

involvement of the musculospiral nerve. He can carry heavy office chairs and do the work that might be expected of an ordinary coolie with ease, see figure 3, and with his clothes on it is difficult to suspect that the arm has been injured in the manner described.

The individual is above the average in muscular development and gives the impression of being a remarkably tough fellow of unusual vitality.

This is the first case of this nature that I have seen, but recovery of function to a remarkable degree after failure of union would appear

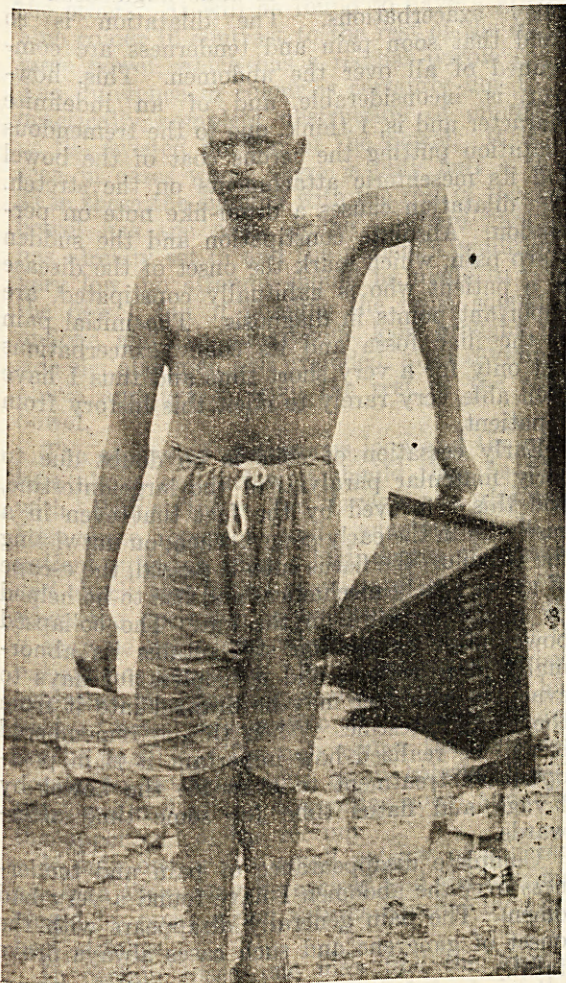


Fig. 3

to be a special feature of injuries in this region, as a remarkably similar case is described by Sir John Coolie in his book, *Fraud in Medico-Legal Practice*, page 11. Sir John Collie describes his case in detail to illustrate the need for thorough examination in medico-legal work. His patient, a sailor, had done strenuous able-bodied work for 18 years and was at great pains to conceal his disability. He boasted, after exposure, that he had deceived between

20 and 30 doctors to whom he had been sent for physical fitness examinations.

The individual whose condition is described in this note had been sent to me for the usual periodical medical examination for physical fitness and visual acuity prescribed for railway employees. He was, like the sailor, very keen to prove that he was fit in every way.

As a railway surgeon I am not infrequently concerned with compensation cases under the Workman's Compensation Act, and it is of some interest to speculate on the possible outcome of this man's injuries had they occurred to-day under the present rules. The assessment of his present disability would certainly present difficulties.

Pseudarthrosis after non-union of fracture does not appear to be as common in the upper arm as in the forearm, where, if both bones are fractured, non-union with a false joint is more likely to occur than in any other part of the body. As a rule the only satisfactory treatment is bone grafting. This man was offered an operation of this type but refused. In his state of life I think he was wise.

I have to thank Dr. R. V. Clayton, M.B., D.P.H., D.M.R.E., Principal Medical and Health Officer, G. I. P. Railway, for permission to publish this case, and my assistant Dr. M. Roskino for the illustrations and radiogram.

