Late management of penetrating oesophageal injury

Case reports

M. SCHEIN, R. POOL, A. A. CONLAN

Summary

Two cases of oesophageal perforation at the thoracic inlet, due to penetrating trauma, are described. In the first case the diagnosis was established 2 weeks after injury; the second case was diagnosed within 30 hours, was treated unsuccessfully and referred to us 1 month after injury. The management of these severely ill patients is discussed. Defunctioning of the oesophagus was necessary in both cases, and later reconstruction was carried out in one of the patients.

Noniatrogenic penetrating injury of the oesophagus constitutes a small percentage of oesophageal perforations in most reported series. Injury to the oesophagus is rare in penetrating cervical or thoracic wounds because of the central, protected position of the oesophagus. The pathophysiology of this condition, symptoms and signs, and the importance of early diagnosis in decreasing the mortality and morbidity are well covered in the literature.

Much controversy exists as to the correct management of oesophageal perforations when diagnosed late. We describe our experience with 2 patients in whom the diagnosis of oesophageal perforation was delayed.

Case reports

Case 1

A 25-year-old Black man was admitted to an outlying hospital with a stab wound in the left lower cervical region. On admission a tracheal tear was diagnosed and a tracheostomy tube was inserted through the original stab wound. The neck was not formally explored despite increasing surgical emphysema. A chest radiograph showed a right-sided pneumothorax, for which an intercostal drain was inserted. Within a few days an empyema had developed with drainage of pus from the right chest. A nasogastric tube was inserted, and the patient was given intravenous fluids and broad-spectrum antibiotics. Because of progressive deterioration he was transferred to our unit 2 weeks after the initial injury.

On admission he appeared moribund. He had a low-volume pulse of 140/min with marked pulsus paradoxus. Blood pressure was 110/70 mmHg and the respiratory rate 40/min. There was marked surgical emphysema and tenderness of the neck. The tracheostomy tube was in situ. Pus drained profusely from the right pleural cavity. A Gastrografin swallow showed a leak from the oesophagus above the thoracic inlet, communicating with the right pleural space.

The patient was immediately prepared for operation. A midline laparotomy was performed and the oesophagogastric junction was divided at the diaphragmatic hiatus using a T35 x 4.8 stapler. A feeding jejunostomy was fashioned and the abdomen was closed.

Left cervical exploration was proceeded with, the oesophagus was identified, divided above the perforation and the proximal portion brought out onto the skin as a cervical oesophagostomy. The distal end was stapled with a T30 x 3.5, and left in the posterior mediastinum. A large mediastinal abscess was observed and drained at this stage. A right-sided rib resection concluded the operation.

The postoperative course was stormy and included episodes of septicaemia and shock. Two weeks after the initial operation a right thoracotomy and decortication were performed to achieve full expansion of the right lung. At thoracotomy the mediastinum was once again drained of pus. Three months later the patient had a retrosternal gastric bypass operation to restore gastro-intestinal tract continuity. The stomach was mobilized, pedicled on the right gastric and gastro-epiploic arteries, brought up retrosternally, and anastomosed with the proximal oesophageal segment in the neck. The procedure was well tolerated and the patient was subsequently discharged, eating a normal diet and free of sepsis.

Case 2

A 21-year-old Black man was admitted to hospital after sustaining a stab wound below the right clavicle. An intercostal drain was inserted on the right side but subsequent radiography revealed a pneumothorax on the left side, and a drain was inserted on that side as well. Within 24 hours a left-sided empyema had developed with drainage of undigested food particles from the chest. A Gastrografin swallow showed a large tear in the oesophagus at the thoracic inlet.

At operation the neck was explored and a right-sided cervical oesophagostomy performed. In order to prevent continuous soilage of the mediastinal and pleural cavities from gastro-oesophageal reflux a Foley catheter was inserted into the distal portion of the oesophagus and the balloon inflated in an effort to occlude the lumen. Treatment with broad-spectrum antibiotics and parenteral hyperalimentation was instituted. However, septis persisted, the patient's condition did not improve, and he was admitted to our unit in a catabolic state 1 month after his initial injury.
On examination the patient was acutely sick and distressed. He had a pulse rate of 120/min with marked pulsus paradoxus, and a respiration rate of 46/min. The cervical oesophagostomy was draining saliva, the Foley catheter was in situ, and a left-sided empyema was still present with a collapsed, trapped lung and gross suppurative mediastinitis.

The patient was immediately prepared for theatre where a laparotomy was performed, the oesophago gastric junction was stapled and a feeding jejunostomy was fashioned. The neck was explored, the Foley catheter removed, the distal oesophagus was stapled and the mediastinum drained. A left-sided rib resection completed the procedure. The patient’s condition improved rapidly. Intolerance of jejunostomy feeds precluded continuation of nutrition by that route, so a central feed-line was inserted and parenteral nutrition was commenced. He died, however, following cardiovascular collapse due to septicemia.

