I had hoped to show you a boy illustrating this condition, but he was not able to come. He was in hospital three years ago with acute osteitis, and during a long and serious illness he developed, no one knew exactly when, an arthritis of the hip which resulted in a pathological dislocation. So far as is known there was never any swelling or other sign to call attention to the hip-joint, and no pus formed, or, at any rate, no abscess was opened. Nevertheless, there is a dislocation that is easily made out, and the x-ray plate shows that the joint has been completely disorganized.

Such a condition may well be termed " quiet " infective arthritis owing to the absence of any definite occurrence to call attention to the condition. As in this case the hip is the joint most usually involved, possibly owing to its deep position, but other joints may in the same way become affected without attracting attention, especially in patients lying desperately ill from a blood infection. The knowledge of the possibility, as illustrated by this case, will no doubt help to emphasize the importance of keeping a watchful eye on the joints in all cases of acute infective illnesses.

ACUTE INTESTINAL OBSTRUCTION.

A SERIES OF 282 CASES.

BY

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THE object of this paper is not to detail the frequency of the various kinds of acute obstruction, or to show the relative proportions in males and females and the ages at which they occur, etc. These points have all been worked out in papers by many authors. It is mainly to the subject of treatment my remarks will be directed.

The operative mortality of acute obstruction is generally held to be somewhere between 40 and 50 per cent. in a series of cases. There is no doubt this large death rate is attributable in no small degree to operation being performed on cases sent into hospital very late in the disease, but I hope to show that by making use of the results revealed by recent experimental work it is possible to reduce this mortality very materially.

This series of cases is 282 in number and a consecutive series upon which I have operated in a period of two years. They were taken as they came, without any attempt at selection as regards suitability for operative purposes, and are a very fair sample of the type received into any large hospital.

There is no doubt that there has been much improvement of recent years in the matter of early recognition of serious abdominal cases of all descriptions, but acute intestinal obstruction has still a very heavy mortality, which is due partly to delay and partly to the very vital character of the organs concerned.

The mortality in this series is 15.6 per cent. As will be seen from the table below I have included strangulated external herniae and acute obstruction from carcinoma. It is not usual, perhaps, to classify these with the ordinarily accepted cases of acute obstruction. Leaving these out of account, there were 70 cases, with a death rate of 28.5 per cent. This is still too great a mortality, but a considerable improvement.

Classification of Cases and Mortality.

	No. of Cases.	Deaths.	
		No.	Per cent.
External herniae	170	18	10.5
Bands and adhesions	39	10	25.6
Intussusception	26	10	38.4
Carcinoma of intestine	42	6	14.6
Volvulus	2	0	
Internal hernia	1	0	
Thrombosis of mesenteric vessels ...	1	0	
By gall stone	1	0	

I included external herniae because the pathology is essentially the same as that of many cases of strangulation by band, and the carcinoma cases are included because they were admitted as emergencies, and in many of them the only diagnosis possible before operation was acute intestinal obstruction.

Let us consider first the experimental work, the application of which, I hold, is of the greatest importance in the treatment of acute ileus.

Wilkie[1] has shown that the contents of the intestine above an acute obstruction are very toxic and teeming with bacteria, and that the mucosa protects the organism against a toxaemia until it becomes seriously damaged by great distension, demonstrating the important selective and neutralizing function of the intestinal mucosa. The work of McLean and Andries[2] fully confirms this.

Further confirmation of the late absorption of the toxic contents of the intestine was established by Wilkie in a series of experiments on cats, in which he produced an acute obstruction and then injected into this obstructed part the toxic contents from the intestine of cats which had died of an acute obstruction. If toxic absorption had killed the first series, and the second started out with its obstructed intestine filled with the toxic material from the first series, symptoms of toxaemia should very quickly supervene; the results, however, were the same as in the first series. If, then, toxaemia is not responsible for the symptoms of acute ileus until a late stage, to what are the early symptoms due? Wilkie's experiments on cats show that early death in acute strangulation is mainly due to shock with its associated splanchnic paresis and depleted systemic circulation (internal loss of fluid); that peritonitis plays an important part only after some twenty-four hours, when the vitality of the mucosa has been considerably interfered with. Death in high intestinal obstruction—as opposed to strangulation—is due to shock also, but in this case the fluid is largely lost externally through excessive vomiting, as well as into the tissues, and in the absence of strangulation the vitality of the mucosa persists much longer. Death in low obstruction is much later in its occurrence, owing to reabsorption of much of the intestinal secretion poured out into the upper reaches of the intestine.

