An Address ON VOLVULUS.*

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I HAVE chosen Volvulus as the subject of my remarks, for the reasons that this morbid condition is, I am convinced, by no means so rare as is generally supposed; that it is not often diagnosed prior to opening of the abdomen; that it is, in my opinion, the most fatal of all the many varieties of intestinal obstruction, although if treated in good time its mortality should be far less than it now is, as operation in the early stages of the affection is at least as likely to prove satisfactory as laparotomy for any other variety of intestinal obstruction; and, lastly, that it will afford me the opportunity of making some observations on the subject of mechanical intestinal obstruction.

We must at the outset distinguish between two great classes of intestinal obstruction: (1) those in which there is mechanical obstruction only, and (2) those in which to mechanical obstruction there is added strangulation of the intestine. In the latter case the vitality of the bowel wall is seriously impaired, with the result that necrosis, with permeation of the strangulated segment of bowel by infective microbes, takes place, with or without perforation of the intestine, and thus septic peritonitis arises. This is practically constant in volvulus unrelieved by treatment, in which condition the later symptoms owe their existence chiefly to infective peritonitis rather than to mechanical obstruction. A few hours' delay in relieving the obstruction may do little harm in a case of pure mechanical obstruction, while they may make all the difference between life and death in one such as volvulus, in which the lesion is obstruction *plus* strangulation.

The subject of volvulus has impressed itself upon my mind owing to the fact that within the past six months I have seen, I believe, no less than five cases of this lesion, one of which was a combined volvulus of both small and large intestines, so that I have encountered during this short period six examples of intestine rotated round its mesenteric axis. One case I admit recovered without operative treatment, and you may therefore feel some doubt about my diagnosis, but even if we exclude this case it is remarkable that so many examples of volvulus should have occurred in so short a time in the practice of a single surgeon.

Two distinct varieties of volvulus must be mentioned. In the more common variety the intestine (commonly the large bowel) is rotated around its mesocolic or mesenteric axis in such a manner that the lumen of the intestine is obstructed. In the rarer variety, of which the above five cases offer one example only, the small and the large intestine are both rotated around their mesenteric and mesocolic axes, so that a double or compound volvulus results with symptoms more urgent than in the more frequent variety.

Volvulus most frequently involves the sigmoid colon, and it will be noticed that this segment of the intestine was affected in four out of the five cases mentioned. More rarely the caecum and commencement of the ascending colon constitute the intestinal segment concerned; this was the case in one only of these cases. Still more rarely is a volvulus of the small intestine observed; this was noticed once only, and then in combination with volvulus of the sigmoid flexure.

Volvulus of the Sigmoid Flexure.

This, by far the most frequent form of volvulus, is found either uncomplicated—that is, the sigmoid colon is twisted upon its mesocolic axis (three instances)—or in combination with a volvulus of the small intestine (one case).

About 75 per cent. of all cases of volvulus are instances of the sigmoid colon rotated around its mesocolic axis.

The so-called 'sigmoid flexure' has, as Sir F. Treves has remarked, a greater resemblance to the capital letter Ω .

The rectum of our student days has, by modern anatomists, been shorn of its first part, which is now included with the sigmoid colon under the name of the omega loop.

This omega loop varies more in length than any other structure in human anatomy. On the operating table I have known it as short as 7 in. and as long as 26 in. It will be observed that in cases in which the sigmoid colon approximates to the length of its mesocolic attachment to the posterior abdominal wall no volvulus can occur, whilst in instances in which the sigmoid colon is several times the length of its parietal attachment there is a definite predisposition to the occurrence of a twist of the colon around its mesocolic axis. In a long omega loop the comparatively narrow pedicle of attachment serves as a predisposing cause of volvulus. The nearer the two extremities of the omega loop approach one another, and the longer the segment of bowel, the more likely is rotation around the narrow mesocolon to occur. Elongation of the sigmoid colon might naturally be considered to be of congenital origin, but against this view I may state that during many years' service on the staff of a large children's hospital I have never met with a case of volvulus of the sigmoid flexure in a child.