Discussion

After penetrating injuries of the cervical oesophagus, peri-oesophageal contamination and infection extend along the pre­tracheal and retrovesical spaces towards the mediastinum. In the thoracic section of the oesophagus the spread of inflamma­tory reaction from local perforation depends on the relationship of the oesophagus with the adjacent pleural cavity. The upper two-thirds of the thoracic oesophagus lie in close proximity to the right pleural cavity, while the lower third deviates to the left.

Since infections due to perforation of the thoracic oesophagus tend to affect the mediastinal pleura and cause early effusion, the level of oesophageal perforation can be predicted with consider­able accuracy on the basis of the location of the associated pleural effusion or empyema.

Fluctuation in the negative intrathoracic pressure tends to suck the contents of the fascial spaces and the oesophagus into the mediastinum. Oral and gastric secretions containing air, saliva, anaerobic bacteria, enzymes, bile and food are then forced into the mediastinum and pleural cavity and contribute to the virulent, necrotizing mediastinitis. The infection takes the form of a diffuse necrotizing cellulitis with septicaemia, which in time becomes supplicative. Mediastinitis need not be extensive to produce severe local and systemic reactions. The sequestration of fluids into the neck, mediastinum and pleural cavity causes major loss of plasma volume and protein contents and may interfere with cardiovascular dynamics.

Although the treatment of a recently perforated cervical or thoracic oesophagus is generally agreed to be by primary sutu­ring and drainage, there is divergence of opinion regarding the classification of a perforation as ‘early’ or ‘late’. Sawyers et al.,3 reporting on 64 patients, defined ‘early’ injuries as those diag­nosed within 24 hours. The mortality associated with early lesions was 13%, but if diagnosis was delayed the mortality rose to 56%.

Abbott et al.12 reported 47 cases of spontaneous rupture which showed an alarming tendency to break down when primary repair was attempted 12 - 24 hours after perforation. Triggiani and Belsey,13 reporting on 126 perforations, advocated primary repair only in those cases diagnosed within the first 12 hours. Hinder et al.11 consider 6 - 8 hours ‘early’, 8 - 24 hours con­stituting a ‘grey’ area. When considering the most suitable opera­tive procedure for his patient the surgeon should take into account various other factors besides time before deciding to treat the case as ‘early’ or ‘late’.

Ultimately, all the findings at operation will dictate the procedure to be followed. Severe inflammatory oedema in the wall of the oesophagus adjacent to the perforation with extensive contami­nation will preclude primary suture, even in early diagnosed cases.

Symbas et al.8 described 3 patients with bullet wounds of the thoracic oesophagus operated on 2, 4 and 24 hours after injury respectively. Because of severe oesophageal damage at the area of perforation, debridement of the wound edges was undertaken before primary suturing. In all these patients the suture line disrupted postoperatively. Histological examination of debrided oesophageal tissue showed diffuse haemorrhage involving all layers of the oesophageal wall. This confirms the common ten­dency to underestimate the extent of tissue injury at operation.

Recent reports of large series of penetrating wounds of the oesophagus deal mainly with cases diagnosed soon after injury. In one series a mean period of 6,2 hours elapsed before diagnosis, and all but 1 case were diagnosed within 24 hours.9 In another series of 26 patients, 24 were treated surgically within 24 hours of injury.11

A high index of suspicion, coupled with the routine use of oesophagography in all patients with injuries near the oesophagus or when missiles or weapons may have traversed the medi­astinum, has greatly increased the probability of early diagnosis of oesophageal perforations.5 The high incidence of firearm in­juries, calling for more urgent exploration than do simple stab wounds, may also account for the low incidence of delayed diagnosis of oesophageal injury in Symbas et al.’s9 series.

The surgical methods employed in the treatment of late­diagnosed oesophageal perforations were developed and tested while treating patients suffering from spontaneous perforation of the oesophagus (Boehrhaave syndrome). Mengoli and Klassen14 presented 18 patients with perforations arising from endoscopy, all but 4 diagnosed within 24 hours. The patients were treated conservatively with nasogastric suction and intravenous antibiot­ics. All but 1 survived. Triggiani and Belsey13 described 6 perfo­rations arising from instrumentation, 5 of which were treated conservatively. Four of the patients recovered uneventfully but 2 developed upper mediastinal abscesses which required drainage through the neck.

A conservative approach to oesophageal perforations is strongly condemned by most authors. The fact that some small perfora­tions, particularly in the neck, can often be treated successfully by conservative management is not questioned. During the past 2 years we managed 3 patients with penetrating knife injuries of the cervical oesophagus without mediastinitis by cervical drainage and antibiotics, with full recovery. The difficulty, however, lies in classifying a perforation as ‘small’ and in predicting the ultimate effects of such a perforation.5 Late penetrating injuries of the cervical and thoracic oesophagus, when treated conserva­tively, are almost always fatal.15

Most operative procedures which have been suggested in the ma­nagement of late-diagnosed oesophageal perforations, reflecting dissatisfaction with results obtained so far. Abbott et al.12 recommend a soft Silastic T-tube which they used in the ma­nagement of these cases. At thoracotomy the oesophageal rupt­ure is debrided and the T-tube is inserted into the oesophagus so that the inferior limb of the T extends into the stomach. The long part of the tube is brought out through the oesophageal perfora­tion which is closed loosely around it. The procedure is com­pleted with a gastrostomy for drainage and a feeding jejunostomy.

