

nine months later he was known to be well and with normal bowel action. Biopsy of the specimen removed at sigmoidoscopy showed a portion of normal rectal mucosa.

Comment.—This case emphasizes again the dangers inherent in the use of a sigmoidoscope. These dangers can be lessened, if not eliminated, by a thorough training in the use of the instrument, a sound knowledge of the anatomy of the area, gentle handling without force, and, above all, good lighting to visualize the direction of the intestinal canal. If good visualization is impossible owing to persistent angulation of the bowel, or to faeces, blood, new growth, or other objects obscuring the lumen, the examination should be discontinued.

Treatment.—If operation is decided upon it should be performed as soon as the patient has sufficiently recovered from the shock of perforation. Treatment consists essentially in suturing the perforation, draining the pelvis, and performing a proximal colostomy. In a very few cases it may be considered wiser to treat the patient conservatively: these will mainly be cases in which perforation has not been recognized for twenty-four hours or so, and in which localization of the infection already appears to be occurring.

Perforation by Impalement

These bizarre wounds are of interest because of their comparative rarity and possible sequelae. The methods by which they are sustained are as numerous as the instruments which cause them, but it is curious to note that the majority of reported cases resulted from a fall from a hay-loft on to the handle of a pitchfork. Men are affected in 75% of cases, and according to Habegger (1912) approximately half of them are farm-workers.

There is an anatomical reason for the occurrence of this type of injury; the thigh surfaces, the ischial tuberosities, and the soft parts surrounding the anus tend to form a funnel-like contour which directs penetrating objects, especially those that are blunt, through the anus into the rectum. Because of the oblique relation of the rectal wall to the pelvic outlet the anterior wall of the rectum is the most frequent site of perforation, and the reported cases fall roughly into one of five categories: (1) The impaling object merely enters the lumen of the rectum and causes an abrasion or tear of the mucous membrane only. (2) Penetration of the rectal wall occurs at a low level and the urethra in the male or the vagina may be lacerated. (3) At a higher level, penetration of rectum and bladder occurs without, however, entering the peritoneal cavity. (4) If the force is greater the bladder may be completely traversed and the impaling object enters the peritoneal cavity through the dome of the bladder. (5) High rectal or even sigmoid penetration occurs, missing the bladder altogether and reaching the peritoneal cavity direct.

The immediate effects are often surprisingly slight; there may be very little pain, bleeding, or shock, and this may be most misleading. The seriousness of these injuries depends largely on whether the peritoneal cavity has been penetrated or not: Habegger reported a mortality of 26.8% in 179 cases, but with peritoneal involvement the figure reached 78.5%.

Case 4

A youth aged 17 was admitted with a history that five hours previously he was walking downstairs in his dressing-gown when he slipped and slid downwards feet first: at the bottom of the stairs a broom had been left lying, and the handle of this went in between his legs and into his rectum. He immediately withdrew it, and as he did so felt an acute pain across the lower abdomen. Very free bleeding occurred from the bowel and severe rectal tenesmus developed.

On admission he looked and felt ill. The lower half of the abdomen was tender and rigid; the perineum appeared normal

and there was no bruising round the anal margin; the external sphincter was undamaged. There was still considerable bleeding and also a copious mucoid discharge. A diagnosis of intraperitoneal rupture of the rectum was made. Sigmoidoscopy was not performed.

At operation, two hours after admission, the bladder was catheterized and 8 oz. (230 ml.) of clear urine withdrawn. On opening the abdomen free seropurulent fluid was found in the pelvis and there was a tear 1 in. (2.5 cm.) in diameter in the peritoneum of the recto-vesical pouch in the midline. This opening was enlarged laterally on each side, and a circular tear 1 in. in diameter was seen in the anterior rectal wall, 1 in. below the peritoneal reflection. The bladder was intact, but there were early inflammatory changes in the pelvic cellular tissues.

Owing to the position of the perforation deep in the pelvis, adequate suture proved impossible; a large sheet of corrugated rubber was therefore laid against the side of the bowel and brought out through the abdominal incision; the peritoneum of the pelvic floor was left unsutured. A soft rubber tube was inserted through the anus, and its proximal end was guided up to above the level of the perforation. A left iliac spur-type colostomy was then performed and opened immediately.

The patient made an uneventful recovery; the colostomy was closed after three months, and he was known to be well and with normal bowel function two years later.

Discussion

Important points in the management of these cases are to determine immediately whether the rectum has been perforated and whether there are injuries to other viscera, especially the bladder or urethra. If no gross blood is present in the urine serious bladder injury is unlikely, but if there is doubt cystoscopy should be performed.