I am convinced that the common cause of elongation of this segment of the large intestine is constipation. The omega loop laden with hardened faeces drops down into the cavity of the pelvis, and the weight of the faecal mass tends to lengthen the distance between the parietal attachment of the mesocolon and the bowel, and at the same time to approximate the two ends of the omega loop. The mere weight of the faecal content of the omega loop has much to do with starting the rotation of the intestine around its mesocolic axis.

Two varieties of rotation are possible. In that which is of by far more frequent occurrence the upper part of the omega loop travels downwards and forwards anterior to the lower part of the loop, so that the end of the descending colon touches and lies anterior to the upper rectum (type *rectum en arrière*, Potain). In the far less frequent variety the upper part of the omega loop passes downwards and backwards, so that the end of the descending colon is in contact with and behind the commencement of the rectum (type *rectum en avant*).

The extent of rotation of the colon around its mesocolic axis is very variable and may be from about half a circle—that is, an angle of 180 degrees—to three complete rotations. Anything short of 180 degrees will not produce symptoms of total obstruction or of strangulation of the intestine. It is commonly taught that once a volvulus has occurred it cannot replace itself spontaneously. This, I am convinced, is an error, and I shall adduce evidence in support of my contention. In cases in which reposition does not soon take place the volvulus rapidly becomes greatly distended with gas, as it is a closed sac with putrescent contents; at the same time its walls suffer intense vascular engorgement. The longer the volvulus is allowed to remain unreduced the more difficult is it to replace the bowel. Even if this be accomplished, the volvulus recurs immediately. No force must be used to untwist a volvulus, otherwise the damaged bowel will assuredly burst. An incision must be made into the tense intestinal loop to give exit to the distending gas and contained faecal matter; reduction of the volvulus is then easily accomplished and the twist does not recur.

A volvulus of the sigmoid colon may attain enormous dimensions. I have seen one which reached nearly to the liver, and overlay and thus hid from view the whole of the rest of the intestine.

The intestinal wall is always seriously damaged. In colour it may be dark violet-red to black; it is always swollen and very friable. Linear ruptures of the peritoneal and muscular coats are commonly seen, but the resistant submucous layer saves the mucosa from participating in the tear. In the worst cases numerous spots of gangrene of the size of a sixpenny piece, and affecting the whole thickness of the bowel wall, may be observed; in rare instances they lead to perforation of the bowel. Peritonitis always occurs if the case last sufficiently long, owing to the fact that the damaged intestinal wall is

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permeable to micro-organisms from inside the twisted loop of bowel, and it rapidly becomes generalized.

Volvulus of the Sigmoid Colon Combined with Volvulus of the Small Intestine.

One example of this rare condition was met with in my five recent cases. A segment of ileum with a long mesentery had apparently passed across the sigmoid colon at its lower part. It lay external to the line of the omega loop. The latter had twisted around the pedicle of the small intestine coil, and presented the normal aspect of a volvulus of the omega loop. I was fortunately able to untwist the volvuli, and the patient is now well. This is the most extraordinary case of volvulus that I have yet seen.

The patient, a woman, was admitted into Charing Cross Hospital on December 26th, 1908, with severe symptoms, enormous abdominal distension and constant vomiting. Enemata given every hour soon caused abatement of the symptoms and she desired to be discharged thinking herself cured. Flatus and even fluid faeces were passed, but a lump could still be felt. Thirteen days later, on opening the abdomen, the above-described condition was found. The rotation in the case of the sigmoid volvulus was through an angle of 180 degrees, and the volvulus was held in this position by an adhesion to the left Fallopian tube. The loop of ileum was rotated through an angle of 130 degrees only.

This case lends support to the views of von Samson, who holds that a half-turn volvulus—that is, the rotation through an angle of 180 degrees—does not occlude the lumen of the bowel or produce symptoms of strangulation of the intestine.

Volvulus of the caecum and lower part of the ascending colon was found in one of my five recent cases.