Among the effects of shock are a concentration of the blood and increased viscosity due to loss of plasma from an abnormal permeability of the capillaries. Severe pain, which causes an outpouring of adrenaline from the suprarenal glands, can produce these evidences of shock, as shown by Elliott, Cannon, and others. And it is not too much to suppose that the severe pain, probably peritoneal in origin, caused by acute obstruction of such vital parts as the intestines, is enough to bring about this outpouring of adrenaline and the production of shock. Later, the shock will be kept up by toxic absorption, for, as Dale and Laidlaw[3] have shown in their experiments with the poison histamine, shock may be produced, and this substance acts apparently in the same way as many products of protein digestion and bacterial activity.

In cats Wilkie has demonstrated the immense value of subcutaneous saline infusion. In obstruction of the distal part of the duodenum in a cat the animal vomits large quantities of bilious fluid, is very thirsty, and loses weight rapidly, dying usually within seven days of onset. If, however, the animal be given daily subcutaneous infusion in large quantities with 3 per cent. dextrose, not only will it show immediate improvement, but life will be prolonged for many days beyond that of a control animal.

Another point of much importance is brought out by Wilkie, and that is that toxic absorption from the intestine below an obstruction, after the relief of this, has been greatly exaggerated; indeed his experiments scarcely permit of its occurrence at all. The intense danger, however, of the least soiling of the peritoneum with this highly toxic material is forcibly emphasized. He concludes that peritonitis plays little part in the causation of death in simple acute obstruction until the late stages, unless accidental soiling occurs at operation. I shall revert to the practical surgical application of these experiments after considering those of another experimenter—namely, Crile.

Crile's[4] work is mainly concerned with shock, and as shock is closely associated with the cause of death in acute ileus, his experimental work is quite pertinent. He has elaborated a very perfect technique for the prevention and lessening of the harmful effects of severe and prolonged stimulation. The principle of this anoci-association is the blocking off of the entry of the stimuli to the higher centres of the nervous system, both physical and psychical stimuli. This is accomplished by the free use of morphine, local anaesthesia, and gas and oxygen as a general anaesthetic. Morphine lessens the conductivity of the nerve paths, whereas strychnine, which is often given to patients suffering from shock, to "buck them up," as it is said, increases conductivity, and so enables the noxious stimuli to get to the nervous system more easily. Morphine should only be given in the absence of cyanosis; this symptom, according to Crile, indicates a state of acidosis, and morphine impedes the efforts of the tissues to rectify it. Morphine should be given in repeated doses at half-hourly intervals until the respirations fall to 12 or under. The ideal method is, of course, to get the morphine in first, before the painful stimuli begin; naturally this is not possible in acute ileus, but even so the effect of the drug is to cut off much of the shock producing stimulation.

Local anaesthesia, when efficiently performed, cuts off all stimuli arising in the blocked area. The reason for using nitrous oxide is this: Crile found that this anaesthetic so protected the central nervous system that very few or none of the characteristic changes which are produced in the cells by excessive stimulation appear when stimulation is applied during the administration of this anaesthetic; whereas during ether or chloroform narcosis the same changes occur in the cells, and with nearly as great ease as when the patient is conscious of pain.

In my series of cases these principles were deliberately utilized. I did not, however, always use local anaesthesia, and open ether was the general anaesthetic always employed. Gas and oxygen has this practical objection: that many anaesthetists find much difficulty in obtaining a sufficient relaxation, and this is particularly impeding to the surgeon in such a condition as obstruction, where the distended intestines are often extremely difficult to control even under the most favourable disposition of affairs.

It is evident, therefore, that it is not in the best interests of the patient merely to operate at the earliest moment. Certainly, broadly speaking, the sooner the patient is brought to operation the better, but there is usually an interval between deciding to operate and the commencement of the actual operation—an interval of perhaps an hour or two at the least, during which measures should invariably be taken to assist the resources of the patient, both against his disease and against the additional shock of the approaching operation.