VOLVULUS OF THE SIGMOID

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VOLVULUS is possible in any portion of the intestinal tract from the stomach to the sigmoid colon. Thus volvulus of the stomach, due to gastropnoxis, an hour-glass contraction or certain kinds of injury, although extremely rare, is known. Volvulus of Meckel's diverticulum when it is persistent is recorded. Similarly volvulus of the small intestines, the ileo-caecal junction or even of the caecum occurs but very rarely. The commonest volvulus is that of the sigmoid colon. This portion of the colon, on account of its peculiar anatomical structure in having a very narrow-based but long mesentery which spreads out in a fan-shaped manner, is easily susceptible to twisting. The length of the loop suspended from this narrow mesentery varies from nine to about twenty inches and it is extremely mobile. The two ends of the loop are very closely approximated owing to the nature of the mesentery. The narrower the base of attachment which may be a normal condition or may be caused by inflammatory adhesions, as a result of infected lymphatic glands, or chronic inflammatory and ulcerative conditions of the loop itself, the greater is the tendency of the bowel to be twisted. The lengthening of the bowel on

account of its being constantly loaded from chronic constipation is yet another factor which predisposes to volvulus. All these factors lead to thickening and fixation of the narrow base of the mesentery and thus the parietal attachment forms an axis round which the bowel may readily get twisted.

The exciting factor may be sudden and excessive peristalsis or an excessive accumulation of flatus or strain in a constipated person due to an effort to evacuate the bowel. Indeed in many cases the exciting factor is so insignificant that it cannot be discovered from the history of the case. Even a sudden change in the attitude of the patient has brought it about.

The extent of the rotation varies from a half turn to two or even three complete turns. It generally takes place from right to left, that is in the direction of the hands of a clock. The position of the bowel after volvulus varies considerably. Where the rotation takes place with the loop more or less in the pendulous position, and if the case is seen early, the volvulus lies mostly in the pelvis in front of or behind the rectum, that is in the lower part of the abdomen and on the left side. If unrelieved, the distension of the bowel increases and the twisted loop, gradually filled up with gas, moves upwards and to the right. With increasing distension of the volvulus the large bowel above the twist also begins to dilate, and in a short time the whole abdomen is enormously distended and respiratory embarrassment is noted.

When the twist takes place with the loop already dilated and lifted out of the pelvis by gas, the volvulus occupies most of the left side of the abdominal cavity with only partial encroachment on the right side and into the pelvis. In either case the coils of small intestine are collapsed by compression.

In certain cases the distension of the bowel is so considerable that the longitudinal muscular bands cannot be recognized.

If the twist is complete and tight so that there is almost total disturbance of circulation which occurs in most cases, the changes in the wall of the loop are rapid, and the wall becomes oedematous and congested. Hæmorrhage from minute vessels in its walls takes place and exuded serum and blood dilute any fæcal matter that may be present. With further progress of the constriction, effusion of sero-sanguinous fluid into the general peritoneal cavity may occur. This has been stated by some authorities as diagnostic but in my experience it is rare and I have so far noticed it only in one case. If the volvulus is still unrelieved, patches of ulcer appear in the mucous membrane of the bowel and later small areas of gangrene are noticeable on the serous coat. I have seen both these conditions but I have never seen perforation even in very advanced cases. Perforation when it does occur is usually said to be found above the obstruction.

The gas which fills the distended bowel is certainly the result of putrefactive processes, which follow the condition. A puncture of the bowel leads to the escape of an offensive gas and some fluid fæces.

When the twist is not complete and not very tight, the distension is not so extreme and some fluid fæces mixed with blood and flatus may be passed.

The onset of the disease is always sudden and is ushered in with a fairly sharp pain in the region of the left iliac fossa followed by absolute constipation. In the early stages the pain in the iliac fossa is from time to time augmented by colicky exacerbations. The dilatation is so rapid that soon pain and tenderness are complained of all over the abdomen. This, however, is inconsiderable and of an indefinite character and is, I think, due to the tremendous dilatation putting the serous coat of the bowel and its mesenteric attachments on the stretch. The dilatation causes a drum-like note on percussion. Absolute constipation and the sudden sharp pain, which mark the onset of the disease in a patient who is habitually constipated, are important points in diagnosis. The initial pain in the iliac fossa and its colicky exacerbations last only for a very short time and thus I have been able very rarely to elicit this history from a patient.

Early cessation of colic is no doubt due to early muscular paralysis of the large intestine, and this is proved by the fact that even in a case seen in the early stages, when, on untwisting the volvulus, the flatus tube is passed, the escape of gas is purely mechanical and has to be helped by gentle pressure on the gut. The collapsed bowel after evacuation still retains its abnormally large calibre, and is helpless for days to evacuate whatever may be drained into it from the small intestine. When this is remembered it will be realized how important it is in post-operative treatment to evacuate the bowel by lavage and flatus tube for some time afterwards.