The rectal laceration when found should be sutured if possible, adequate drainage provided, and a temporary colostomy performed. If the bladder is involved the rent should be sutured and suprapubic or transurethral drainage instituted, depending on the degree of injury.

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TREATMENT OF PERFORATIONS OF THE OESOPHAGUS

REPORT OF THREE CASES

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Perforation of the oesophagus, particularly of its thoracic portion, was until recently regarded as a condition associated with a very high mortality rate. Perhaps for this reason there has been little eagerness to diagnose the lesion in its early stages. Barrett (1946) stressed the possibility of early recognition and radical treatment for spontaneous perforation. Goligher (1948) proved that early suture of perforation of the pharyngo-oesophageal wall due to crushing between the gastroscope and the cervical vertebrae is feasible. Fish (1946) recorded the successful suture of a gunshot wound of the oesophagus.

Tearing by foreign bodies, including oesophagoscopes, still remains the commonest cause of perforation. Mosher (1935) reported 19 deaths in 938 oesophagoscopies, two of these deaths occurring among the 285 cases examined

for foreign body. Occasionally patients with perforations produced in this way survive, with the formation of empyemata or mediastinal abscesses, which have been successfully drained (Churchill, 1935; White, 1941; Adams, 1946; Dorsey, 1948). However, the majority of patients with such perforations have died. Case 1 below illustrates the fact that perforation of the thoracic oesophagus—even multiple perforation—can be dealt with successfully by primary suture.

Case 1

The patient, a man aged 39, was a criminal in the "escape" category serving a sentence of three years' penal servitude. He reported to the prison medical officer on Aug. 23, 1948, that he had swallowed three safety-razor blades five days previously, and complained of dysphagia and precordial pain. On other occasions in prison he had swallowed pieces of glass and half a spoon, which he had passed without difficulty.

He was admitted to hospital, and a radiograph showed one razor blade in the oesophagus and at least two in the abdomen. The same morning oesophagoscopy was undertaken and an attempt made to remove the blade. The endoscopist reported that a grip was obtained on the blade, but it broke on attempting to move it and only several fragments were recovered. Haemorrhage put an end to any further intra-oesophageal manipulations.

When seen on the afternoon of the 24th he was shocked and there were signs of a right hydropneumothorax, which was confirmed by x-ray examination. He was transferred to this unit and operation was undertaken immediately.

Anaesthesia was induced with thiopentone and curare, and the lungs were then distended by using a facepiece and bag before passing an endotracheal tube. A right tension pneumothorax developed, respiration ceased, and the pulse almost disappeared. On inserting a large-bore needle in the right chest air hissed out and the patient rapidly recovered. An endotracheal tube was then passed and anaesthesia maintained.

The right sixth rib was resected and a large quantity of fluid containing pus and altered food was aspirated from the chest. The right lower lobe appeared to be consolidated. The mediastinal tissues were inflamed, and the pleura overlying the mediastinum and oesophagus showed jagged tears in a number of places. On incising the mediastinal pleura the oesophagus was seen to be cut open from 2 in. (5 cm.) above the azygos vein to 4 in. (10 cm.) below it. The vein itself was intact, and to facilitate exposure it was doubly ligated and divided.

The oesophagus was then opened up by joining the main 6-in. (15-cm.) tear to several small ones above and below it. At the upper part of the slit area there was a large abrasion on the right side of the oesophageal wall, with some necrosis. On the left side of the oesophagus there were four deep slashes penetrating the mucosa and musculature into the mediastinal tissues but not opening into the left pleural cavity. A further abrasion was present on the posterior wall towards the lower end of the oesophagus. At this point a broken half of a razor blade was found and removed. The cuts on the left side of the oesophagus were sutured from inside that organ, using a single layer of interrupted silk and turning the edges of the mucosa into the lumen. A good repair was apparently obtained.

The incision on the right was then sutured, leaving the knots of the silk sutures within the lumen of the oesophagus so far as was possible. The necrotic-looking area was excluded by stitches and left outside the oesophageal lumen. The mediastinal tissues were widely opened up by forceps dissection into the right pleural cavity, and a closed water-seal drain was inserted up to the oesophagus with side holes for draining the pleural cavity. Sulphonamide and penicillin powder was dusted in and the chest wall was closed.

The patient was maintained on intravenous and later on rectal fluids. He was given penicillin, and his general condition improved greatly.

On Aug. 28, four days after operation, a small amount of fluid was given by mouth and it immediately appeared through

the tube draining his chest. He returned to parenteral fluids, and on Aug. 30 a laparotomy was performed. Three halves of razor blades were removed from various portions of his intestine and a Kader-Senn gastrostomy was carried out. He was subsequently fed through his gastrostomy opening, but the lower lobe of his right lung failed to expand and he remained pyrexial.