In addition to the usual measures of warmth, washing out the stomach, and so on, there are two of the first importance—namely, saline infusion and morphine.

First, with regard to saline infusion. This should be given at the rate of at least two pints an hour before operation, and continued during and after operation at about half this rate. Five per cent. glucose should be added, and it will usually have to be given subcutaneously. I think saline infusions are absorbed more quickly when given by the rectum, but in acute ileus they are not always well retained. It is common knowledge that in deep shock saline has a very transient effect; nevertheless, even then it produces temporary improvement in the patient's condition. The earlier it is given the better the effect. Dale and Laidlaw suggest the addition of calcium ions, as this drug has a specific action in reducing the permeability of the capillaries. I have tried calcium chloride in 0.05 per cent. strength, and have not been able to convince myself that it is any more efficacious than normal saline. I am not sure that whole blood would not be better, but, so far, I have not been able to satisfy myself that this is the case in acute obstructions.

The second measure to use is morphine. As soon as it has been decided to operate the sooner morphine is given the better. To an adult ¼ grain may be given at once, and repeated in doses of ⅛ grain, or just over, every half-hour until the respirations fall to about 12. I usually give 1/12 grain to quite young children with intussusception for example, and repeat it. Morphine should be continued after operation and the patient be allowed gradually to come out from its influence during the succeeding twenty-four hours.

Pituitary extract is another useful drug. It exerts a prolonged and general contraction of the circulatory system, and thereby diminishes the total capacity of this system, and mitigates the effect of deficient blood volume. After operation it may help to produce muscular contraction of the intestine. Eserine is another drug which may be used for this latter purpose.

For the last ten minutes of the operation the patients were made to breathe pure oxygen through an inhaler. This seemed to better their condition, and I am not sure it would not be a good thing to keep this up for some time after, in much the same way as is done for cases of gas poisoning and others.

As to the operation itself, the earlier in the case it is performed the simpler it will be, and in the more leisurely manner may it be done. As a rule, the cases are not seen at this desirable stage, and quick operating is usually required, and at times is absolutely essential; but rapid, inaccurate, and rough work is responsible for many deaths. Repeated indecisive handling of the same parts is to be avoided. Precision, with gentleness and the minimum of exposure, are the essentials for success. Plenty of warm and moist towels to cover intestine, which may unavoidably

prolapse, or be purposely turned out, and more than usual care to avoid soiling, are points which require particular attention.

The most useful incision is a right para-umbilical one, splitting the rectus muscle. In some cases a large intestine growth will be found, and colostomy or typhlotomy be required. The central incision is then used for the purposes of exploration only, and stitched up before the artificial anus is made through a separate opening. If the intestine be found viable nothing remains to be done but release it, either by freeing the adhesions, or, if the obstruction be by band, this will need dividing and ligaturing close to both its attachments.

It may be found that the line or lines of compression are anaemic, or even have cut through into the intestinal lumen, the rest of the gut being returnable with safety. In this case it is wiser to bury this area than attempt a resection. Any suturing which has to be done requires infinitely more care than is necessary in suturing under non-obstructive conditions. It is almost certain that the serous stitch occasionally penetrates into the lumen of the gut, and is not attended by disaster, but in obstructed and tightly distended intestines leakage occurs at such a point, with an inevitably fatal result.

Enterotomy, merely to drain the intestine at the time of operation, is never necessary, and is a very risky procedure.

It often happens that there is a sero-sanguineous fluid in the peritoneal cavity in cases of strangulation. This should be mopped out, and no drainage employed in the absence of offensive smell. This fluid may be present for forty-eight hours before it becomes infected. If there is even a faint faeculent odour about it a tube should be inserted into the pelvis through a stab wound. Any such smell means also that the intestinal wall is incompetent at some point, and would be an indication for not merely returning the intestine into the abdomen.