It occurred in the case of a man admitted into my male ward at Charing Cross Hospital, January 7th, 1909, suffering from carcinomatous stricture of the sigmoid colon. In this patient the distended caecum was rotated along with the lowest 3 in. of the ascending colon on its mesocolic axis through an angle of 360 degrees (a complete circle). The volvulus was a huge one and strangulation had lasted for more than four days. The wall of the caecum exhibited numerous round patches of gangrene, and for this reason, after the damaged segment of intestine had been incised, it was found necessary to leave it outside the abdominal cavity.

Volvulus of the Small Intestine.

In this variety the rotation may be from left to right or from right to left, and the loop of bowel, commonly the lower ileum, is twisted on its mesentery through a complete circle.

Incidence of Volvulus.

Volvulus is stated by various authors to be responsible for from 3 to 4 per cent. of all cases of intestinal obstruction. In my practice its frequency has been at least double that given above. In about three-fourths of all cases the sigmoid colon was the segment of intestine involved.

The condition is far more common in the male than in the female, fully 80 per cent. occurring in the former sex. The most frequent age is 50 to 60 years.

Volvulus is only possible where the mesentery or mesocolon is long. Hence its frequency in the sigmoid flexure, in the ileum, and in the caecum when this part possesses a mesocolon.

Spontaneous Reduction.

Spontaneous reduction of a volvulus is an event that, I am convinced, by no means infrequent. I have once seen it occur. I performed ovariectomy in a thin woman, and, as the result apparently of the sudden removal of the support afforded by the tumour, the omega loop rotated on its mesocolic axis through an angle of 180 degrees. I was about to untwist it when, to my surprise, the twist undid itself spontaneously. I think that in many cases volvulus of the omega loop of mild degree takes place, occasioning sudden abdominal pain in the left iliac fossa, and is reduced either spontaneously or as the result of rectal enemata. It will be observed that in one of my cases I believe the recent volvulus to have been reduced by enemata.

This case occurred to a friend of mine, seen in consultation with Drs. Carruthers and Douglas of Upper Norwood. To the kindness of my friend, Dr. S. W. Carruthers, I am indebted for the account of the history of the case. "About 11.30 a.m. the patient was seized with intense abdominal pain, which rapidly abated sufficiently to allow him to continue what he was doing. An hour later the pain again became agonizing, and the patient

was writhing on the floor when I (Dr. Carruthers) saw him. Countenance anxious and pale, pulse 85. Patient located the pain definitely at a point in the left iliac region. The abdomen was not distended nor rigid. No flatus had been passed since the original paroxysm of pain. Patient was at once put to bed. No opium was given, for fear of masking symptoms. Two soap-and-water enemata were given in rapid succession. The first (30 oz.) brought away a small solid motion from the lower part of the rectum; the second (40 oz.) brought away nothing further, but gave the patient immediate sense of relief. It was followed, however, by sharp vomiting. Thereafter no severe paroxysm of pain, no flatus passed, and the pain had now become dull, not much more than acute discomfort, with occasional griping. Enemata were continued, and the patient vomited twice. At 6.30 p.m. Mr. Waterhouse and Dr. Douglas saw the patient with me in consultation. Our unanimous opinion was that it was a case of volvulus of the sigmoid flexure, which it was hoped had been reduced by the enemata already administered. Some tenderness on pressure was elicited over the sigmoid flexure. It was decided to continue the use of enemata and to await events for a few hours. At 10 p.m., after discussion with Mr. Waterhouse over the telephone, it was decided to run the risk of postponing abdominal exploration, owing to the cessation of vomiting and general *bien être* of patient. Enemata given at intervals during the night nothing but water by mouth. Between 7 and 8 a.m. flatus was passed several times. Fluid food was now allowed, and calomel was given, $\frac{1}{2}$ grain hourly, after a second consultation with Mr. Waterhouse at 5 p.m. Bowels acted next morning, a fairly copious stool, and recovery was thereafter uneventful."

Can there be any doubt that this was an instance of volvulus of the sigmoid flexure untwisted by the second enema administered by Dr. Carruthers, which, though it brought away nothing, gave instant relief to the patient? I have no doubt on the subject, though I admit that I cannot prove my contention. I have come across several such cases, and I believe them to be far from uncommon.