Complete disappearance of pain and tenderness over the abdomen I have found a very bad omen. The pain generally disappears with the onset of gangrene and such cases always prove fatal.

Toxæmia is rather slow in onset as compared with other varieties of acute intestinal obstruction, no doubt owing to very slow absorption as a result of almost complete obstruction of arterial, venous and lymphatic circulation.

The temperature remains normal till very late in the condition when it may become sub-normal. The pulse rate and respiration in the early stages are also practically normal. Indeed I have often noticed the pulse rate and respiration to be slower than normal. But with increase in abdominal distension late in the course of the disease respiration becomes more frequent while the pulse rate is only slowly

increased, and thus the normal pulse and respiration ratio is disturbed.

Except in the very early case, when an attempt may be made to relieve the condition by passing a flatus tube once, no delay should be made in opening the abdomen. When operation is performed early, the volvulus is easily recognized directly the abdomen is opened. In late cases, however, along with the twisted portion of the colon other distended coils of large bowel are seen and it is difficult to make out which is the twisted loop. I have, however, found that the twisted loop of sigmoid presents a different colour from that of the others. It will be found to have a greyish-blue colour in contrast to the rest of the dilated large bowel, which has a reddish-purple colour. The difference in colour is certainly due to the practically complete obstruction of circulation in the twisted portion of the bowel. It is not seen in cases where there is only half a twist, as in these the sigmoid with the rest of the large bowel has the same colour. Where gangrene has already set in and the patient's condition is very low, no attempt should be made to resect the bowel, but if possible the twist should be undone and the gangrenous loop brought outside the abdomen and excluded, after dividing it above and below, from the rest of the sound bowel.

The separated gangrenous loop and the openings above and below it should then be fitted with Paul's tubes for lavage and drainage. Immediate resection and anastomosis in a patient suffering from a high degree of toxæmia and shock very often prove fatal in India even when the operation is performed quickly. But it may be done later when the condition of the patient has improved. When gangrene has been extensive, necessitating removal of a very long piece of bowel, even end to end anastomosis may not be possible. The only course then left is to create an artificial anus as in colostomy with the lower end of the descending colon and close the upper end of the rectum.

If only one or two small patches of gangrene are seen these may be excised and the openings closed by purse-string sutures covered by Lembert stitches.

In certain cases, one may find the loop so fixed by adhesions at the point of the twist that it cannot be untwisted. Of course the only immediate surgical measure then possible is to drain the upper and lower limbs of the loop. I have myself not seen such a condition.

In the generality of cases, I suggest the following operation :—

The abdomen should be opened on the left side by a left paramedian incision extending from three to four inches above the umbilicus to an inch or an inch and a half above the pubic symphysis. The abdomen is entered from the inner side of the rectus muscle. In very early cases the volvulus will be found occupying

partly the pelvis and partly the lower abdomen, and the loop will be easily recognized from the rest of the distended colon by its peculiar colour which I have described above. It should be carefully taken out and untwisted. So long as the distended loop is not extracted from the abdominal cavity, it is difficult to determine the direction of the volvulus. I consider it therefore necessary for it to be brought out of the abdominal cavity. As soon as it is untwisted a rectal tube should be passed to relieve the dilatation by letting out any gas and as much of the fluid fæces as possible. More than one tube should be kept at hand as they get rapidly choked with fæces.

In a case where the dilatation is extreme and the loop occupies the whole of the abdominal cavity reaching up to the under surface of the diaphragm, it is inadvisable to attempt to drag it out of the abdomen even through a large opening. In the attempt the bowel may easily be ruptured. In such circumstances, the part of the distended bowel, which presents itself in the abdominal opening, should be punctured to relieve the distension, every care being taken to prevent contamination of the peritoneal cavity. This opening should be closed with purse-string and Lembert sutures as soon as the distension is relieved. It will be easy now to bring out the volvulus and untwist it.