On Sept. 6 bronchoscopy was performed, and a large amount of pus was sucked out of the right lower-lobe bronchus, following which pyrexia subsided and the lung re-expanded. In spite of this, on testing the healing of his oesophagus by giving him a small amount of water coloured with indigo-carmin the dye immediately appeared through his tube.

Since healing was unsatisfactory, oesophagoscopy was carried out on Sept. 21. The oesophagoscope was passed between two rows of sutures, which were clearly seen, but no fistula was apparent and there was no tendency to stricture formation. The oesophagus contained fragments of half-chewed apple, and on subsequent search of his room quantities of food and cigarettes were found concealed—this in spite of the fact that a warder was in constant attendance. Security measures were tightened up and his oesophagus now very rapidly healed, as shown by the dye test, and on Oct. 4 the gastrostomy tube was removed.

There was still a small sinus into his chest, but this was rapidly healing and there was good aeration of his right lung.

Accordingly he was returned to prison on Oct. 7, where he made good progress. He subsequently developed a small localized empyema in the anterior part of his right chest, presumably a residual pocket left by the expanding lung. It was found possible to deal with this without removing him from the surveillance that seemed to be so necessary for his welfare. Oesophagoscopy on Dec. 20 showed good healing and no stricture, although the sutures were still present.

Recovery in this case is somewhat surprising in view of the extent of the damage, the long delay that took place between perforation and repair, and the considerable degree of infection that had already occurred, as well as the uncooperative attitude of the patient, who was anxious to prolong his stay in hospital indefinitely.

Comment on Case 1

The treatment of this case can be epitomized as drainage of the mediastinum and repair and defunctionalization of the oesophagus. Drainage of the mediastinal tissues should always be into the pleural cavity, opening the mediastinal pleura from top to bottom. The posterior extrapleural route—unless it is to resemble a Sauerbruch thoracoplasty—cannot effectively drain the mediastinum. In an early sutured tear of the cervical oesophagus with only slight upper mediastinal involvement mediastinotomy might be considered justified, but as soon as the mediastinitis extends so that the drainage is no longer dependent thoracotomy would be necessary. In view of this and of the difficulty in appreciating the extent of the infection, it is probably wiser in all cases to open the thorax at the outset.

The ideal time for exploration seems to be either before complications can develop or as soon as measures have been taken to deal with such urgent complications as tension pneumothorax. The surgeon who believes he has perforated the oesophagus during an endoscopy should, if facilities are available, have the anaesthesia continued, turn the patient over, and open his thorax. In such a case it should be possible to proceed with a gastrostomy immediately. If the patient is not fit to stand a gastrostomy, rectal or intravenous feeding should be continued for a few days and then the gastrostomy performed. Even if primary suture is carried out disappointments are only too common, and are likely to remain so until the diagnosis is made before serious infection has intervened. Case 2 illustrates a tragedy of this type.

Case 2

A woman aged 54 was admitted to hospital complaining that she had swallowed a chicken bone on Sept. 21, 1948, and that it was sticking in her chest.

Oesophagoscopy was carried out the next day under a general anaesthetic. No foreign body was found, but an abrasion of the mucosa was seen low down in the oesophagus. She was returned to the ward and shortly afterwards, at 4 p.m., suddenly complained of difficulty with breathing and of pain in the left side and back. She was reported as being obviously shocked, and oxygen and nikethamide were administered. Her condition did not improve very greatly, respirations became increasingly difficult, and diminished air entry was noted on the left side.

On Sept. 23 she was somewhat easier. When seen later that day she was pyrexial, and obviously her oesophagus was perforated into the left pleural cavity. X-ray examination showed hydropneumothorax and mediastinal emphysema. There were many moist sounds throughout the right lung and no breath sounds on the left. The heart and trachea were displaced somewhat to the right. She was not fit to be transferred to the chest unit and was treated in the hospital of admission. A needle was inserted into the left chest immediately and attached to an under-water drain. Air bubbled up under pressure and there was a considerable improvement in her condition.