Symptoms.

Volvulus is always of sudden onset and commonly commences in a patient in sound health. Abdominal pain about the seat of the twist is constant, it is commonly severe and continuous, but may be colicky; the constant pain is due to the twist, the exacerbations to the violent increased peristaltic movements above the volvulus. The other symptoms depend largely upon the locality of the volvulus. If it affects the small intestine the symptoms are those of acute intestinal obstruction. If, on the other hand, it occurs in the lower part of the large intestine the immediate symptoms of obstruction may be, at first, comparatively trifling. Vomiting is urgent and constant in the former case, whilst it may never occur in volvulus of the omega loop. My last case of volvulus of the caecum did not vomit either prior to or after the operation.

In volvulus, as in other abdominal diseases, tenderness is a far more valuable localizing symptom than pain. The latter may be referred, the former corresponds to the situation of the lesion. Distended coils of intestine may exhibit violent peristaltic movement which may be seen to cease abruptly at a definite spot. Local meteorism may enable a diagnosis to be made, and such localizing symptoms are often of real value. Soon the twisted intestine and mesentery undergo venous engorgement and oedema, and both exude plastic lymph which may glue the volvulus to adjacent coils of intestine, and thus present a formidable obstacle to reduction of the lesion. Not until the vitality of the bowel wall has been so impaired as to permit of its permeation by microbes from inside the strangulated bowel will septic peritonitis commence, but when once started this infective process spreads rapidly and soon becomes diffuse. Extreme intestinal distension is chiefly noted in cases of volvulus and of generalized septic peritonitis. As a point of differential diagnosis, it may be mentioned that tenderness on pressure is far more marked in the latter condition.

The onset of gangrene of the twisted bowel is indicated by the pulse becoming rapidly weak and quick and by the septic appearance of the patient.

A hyper-resonant note may frequently be elicited over the distended volvulus. The diagnosis of volvulus I have found far easier in the early stages of the malady than when the characteristic symptoms are concealed in great measure by the general tympanitic distension of the abdomen and the onset of peritonitis. In the diagnosis of volvulus it must be remembered that the onset is very sudden, that the obstruction of the intestine is complete, that the volvulus can often be felt as a tense tumour (resembling an india-rubber ball intensely inflated) which

is always tender on pressure, hyper-resonant on percussion, and commonly the seat of pain.

A volvulus that is very recent and in which no secondary changes have occurred in the twisted mesentery may, I am convinced, be reduced occasionally spontaneously, and more frequently by the aid of copious rectal enemata, especially if the rotation has only been through half a circle or thereabouts. When, however, the volvulus has been in existence for some time, and the rotation corresponds to a complete circle, or more, and when secondary changes have occurred in the mesentery and intestinal loop, then death from obstruction and septic peritonitis, otherwise inevitable, can only be avoided by opening the abdomen and undoing the twist. The more complete the twist and the higher up in the bowel the volvulus the more urgent is the danger.

Treatment of Volvulus.