Whether the intestine is viable or not requires experience to determine in many cases. When the colour is a dirty grey or greenish-grey, or the brown of a dead leaf, and the gut feels like wet blotting-paper, it is quite certain that recovery is impossible; it is equally certain that it will recover when the colour is red, or even black, if there is any resistance to touch in the walls. It is in the intermediate stages that difficulty may arise. I think more reliance may be placed on the fingers than the sight in these cases. If the walls feel limp and offer no sensation of firmness to the fingers—it is, perhaps, too much to call it resistance—then it is not likely that recovery will occur. The mortality of all cases not requiring resection in this series was 9.3 per cent.—that is, 236 cases, with 22 deaths.

When it has been decided that resection, or anything more than merely freeing the intestine, is necessary, the utmost care should be expended in isolating the field with protective appliances. Gauze swabs wrung out in hot saline are carefully packed in all round, and over these, protecting them and the edges of the wound, are placed mackintoshes; these consist of a sheet of dental rubber stitched into a thin gauze covering. These serve two purposes—they prevent in a most efficient manner the entrance of septic material from the damaged intestine; and, secondly, they keep in the natural moisture and warmth much better than does a pervious material like gauze alone.

Having protected the field one proceeds to deal with the damaged gut. In most cases this will mean resection. After removing the necessary amount of intestine it is as well to empty some of the contents from the proximal segment by inserting Moynihan's tube. This makes suturing much easier. A lateral anastomosis is the best method of union to employ, because it is safer and there will be much difference in calibre between the two ends. Enterostomy should only be done in the very desperate cases. It is not always easy to know exactly where the opening is being made, and if high in the intestine the patients waste rapidly. Also it is necessary, as a rule, to do the second operation within a few days of the first, when the patients are not fit to endure much manipulation, and it is just these cases which are exceedingly difficult to deal with. Consequently the mortality is a very high one after the second operation. Nevertheless, some desperate cases have been now and again saved by this measure.

One more practical point, which I have found of great use, is the finding of the obstruction. Much needless exposure, and therefore much avoidable shock, is prevented by first examining the caecum and terminal ileum. Distension of the caecum, of course, means obstruction in the large intestine, and the condition can be dealt with as below. But if one finds a piece of collapsed ileum, this should be followed towards the stomach until the distended intestine is met. The examined part is returned as finished with. This method only requires about 2 in. of gut to be out of the abdomen at any one moment.

It should always be kept in mind that there may be more than one band causing obstruction; in my series there were two such cases.

In this series there were 46 cases which required resection; 11 of these were intussusceptions, with 9 deaths. This is in marked contrast with the reducible cases, of which there were 15 with 1 death. The youngest successful resection was in a girl just under 3 months old.[5] The mortality of all resections was 45.4 per cent.

Of the cases in Group 2, 12 were the result of bands and adhesions due to the presence of tuberculous mesenteric glands, 9 to bands not of tuberculous origin, 4 to Meckel's diverticulum acting as a band, 1 to the appendix acting as a band, and 13 to adhesions resulting from previous operations—2 of these occurred during the first few days after appendicectomy with drainage. It is interesting to note that when adhesions caused the obstruction, this appeared to result from a rotatory effect given to the intestine rather than from kinking.

The volvulus cases were both of the caecum—one was merely reduced and fixed, the other required resection.

The internal hernia was through a hole in the mesentery, and whether of congenital origin or not was not determined, though there was no history of injury.

The case of thrombosis of the mesenteric vessels required resection of some 4½ feet of small intestine, apparently about the lower jejunum, and was successfully accomplished.

In the gall-stone case the stone was impacted in the lower ileum, and was removed, the intestine being sutured.

Of the external hernia cases there were 170, with 18 deaths, a mortality of 10.5 per cent. Fifty were inguinal, with the strangulation at the external abdominal ring in at least 40—it was only found at the internal ring in 5; there were 3 deaths. Ninety-eight were femoral, with 11 deaths. Eighteen were umbilical, with 4 deaths.

Resection was performed only once in the inguinal cases, 18 times in the femoral, and 4 times in the umbilical.

It is interesting to note how much more serious to the vitality of the intestine is a femoral hernia, probably due to the much tighter ring.

