the lower oesophagus through a long thoracotomy wound, with primary repair of the tear and adequate drainage followed by intensive chemotherapy and the use of antibiotics, has resulted in a successful issue. Eliason and Welty (1946) suggested posterior mediastinotomy as a possible approach, but the majority would, I think, favour the transpleural operation.

In my opinion feeding difficulties in the post-operative period can be better overcome by a nasal indwelling tube than by further adding to the patient's discomfort by the performance of a gastrostomy or jejunostomy. It is well, however, as Frink (1947) suggests, to check the position of the tube, as this has been known to pass through the rent into the mediastinum.

It seems to me that if a correct and early diagnosis is made and is followed by urgent operation and energetic after-treatment many of these cases can be saved.

Summary

Two further cases of spontaneous rupture of the oesophagus are recorded, with recovery after operation in one.

The main pathological and clinical features are reviewed and a plea for earlier diagnosis and surgical treatment is made.

I wish to thank Dr. J. A. Torrens for his assistance with the management of the second case, and Dr. Patricia Chippindale, my house-surgeon, for her painstaking care and enthusiasm in the after-treatment of this same patient.

REFERENCES

- Barrett, N. R. (1946). *Thorax*, **1**, 48.
 — (1947). *Brit. J. Surg.*, **35**, 216.
 Eliason, E. L., and Welty, R. F. (1946). *Surg. Gynec. Obstet.*, **83**, 234.
 Frink, N. W. (1947). *J. thorac. Surg.*, **16**, 291.
 Graham, E. A. (1944). *Year Book of General Surgery*, p. 382. Year Book Publ. Co., Chicago.
 Olsen, A. M., and Clagett, O. T. (1947). *Postgrad. Med.*, **2**, 417.
 Ridgway, E. C., and Duncan, G. G. (1937). *Bull. Ayer clin. Lab. Penn. Hosp.*, **3**, 79.

RUPTURE OF INTESTINE DUE TO NON-PENETRATING INJURY

UNUSUAL ACCIDENTS FROM A MECHANICAL SAW

BY

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While most surgeons are familiar with injuries of the fixed portions of the bowel due to severe crushing of the abdomen, it is less common to encounter isolated rupture of the mobile loops following on what at first appears to be a relatively slight injury.

Case 1

On June 21, 1948, a woodworker aged 59 was sawing lengths from a beam 4 in. (10 cm.) square by means of a circular saw. At about 3 p.m. one of these sections was caught by the revolving blade of the saw and flung over the guard, striking him in the left lower quadrant of the abdomen and throwing him backwards for a distance of about 4 ft. (1.2 metres).

He was doubled up with intense pain at the time and was taken to hospital—where he was catheterized, clear urine being obtained—and kept under observation for two hours. No abnormality was detected in the abdomen. At the end of this time his pain had almost gone, his pulse rate was 80, and he was allowed to leave. He walked back to his works (about 500 yards—457 metres) and wished to resume work, but was sent home, walking a further 200 yards (182 metres). He experienced little pain at the time; there was slight nausea, but no vomiting throughout. He went to bed without having his evening meal.

About 9 p.m. (six hours after injury) abdominal pain returned, mainly in the left iliac fossa, and became steadily worse. Just after midnight he was admitted to Bethnal Green Hospital. Though in considerable distress from abdominal pain, he was not shocked. Blood pressure was 160/110, temperature 98° F. (36.7° C.), pulse 110. The tongue was dry and furred; the abdomen was immobile, the knees were drawn up, and rigidity was board-like. Tenderness was maximal over the left iliac fossa. No trace of bruising or abrasion could be seen. Bowel sounds were absent; the abdomen was resonant, with some alteration of percussion note in the left iliac fossa. Per rectum there was some resistance and definite tenderness in the recto-vesical pouch.

Laparotomy under general anaesthesia 11½ hours after injury revealed about a litre of free seropurulent fluid in the peritoneal cavity and some fibrinous exudate in the left iliac fossa. There was hardly any bruising of bowel or mesentery, but an isolated rupture of the jejunum was found about 9 ft. (2.75 metres) from its upper end, situated on the anterior surface ¼ in. (1.9 cm.) from the mesenteric border and about the diameter of a lead pencil. From this opening gas, fluid, and a piece of lettuce were escaping. Bacteriological examination of the peritoneal fluid subsequently proved sterile on culture. Apart from two patches of fibrinous exudation presumably due to irritation by the intestinal contents, the jejunum, ileum, sigmoid, and transverse colon showed no abnormality. The opening in the jejunum was closed by two layers of Lembert sutures in the transverse axis of the bowel and the peritoneal cavity was drained through the left iliac fossa.