The loop of bowel twisted upon its mesenteric axis provokes vigorous peristaltic movements in the intestine above it. The first indication in treatment is to calm this dangerous peristalsis, which tends markedly to aggravate the existing obstruction and strangulation. No food must be given by the mouth, but I never forbid water, as the suffering of the patient is greatly augmented by the intense thirst due to frequent vomiting, so often a prominent symptom in intestinal obstruction of all kinds. Should the ejecta consist largely of bile or the contents of the small intestine it adds greatly to the patient's comfort to wash out the stomach either by the stomach tube or, as I prefer, by giving water freely by the mouth. Many authorities advise that the exaggerated movement of the bowel above the site of obstruction should be calmed by opium administered by the stomach or by a hypodermic injection of morphine. I earnestly beg of you never to allow yourselves to be persuaded in any case of intestinal obstruction to use this, in such cases, treacherous and deceptive drug. I yield to none in my admiration for morphine as a mitigator of pain, but in intestinal obstruction I regard it as a deadly drug. How often have I at the bedside, racking my brains to make a diagnosis in a case of acute abdominal trouble, regretted that I could not discount the effect of even a single dose of morphine! Over and over again have I felt that I might have made a more correct diagnosis and by timely operation have been enabled to save life had it not been that my judgement was obscured by the statement both of the medical attendant and of the patient that the condition of the latter was evidently improving, as he was certainly better than he was six or eight hours previously. I have in many such cases neglected to make full allowance for the effect of even a single dose of morphine, and have fallen in with the request to wait to see how the patient was the next day, to learn at the operation that I had waited too long. Pray do not think that I am unreasonable in this matter. I fully understand that the practitioner's duty in the eyes of his patient is to give relief to his most urgent symptom—that of intolerable pain—and that a hypodermic injection of morphine will accomplish this. I beg of you, however, to remember that an operation followed by death will bring discredit on the surgeon, and that in common fairness to him he should be allowed to see the patient as he really is rather than with his sensibility to pain and tenderness annulled by a dose of morphine. If I, as a surgeon, were asked how I would define a first-rate practitioner, I would be inclined to answer: One who does not administer morphine in acute abdominal disease until a fairly confident diagnosis has been arrived at.

I am a profound believer in the value of rectal enemata in volvulus. I am convinced that I have seen many cases both of volvulus and of intussusception which have been reduced by the use of repeated rectal enemata. I admit that clear proof of this is wanting, but I have no doubt in the matter. I would draw special attention to the value of the genu-pectoral position during the administration of enemata. I am certain that I have been enabled more than once to reduce a volvulus of the sigmoid colon by repeated enemata administered in this position in cases in which enemata administered in the dorsal position had failed to accomplish reposition. My belief is that cases of volvulus of the sigmoid colon which can be reduced by rectal enemata are those only which are of recent origin

(less than twelve hours), and in which the angle of rotation is less than 270 degrees. You will remember that we have seen that there are two varieties of volvulus of the omega loop. In the more frequent, in which the upper part of the loop travels downwards, forwards, and inwards anterior to the lower part of the loop, it is clear that distension of the lower segment of the bowel will have a tendency to undo the twist. In the less frequent variety, in which the upper part of the loop passes downwards, backwards, and outwards posterior to the lower end of the loop, distension of the lower bowel will tend rather to aggravate the twist.

I have clinical evidence for this. In two cases of volvulus of the sigmoid flexure I found after opening the abdomen that the volvulus in the first-mentioned variety was readily reduced by rectal injection, which failed in the example of the latter variety, and in fact seemed to render the twist tighter than before.

What is the mortality of volvulus? I cannot tell, but I know well that it is appallingly high. It is certainly the most fatal form of intestinal obstruction, and yet it ought to be one of the least fatal. I am convinced that the cause of the awful mortality is that the operation is, in almost every case, postponed until the strangulated intestine is beyond recovery.

Few operations have yielded me happier results than those for early volvulus of the sigmoid colon; none more terrible consequences than those in which I have been called to a similar volvulus on the fourth, fifth, or sixth day subsequent to the onset of the condition, to find the strangulated bowel gangrenous and diffuse peritonitis already developed. One great reason for the delay that has occurred is the fact that in about half of my cases of volvulus of the sigmoid there has been no vomiting, and the case has therefore appeared to the medical attendant not to be one of urgent intestinal obstruction.

The two conditions that make for success in the treatment of volvulus are immediate diagnosis on the part of the practitioner and immediate reduction of the volvulus by the surgeon. Should either of the two fail in his part, the probable result will be the death of the patient.

In very recent volvulus, especially of the omega loop, reduction may be accomplished by rectal enemata in a certain proportion of cases. Should they fail, and this will frequently happen, the surgeon must in every instance open the abdomen. The incision should, I think, in every case be made in the linea alba, for the reason that by a median incision every viscus in the abdomen may be examined.