Most of the femoral hernia cases were operated on from the abdomen through the outer part of the rectus sheath. It was necessary to free the sac from below, and Gimbernat's ligament was also usually divided from below. The peritoneum was efficiently protected, and first the gut reduced and dealt with from above, and later the sac was turned inside out into the abdominal wound. There is a distinct advantage in this method in two ways—first, it gives much more satisfactory access in case resection be necessary, and secondly, a radical cure is more easily effected, for the neck of the sac can be stitched up into the abdominal wound and the inner end of Poupart's ligament can be stitched to Cooper's ligament under direct observation on the upper side of the pubic arch. Also, if thought necessary, a piece of the rectus muscle can be carried across to Cooper's ligament, though I have never found that this was required. I have never seen a case recur after this method, though it is probably claiming too much for it to expect never to see a recurrence.

As regards the carcinomata cases, it usually happens that a positive diagnosis is only made after an exploration by a right para-umbilical incision. It is unfortunately true that most cases of carcinoma of the colon are only recognized either after giving rise to acute obstruction or on the discovery of a tumour. When the patient is desperately ill it is better to do typhlotomy at once, but when possible an exploration is advisable to ascertain the position of the growth and the feasibility of subsequent removal. If the growth is in the sigmoid and irremovable a colostomy should be done, but if removable, typhlotomy.

There is no doubt that the danger of sepsis at the second operation is thereby much reduced. A growth higher up in the colon requires either typhlotomy or, when in the descending colon or left half of the transverse colon, transverse colostomy may be done; if, however, there is a removable growth in these parts I believe it is always better to do typhlotomy.

Carcinoma of the rectum, of course, can be diagnosed before operation, and in any case requires a colostomy.

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ABDOMINAL PAIN:
ITS MECHANISM AND CLINICAL SIGNIFICANCE.*

BY

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POSSIBLY no symptom in the whole realm of disease is of greater interest and of wider distribution than that of pain. To the uninitiated it is often considered a mystery, more perhaps from its moral aspect than from its clinical. To those of us who regard it in the light of an indication that Nature is conveying information of considerable physiological and clinical importance in the elucidation of functional and pathological disorders, it becomes a subject of the greatest significance. As a study in itself, pain embraces an accurate knowledge of certain anatomical and physiological facts, as well as a comprehensive investigation into the morbid processes of disease. The subject is naturally a very wide one, and in the short hour at my disposal I can only deal with it in a very restricted way. My remarks, therefore, are to be limited to the discussion of pain as it is manifested in the abdomen.

For us, as clinicians dealing with the symptoms of disease, the most practical part of all these considerations about the nerve supply of the various parts of the body is that which concerns the ultimate distribution of the spinal nerves; for it is by means of these that we gain a great deal of our clinical information regarding the various seats of disease, and sometimes also the particular nature of the disease. It behoves us, therefore, to remember very accurately the final distribution of every nerve that leaves the brain and spinal cord to end in some part of the body. Take, as an example, the sixth thoracic intercostal nerve. In its course between the sixth and seventh ribs it gives off close to the spine its posterior primary branch, which is distributed to the skin between the lower angles of the scapulae; then, about the middle of the intercostal space, from before backwards, it gives off its lateral cutaneous branch, which ends in the skin on the side of the chest a little below the level of the lower end of the scapula; and, finally, the nerve ends in the sensory organs contained within the skin of the epigastric region at its upper part.

[Here the lecturer showed by means of diagrams the various anatomical connexions between the sympathetic nerve system, the spinal cord, the nerves, and the viscera.]

Clinical Significance of Pain.

Let us turn our attention to the practical application of the knowledge by which communications take place between the brain and spinal cord and the various parts of the body, and see how it works out in the diagnosis and treatment of disease. As a first clinical example we may take pain felt in the epigastrium, the side, and the interscapular region in the case of chronic gastric ulcer. The nerve supply of the stomach is, of course, by means of the two vagi and the sympathetic solar plexus, the latter being intimately connected with the coeliac plexus, which in its turn receives nerve branches from the subsidiary plexuses that are directly associated with the stomach. When, then, ulcer of the stomach causes pain to be felt in

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* Abstract of a lecture delivered to the students of Queen Margaret College, University of Glasgow.