to have good effect.

After the bowel has been emptied, means should be taken to prevent a recurrence of the accumulation. These means will take the form of careful dieting, of attention to the digestion, of the discreet use of aperients and enemata, and of the employment of massage of the abdomen and electricity. Daily massage of the belly is one of the most admirable means of counteracting the severer type of chronic constipation.

There are several methods of applying electricity in these cases of 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 claimed 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 expelled either from the mouth or the anus.

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.

In other forms of apparatus, 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.

An account of apparatus for the employment of mechanical massage has been given by Dr. Herschell in a recent communication.*

* *Clinical Journal*, London, November 23, 1898.

CHAPTER VI

THE PROGNOSIS AFTER OPERATION FOR CHRONIC INTESTINAL OBSTRUCTION.

So many different conditions are included under the term chronic intestinal obstruction that it is difficult to give in a few words a correct estimate of the prognosis of the operations taken for its relief.

Obstruction due to fæcal impaction should yield to the measures detailed for clearing out the colon and should never demand a cutting operation.

Patients with fæcal impaction may die of exhaustion, of intestinal septicæmia, of peritonitis, of colitis, or the like. The treatment, if undertaken in good time and while the bowel is still in good condition, may be expected to be attended with success and indeed, in uncomplicated cases of obstruction due to fæcal accumulation, the clearing of the colon is—if sufficient pains be taken—as a rule effected with certainty.

I am not aware that an uncomplicated case of fæcal accumulation has called for an abdominal section.

The operations for chronic intussusception are now attended with satisfactory results if the operation be not too long delayed. The matter has been alluded to in previous sections (page 521).

Chronic obstruction due to the bending or kinking of the bowel by adhesions demands an operation of little magnitude, which should be attended with success in nearly all the cases in which the operation is undertaken in good time.

The relief of obstruction due to gall stones or enteroliths is effected with less risk when the obstruction is of a chronic typethan when the symptoms produced are acute.

It is quite impossible to formulate the risk involved in

operating upon cases of obstruction due to the pressure of a tumour outside the bowel, inasmuch as the conditions involved are subject to so great variation.

The operation of excision of a portion of bowel for malignant disease is, in my opinion, one of the greatest value. The treatment of cancer by free excision is strikingly successful when the malignant growth involves the bowel, and particularly when it concerns the colon. Patients who have been subjected to such excision have remained free from any return of the disease for periods of three and four years and even for longer stretches of time.

I would estimate the present mortality of excision of the bowel for malignant disease at about 20 per cent. and the mortality of short-circuiting operations at about 12 per cent. It is to be remembered that the majority of these operations concern the colon.

As in like measures for other forms of obstruction, the great element in success depends upon the performance of the operation at the earliest possible period. The danger in an excision of the bowel, or in a short-circuiting operation, is to be measured mainly by the degree of distension of the bowel at the time of the operation.

When abdominal section is performed as early as possible, the mortality of the operations in question will still further decline.

The mortality of colotomy performed for chronic intestinal obstruction may be placed at between 5 and 10 per cent.

Colotomy has been largely replaced by short-circuiting operations and the cases in which colotomy is now performed are often complicated and have been not infrequently neglected.

There is little reason why colotomy, when performed for chronic obstruction, should not be attended with the little risk which is now associated with that operation, when performed for rectal carcinoma.

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Treves

Intestinal obstructions

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