Post-operatively the patient was treated by gastric suction and intravenous fluids with systemic penicillin for five days. Bowel sounds returned in thirty-six hours. Convalescence was uneventful; the patient got up on the tenth post-operative day and was discharged on the eighteenth day.

Case 2

A woodworker aged 42 was working with a mechanical saw on Sept. 10, 1948, when a piece of timber flew up, hit him in the abdomen, and knocked him down several feet away. He was doubled up at first, but after about forty-five minutes was able to walk into the casualty department of a hospital. Examination revealed no obvious abnormality, and he was advised to go home and rest.

During the night severe abdominal pain developed and he was admitted to Hackney Hospital twenty hours after injury. At that time there was no shock and the pain had passed off, but there was evidence of peritonitis. Although he was thought to have a rupture of the small gut, intervention was considered unjustifiable in view of the interval since the injury, and he was treated with chemotherapy. Although his condition improved for a few days it then deteriorated, and he died seventeen days later.

At necropsy he was found to have general peritonitis resulting from a complete rupture of the transverse colon and a longitudinal tear into the duodenum.

Discussion

Bodenheimer (1945) has also described the case of another woodworker who was struck while using a mechanical saw. Here again the abdomen showed no marks, bruises, or abrasions, but the diagnosis was confirmed by the presence of air seen under the diaphragm on x-ray examination. An isolated rupture was found in the lower ileum and was successfully sutured.

Rupture of a hollow viscus is the result of a sharply localized blow upon a distended loop of bowel which is unable to slip out of the way, owing either to its peritoneal relations or to pathological fixation by adhesions or hernia. The abdominal musculature may be off guard as the result of alcoholic intoxication or the unexpectedness of the sudden blow.

At first the rupture may be very slight, even incomplete, and temporary inhibition of peristalsis may allow plugging of the leak with fibrin (Zachary Cope). Resumption of

intestinal peristalsis after a lapse of some hours then leads to further leakage and spreading peritoneal irritation.

The diagnosis in the first 12 hours before the onset of diffuse peritonitis may be very difficult, as physical signs may be absent or the condition may be mimicked by retroperitoneal haematoma or contusion of the coeliac plexus; in case of doubt radiographs will show gas under the diaphragm. Delay is dangerous; the mortality without operation is from 93 to 100% (Kornblith): even in patients operated on in the first six hours it is 35% and after 12 hours 75%.

At operation it is important to examine the whole of the intestine to exclude multiple perforations: single perforations are closed by suture, but multiple injuries may necessitate resection, especially if complicated by haematoma of the mesentery. Drainage is advisable after the first eight hours, although in our patients the fluid was sterile. Modern chemotherapeutic treatment should greatly reduce the mortality from peritonitis.

I am indebted to Mr. W. P. Greenwood for the opportunity of treating Case 1 and to Dr. J. Flapan for his assistance with the anaesthetic; also to Mr. R. F. Reed for the details of Case 2.

REFERENCES

- Bodenheimer, J. M. (1945). *N. Orleans med. surg. J.*, **97**, 383.
Cope, V. Zachary (1914). *Proc. R. Soc. Med.*, **7** (Sect. Surg.), 86.
Kornblith, B. A. (1946). *N.Y. St. J. Med.*, **46**, 1940.

Medical Memoranda

An Unusual Case of Frontal Sinusitis

The following case is uncommon enough to be placed on record.

CASE REPORT

A man aged 23 attended the out-patient department because he had had a moderately severe headache for three weeks after an ordinary cold. He was quite positive that he had had no ear, nose, or throat symptoms at any time before this attack.

On examination he was found to have slight swelling and oedema over the left frontal sinus, a scarcely perceptible downward displacement of the left eye (with a resultant diplopia which he had not noticed until his attention was drawn to it), and pus in his nose. The temperature was normal and the skiagram showed opacity of the left maxillary antrum and haziness of the left frontal sinus. (The outline of the latter was quite sharply defined.)

He was admitted at once and was treated by calomel by mouth, frequent hot-air baths, and inhalations, and a course of penicillin (100,000 units three-hourly) and sulphamezathine was started. Twelve hours after admission the temperature rose to 100° F. (37.8° C.), but by the third day it had dropped to 99° F. (37.2° C.). On the third day, however, it was reported that he had had two epileptiform convulsions and several attacks resembling petit mal.