It is a well-known fact that recurrence of volvulus is frequent because the pathological condition which causes it cannot be remedied. Plication of the mesentery to shorten it, fixation of the bowel to the lateral parietal peritoneum, and lateral anastomosis between the two limbs of the sigmoid loop have all failed to prevent recurrence. Resection of the loop and anastomosis have been recommended. This is, however, a very severe operation for a patient in a state of shock and toxæmia. I think that a lateral anastomosis between the two limbs of the loop, followed by fixation of the upper limb to the parietal peritoneum laterally, will be found effective and is certainly less severe than resection and anastomosis. The lateral anastomosis must be large, at least four to five inches in length. Thus the canal will be short-circuited for the passage of fæces, and the loop will practically cease to exist. It will form a single tube fixed to the abdominal wall.

Where the sigmoid loop is very long it may be lifted out of the pelvis, its upper limb laid parallel to the descending colon and fixed to it by lateral anastomosis, the lower limb being fixed to the iliac parietal peritoneum.

The limb to be fixed should be stretched and laid parallel to the parietal peritoneum on the lateral abdominal wall nearest to it and then stitched to it by a continuous catgut suture passed through its anterior longitudinal band.

The operation should be performed under local infiltration anæsthesia preceded by a

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COMPLETE TRANSPOSITION OF THE VISCERA

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THE body of a boy, aged two years, who died in the hospital of infantile biliary cirrhosis was dissected in the Mysore University Medical College. This body showed complete trans-



position in the lateral plane of both thoracic and abdominal viscera, the picture presented being an exact mirror image of a normal body.

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hypodermic injection of morphine and atropine. Use of general anaesthetics such as chloroform or ether often brings about pneumonia and a fatal result in a case already toxæmic. The twisted loop of bowel is generally quite insensitive even when its mesentery is stretched or the loop itself squeezed in the course of the operation. Where there is considerable mental uneasiness and the patient demands chloroform or ether anaesthesia an ether mask put over the face often suffices to quieten the nervous patient.

I have performed the operations described above (lateral anastomosis with fixation of the upper or lower limb to the lateral parietal peritoneum) in several cases without recurrence.

Such abnormalities though recorded by various authors are rare, and we are reporting this case as it is the first complete transposition met with by us in the dissecting room.

Cardio-vascular system.—The heart, with the apex pointing to the right, is situated on the right side of the chest with its cavities similarly transposed. The ascending aorta is situated to the left of the pulmonary artery, in the normal slightly posterior plane, the arch of the aorta running from left to right and the descending thoracic aorta running along the right side of the vertebral column. The innominate artery divides into the left common carotid and the left subclavian arteries; the right common carotid and the right subclavian arise independently to the right of the innominate. The right innominate vein obliquely crosses the great vessels superficially from right to left and joins the left to form the superior vena cava which is situated to the left of the median plane. The inferior vena cava is situated on the left of the vertebral column and the two venæ cavæ open into the left atrium.

Respiratory system.—The right lung has only two lobes and presents the cardiac notch along its anterior border. The left lung does not clearly show three lobes, as would be expected.

Digestive system.—The liver (which is much enlarged by disease) is situated on the left side with the larger lobe to the left. The structures in relation to its visceral surface are transposed. The fundus of the stomach is situated on the right side of the cardiac opening which is itself situated to the right of the median plane. The pyloric end is directed to the left and joins the duodenum. The duodenum commences on the left side, has its concavity directed to the right, enclosing the head of the pancreas, the duodeno-jejunal flexure being situated at the level of the second lumbar vertebra to the right of the median plane. The mesentery is attached to the posterior abdominal wall along a line running from the right side of the second lumbar vertebra to the left sacro-iliac articulation. The cæcum is situated in the left iliac fossa with the appendix attached to its right side, about three-fourths of an inch below the ileo-cæcal junction, the free border of the meso-appendix having its concavity directed to the right. The ascending colon and the hepatic flexure are situated on the left side, the splenic flexure and the descending colon being situated on the right, and the sigmoid colon situated on the right side of the pelvic cavity ends in the rectum. The spleen is situated in the right hypochondrium with its hilum facing the left side. The remains of the thymus are present in the superior mediastinum superficial to the great vessels.

Genito-urinary system.—The left kidney is situated half an inch lower than the right kidney and its hilum is in relation anteriorly with the

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