There are few things more distressing than, after making an incision in the left inguinal region for the relief of a sigmoid volvulus, to discover that the caecum has burst owing to over-distension, and that a second incision is called for to deal with this terrible lesion. I speak from painful experience. The abdomen having been opened in the mid-line the caecum is in all cases of intestinal obstruction to be examined immediately. Its condition at once gives information of great value. In volvulus the caecum itself may be the seat of the lesion. If the caecum be empty the obstruction is obviously in the small intestine; if it be distended, in the large bowel. In all cases of two or three days' standing there will be found marked distension of the intestine above the site of the obstruction. The volvulus owing to its huge size will be readily found, and must if possible be brought outside the abdominal incision. This, owing to the undue length of the mesentery (or mesocolon), I have always been able to accomplish. The next step is to replace the twisted bowel into its usual position. In the majority of cases this reposition is by no means a simple matter. Should the volvulus be of only a few hours' duration the adhesions will be slight or absent. Untwist the strangulated loop in a direction the reverse of that in which the twist occurred and deal gently with it. In the majority of instances the bowel loop will immediately spring back into its former vicious position. In almost every case I have found it necessary to open the distended loop of bowel on its antimesenteric aspect in order to evacuate the gas and faecal contents. Not only must the contents of the volvulus be allowed to escape through this incision in the bowel, but the distended intestine above the volvulus must be evacuated of its putrefactive accumulation in order to prevent the risk of auto-infection. This evacuation of the bowel above the constriction is notably aided by irrigation

of the distended coils of intestine through the opening. Once the volvulus has been emptied of its contents reduction of the twist is almost invariably possible, and in no instance have I then known the twist to recur. Many surgeons now advise closing the incision in the bowel and the return of the latter into the abdominal cavity. I admit freely that this is the ideal course to pursue, but I confess that I have never dared to follow it. I have always ligated the margin of the incision in the bowel to a glass tube and drained the distended and damaged bowel for several days. In most cases in which the patient has recovered, the fistulous opening in the bowel has closed spontaneously at the end of some weeks.

In the worst cases it is obvious that gangrene of the strangulated loop of bowel has occurred, and the condition of the patient is always extremely perilous. The ideal treatment would appear to be resection of the gangrenous intestine and union of the proximal and distal segments of the bowel either by end-to-end or by the far safer lateral anastomosis. This treatment I have never ventured to carry out. In every case of gangrenous volvulus that has come under my care the condition of the patient has appeared to me too desperate to warrant a prolonged operation. I have always, in such cases, been content with bringing the gangrenous bowel and a piece of healthy intestine on each side of it outside the abdominal cavity. In such cases as have recovered I have performed resection subsequently. Making two bites at a cherry may be in general a bad practice, but in surgical procedures of grave moment in which the life of the patient literally hangs in the balance, the operation *à deux temps* is, in many instances, the safer for the patient, and the one that the surgeon is therefore bound to follow.

Once the volvulus has been reduced, can any steps be taken to prevent the recurrence of the condition? In one of my recent cases, under the care of Dr. J. H. E. Brock, the patient, a man aged 31, had had his life placed in jeopardy no less than four times in thirteen months owing to recurrent volvulus of the sigmoid colon. I have endeavoured to convince you that the all-important factor in the establishment of a volvulus is undue elongation of the mesocolon or mesentery. Clearly it follows from this that the object of treatment directed to the prevention of recurrence of the volvulus is to shorten the elongated mesocolon or mesentery. Such an object I have endeavoured to obtain, I think with success, by introducing silk sutures at right angles to the bowel from the intestinal attachment of the mesentery or mesocolon to its root and then tying these. I have thus puckered the mesentery or mesocolon parallel to the axis of the intestine, with the result that the mesocolon or mesentery has been shortened and recurrence of the twist prevented. This measure is, I am convinced, far superior to that commonly adopted of suturing the coil of intestine to the abdominal parietes. It must be the experience of all surgeons that peritoneo-peritoneal adhesions almost invariably either stretch out to form long thin cords, which must constitute a constant danger of strangulation to any coil of intestine that may happen to be ensnared by them, or give way entirely, thus in the case of volvulus permitting the recurrence of the twist of the bowel.