It was decided to open the frontal sinus externally without further delay and to do an intranasal antrostomy. Owing to the large size of the frontal sinus it was necessary to make an extensive incision in the line of the eyebrow and to extend the inner end vertically over the forehead for 2 in. (5 cm.). A flap was thus turned back, allowing a wide exposure. The whole of this large sinus was filled with pus, which had the consistency of cream cheese. The mucous membrane was hypertrophied and grossly degenerated. After thorough cleansing of the sinus, beads of pus were seen oozing through the posterior wall, recurring a few seconds after swabbing. It was now necessary to remove the posterior wall, and at the first cut through the bone enough fluid pus gushed out to fill an eggcup. The dura was covered with granulations over a circular area about 2 in. (5 cm.) in diameter, so that enough of the posterior wall had to be removed to leave a surrounding margin of healthy dura. Penicillin was sprayed over the whole area and into the sinus cavity that remained. It was also generously sprinkled with sulphanilamide powder. A tube was passed down the fronto-nasal duct and sewn into the nose; another was sewn in the angle of the incision near the inner canthus, and the incision was closed.

Treatment consisted of instillations of penicillin (200,000 units three-hourly) through the tubes, intramuscular injections of penicillin (100,000 units three-hourly), and a full course of sulphamezathine.

The temperature became normal immediately after the operation and did not rise again. The above treatment was discontinued after the eighth day, and the tubes were removed on the tenth day. The patient made an uninterrupted recovery and was discharged at the end of three weeks.

Bacteriological examination showed "Gram-positive bacilli—very degenerated. The organisms could not be cultured." This report was not very helpful.

The most interesting points about this case are the short history, the absence of severe symptoms till after admission, and the very gross pathological changes. Such cases are said to recur quite often, and it is too soon to reckon that this patient is completely cured. It is felt, however, that recovery without heavy doses of penicillin would have been impossible.

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A Method of Closing the Femoral Canal

The articles by Butters and Kidd and the annotation on them in the *British Medical Journal* of Oct. 23, 1948 (pp. 743, 745, 750) prompt me to describe yet another method of closing the femoral canal.

Many will have read and practised the skin repair closure of the inguinal canal described by Mair (*Brit. J. Surg.*, 1946, **34**, 42). It was whilst dealing with a femoral hernia and an associated direct inguinal hernia that another method of closing the femoral canal occurred to me. The technique used in this particular case was as follows.

METHOD

The approach was from above, and at the making of the skin incision an ellipse of skin was removed for use as the graft. After the canal had been opened in the usual way the femoral sac was isolated, secured as high up as possible, ligated, and removed. The transversalis fascia was then plicated to cover the bulge of the direct hernia. The skin bridge was now sunk in the gap between the conjoint tendon, inguinal ligament, and symphysis pubis. In this case, however, the graft was fashioned Y-shaped, the stem being anchored to the pubic bone and the upper limb being sutured carefully to the free edge of the conjoint tendon (see Diagram). The lower limb, however, was passed through the femoral canal *en bloc* and stitched to the pectineus fascia. The lower edge of the stem and upper limb of the Y were stitched to Poupart's ligament behind the cord, the "bridge" finally being secured by suture at its proximal extent to the internal oblique. The wound was then closed in layers.

A, Free edge of conjoint tendon; B, Symphysis; C, Stitched to pectineus.

DISCUSSION

Owing to force of circumstances I am unable to make any substantial claims for the efficacy or otherwise of this method, the actual number of cases dealt with in this manner being fewer than ten. It is, however, submitted that this method has two outstanding advantages. First, the comparative absence of tension (such as in stitching conjoint tendon to inguinal ligament) is a desirable object in effecting union of structures. Secondly, the actual filling of the femoral canal provides the only reliable means of obtaining a complete and final closure. Here one may speculate on the final fate of the free skin graft. Whether it lives or dies, it is at least certain that it forms a solid collagenous plug. In addition, Butters draws attention to the fact that in as many as 7% of cases operated on from below inguinal herniae subsequently developed.

Whatever the merits of the various approaches, the technique described can be performed from above only by opening the canal. It is, however, submitted that a "bridge" of this nature, which does not weaken any of the surrounding structures (cf. Kidd), does a lot to prevent the recurrence of any type of hernia in this situation.

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