Operation was then undertaken. The seventh left rib was resected. The pleural cavity appeared to be grossly infected and large quantities of thin pus and fibrin clot were present. A hole was noted in the pleura just in front of the aorta, and through this area the mediastinum was laid widely open. Thin pus gushed from the interstices of the mediastinal tissues. On retracting the aorta a tear 1 in. (2.5 cm.) in length was seen in the posterior aspect of the oesophagus just above the diaphragm. This was sutured with five interrupted silk sutures, and a rubber tube leading to the mediastinal perforation, with side holes to drain the pleura, was inserted and attached to a water-seal. Penicillin powder was dusted in and the chest closed. Large doses of penicillin and a rectal drip were administered. Morphine and its derivatives were avoided owing to the considerable degree of lung oedema, and coughing was encouraged for the same reason.

When seen next day her condition had greatly improved. The left lung was aerating well, and fluid still escaped from the drainage-tube. Rectal fluids were being returned, and owing to the condition of her lungs intravenous therapy was contra-indicated. For the same reason I was not anxious to subject her to another operation, so a soft Ryle's tube was passed into the stomach and feeding was continued by that means.

She remained well until 10.45 p.m., when she suddenly collapsed while talking to somebody in the ward and died within a few minutes.

At necropsy the torn area in the oesophagus was found to be adequately sutured and watertight, but both lungs were very oedematous and the left lung was partly consolidated. There was of course mediastinitis and inflammation of the left pleural cavity. I believe that death in this case was due to the lung oedema of acute heart failure resulting from the effect of her severe infection and from toxic absorption. It was difficult to see what other measures could have been taken to prevent a catastrophe, but it is some encouragement to know that the suture itself was effective.

Conservative Treatment

Whilst it has been stressed that a perforation or a suspected perforation of the thoracic oesophagus should be explored without awaiting the development of signs of that condition, suspected perforation of the cervical oesophagus is possibly in a different category. Here the part concerned is under more direct observation and there may in some cases be a place for conservative treatment. No criteria can be laid down for this, and at the very first indication of infection or extravasation outside the oesophageal wall the surgeon must be prepared to explore the

oesophagus and suture the tear. Case 3 illustrates successful conservative treatment.

Case 3

A woman aged 20 reported at hospital on Nov. 6, complaining that whilst eating stew the previous evening a bone had stuck in her throat and had remained there ever since.

Under a local anaesthetic she was examined with a laryngoscope, but it was not possible to pass the upper oesophageal sphincter and no foreign body was found. She was kept in bed and developed a pyrexia up to 100.4° F. (38° C.); there was some fullness in the tissues of her neck. She was put on penicillin the same day. On Nov. 8 a radiograph showed the swallowed bone just above the sternum on the right, but there were no signs of surgical emphysema either on the radiograph or clinically. Under a general anaesthetic an oesophagoscope was passed with ease. Just below the sphincter on the right side there was an area of oedema and redness. On pressing the folds apart a piece of bone was seen lying on the surface of the oesophageal wall. This was gripped with forceps and a long spike 1½ by ¾ in. (3.2 by 1.9 cm.) was withdrawn from its position transfixing the wall of the oesophagus. A small piece of bone was also found lying loose; this was removed. After removal the small perforation made by the spike of bone could be clearly seen.

The patient was given 1,000,000 units of penicillin daily and, after twenty-four hours, sterile water by mouth. Her temperature subsided immediately after oesophagoscopy and remained down. At no time was there any x-ray evidence of surgical emphysema, and her clinical condition gave no cause for alarm. After ten days she was allowed a full diet and was discharged from hospital.

In this case there were very considerable doubts whether further surgery should be undertaken when such an obvious perforation of the oesophagus was seen, but the site was so accessible that had any infection arisen it would at once have been apparent and could have been dealt with. The conservative policy adopted was justified by the end-result.

Summary

The importance of early diagnosis and primary suture of instrumental or foreign-body tear of the thoracic oesophagus is discussed. Lines of treatment are suggested, and two cases are described, one of which had suffered multiple oesophageal perforations from a razor blade and had recovered after primary suture.

Conservative treatment for suspected damage to the cervical oesophagus is suggested, and is illustrated by a successful case.

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The Government has issued a pleasantly illustrated pamphlet entitled *The Budget and Your Pocket* (H.M.S.O., 3d.) describing what money is collected from the taxpayer and how it is spent. It says that the tax money spent on health services is 7s. 9d. a family a week. The hospital service accounts for about 5s. a week of this, over half being the pay of doctors, nurses, orderlies, and other staff; rather over 1s. a week goes to general practitioners, and 9d. to the dentists; the remaining 1s. covers medicines, appliances, spectacles, eye testing, and so on. "It may seem strange," concludes the pamphlet, "to keep some prices high by taxation so as to raise money which is partly for a budget surplus to keep prices down. But that is exactly what must be done. . . . The final remedy will come when we are producing more, and producing it more efficiently so as to keep our prices down—earning more money, and getting more for it."