In conclusion, may I remark that I have largely confined my remark to volvulus, but I hope that my observations may be taken as applicable to other forms of intestinal obstruction? It may be objected that I have taken a lesion of very rare occurrence as my topic: but I would urge that volvulus, certainly in its slighter degrees, is by no means so rare as is generally supposed. As to its rarity, my house-surgeon, Mr. E. H. Hugo, M.B., B.S.Lond., can bear me out in my statement that between January 5th and 12th he saw with me no fewer than 4 cases in which the intestine was twisted upon its mesocolic (three times) or mesenteric axis. I know no more delusive abdominal lesion, none more difficult of diagnosis, and none more fatal, owing chiefly to imperfect and tardy diagnosis, than volvulus. Some of you may say you have never come across a case of volvulus in practice, or you have seen but one or two. Within a few days you may encounter your first, second, or third case of volvulus. If so, pray bear in mind my warning. You will probably in such case misconstrue the symptoms. You will think of other conditions. Should vomiting be absent, as is not

uncommon in volvulus of the sigmoid, you will probably deem the case one of no urgency, and you may wait until the hour of successful intervention has passed. If what I have said prove the means of helping you to a correct diagnosis and induce you to have resort to timely operative treatment, with the result that your patient's life is saved, my object will have been attained.

An Address

ON THE

IMMEDIATE AND ULTIMATE RESULTS OF THE OPERATION OF GASTRO-ENTEROSTOMY FOR GASTRIC AND DUODENAL ULCER.*

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THE immediate results after gastro-enterostomy are wonderfully good when we consider the severity of the operation; still I think that those writers who give the mortality at only 1 per cent. rather underestimate the risk, and such a satisfactory result has only been obtained by good fortune and careful grouping of cases, as well as by good surgery. In a series of 132 operations which I have performed for ulcer of the stomach and duodenum (excluding cases of perforation) there have been 6 deaths, or a mortality of a little under 5 per cent. The causes of death in the fatal cases were as follows: Shock after Roux's operation in an exhausted patient, 1 case; shock after operation for repeated profuse haemorrhages, 1 case; exhaustion after secondary operation for vicious circle, 1 case; syncope after haemorrhage from ulcer ten days after operation, 1 case; rupture of the ulcer three days after operation, 1 case; and pulmonary embolism on the third day after operation, 1 case.

I consider that the last three fatalities were entirely outside the control of a surgeon, and that the case of death after operation for repeated haemorrhage must be considered as occurring in spite of rather than in consequence of the operation. In the remaining two cases death was certainly hastened by the operation, although recovery was impossible had no operation been performed. My experience makes me hesitate to assert that the risk of a gastro-enterostomy is practically *nil*.

While considering the immediate mortality of the operation we ought to bear in mind the mortality of gastric ulcer under medical treatment. There seems to be a great difficulty in estimating this, and it is stated to be from 20 to 50 per cent. by various surgical writers. I cannot but think that even the lower estimate is probably too high, and that a mortality of 10 per cent. would be more reasonable to assume when comparing the results of surgical with those of medical treatment.

So much for the immediate mortality after an operation for gastric or duodenal ulcer. In the non-fatal cases the improvement, with very few exceptions, is wonderful; the patients feel better than they have done for years, and are able to eat and digest any kind of food. This improvement is maintained so long as the patient remains in the nursing home or in hospital, and, were we only considering the condition of patients within a month or two after an operation, we could positively affirm that over 90 per cent. of the cases were completely cured.

The point I wish to discuss is, What is the condition of these apparently cured cases some years after the operation?

Before doing this, I should like to call your attention to the physiological conditions attending a gastro-enterostomy in the case of a simple ulcer. When the opening is first made, the mucous membrane at the edges of the opening becomes congested, partially blocking the opening, and consequently we may have vomiting for the first twenty-four or thirty-six hours; after this the swelling of the mucous membrane subsides and a patent opening is left. Under these conditions, dilatation of the stomach, whether caused by cicatricial contraction or by spasm of the

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