Nine patients in whom perforations were diagnosed 26 - 148 hours after injury were managed along these lines by the present authors, and in 6 of these, cure was achieved. Failures were related to technical errors and, in 1 patient, to an attempted application of the method described more than 7 days after injury and 6 days after an initial attempt at closure.

Robinson et al.15 recommend the use of a ‘gastric patch’ in the management of oesophageal perforations. This method was used in 6 cases of spontaneous rupture diagnosed approximately 36 hours after the event. A high method consists of mobilizing the stomach through the central tendon of the diaphragm and patch­grafting it to the site of rupture, it is suitable only for perforations of the lower third of the oesophagus. Healing occurs over the surface of the patch graft; no attempt is made initially to close the
defect. Five of 6 patients treated by this method survived. Keen suggests that old oesophageal perforations may close after pericardial wrapping, omental wrapping or suturing of the lung over the perforation. Experience with these methods is scanty and success sporadic.

Payne and Larson proposed oesophagogastrectomy for patients with intrathoracic perforation of lower oesophageal carcinoma. In many cases the degree of tissue inflammation defies such extensive dissection and reconstruction.

There are a few reports describing success with intubation of the perforated oesophagus, the tube being impacted at the site of the perforation. Johnson et al. demonstrated that patients with late-diagnosed perforation or those with leakage at the site of primary closure succumb because of continuous soilage of the thoracic cavity with salivary and gastric secretions, leading to reactivation of empyema and mediastinitis followed by loss of large amounts of plasma proteins. They suggested isolating the injured part of the oesophagus from the stomach and cervical oesophagus, thereby diverting the salivary and gastric secretions away from the oesophago-pleurale fistula. This entails dividing the oesophagus at the oesophago-gastric junction and either suturing or stapling both ends. A feeding jejunostomy is fashioned at the same time. Gastrostomy should be avoided, as this damages the stomach which will later be used to bypass the excluded portion of oesophagus. Saliva is diverted away from the fistula by dividing the oesophagus in the lower cervical region, stapling or suturing the distal end, and exteriorizing the proximal portion as a cervical oesophagostomy.

Eventual reconstruction of the oesophagus by one of the available techniques is necessary once the fistula has closed and the empyema healed and the patient is anabolic. A number of reconstructive procedures are available. Colon, jejunum, and stomach have been used as bypass conduits. Because of its better vascularity, the single anastomosis required, and a lower operative mortality, we prefer the retrosternal gastric bypass as our method of reconstruction. The excluded oesophagus forms a posterior mediastinal mucocele, which generally remains asymptomatic. We plan to remove our patient's bypassed oesophagus at some future date.

Triggiani and Belsey described the results of treatment in patients with intrathoracic leaks following oesophagogastrectomy. In 6 patients, where the early diagnosis appeared to justify the procedure, the entire anastomosis was resected and reconstructed. In all but 1 patient the leak recurred, with an eventual mortality of 50%. In another 12 patients, where late diagnosis appeared to contraindicate any attempt at repair, the oesophageal leak was excluded, followed by staged reconstruction 2–3 months later using left colon interposition. The mortality in this group was 17%.

Urschel et al. suggested an improved method of oesophageal exclusion. An umbilical tape attached to a piece of Teflon felt is inserted around the oesophagus below the perforation and above the cardia, deep to the vagus nerves; it is tied firmly but with care, to avoid strangulation of tissue. This prevents reflux of gastric contents into the area of perforation. A gastrostomy is also performed and saliva is diverted via a lateral cervical oesophago-stomy. This procedure avoids the permanency of oesophageal transaction and obviates the need for complicated reconstructive surgery. When the perforation has healed and nutritional status improved, the oesophageal ligature is removed and the cervical oesophagostomy closed transversely, thus preserving the continuity of the oesophagus. The authors described 6 cases of oesophageal perforation. Exclusion of the oesophagus was performed immediately in 3 cases and at a late stage in the other 3, owing to the persistence of oesophageopleural fistula despite adequate drainage and vigorous nutritional support. All these patients improved promptly and the perforations healed.

Hinder et al. describe a tube system introduced into the oesophagus via a cervical oesophagostomy which prevents swallowed material from getting to the lower oesophagus and allows a tube to be passed into the stomach for continuous aspiration of gastric contents. To discontinue the diversion, a surgical procedure is not required as the oesophagostomy closes spontaneously. Our second patient was initially provided with a similar tube system, but continued to suffer from worsening mediastinitis. We suggest that 'exclusion' of the oesophageal perforation by such a system is not adequate and allows continuous contamination of the pleural space and the mediastinum.

No less important than the surgical management is the pre-operative preparation of these severely ill patients, who pose a challenge to the surgeon's ability to recognize and treat compensated shock before anaesthesia is commenced. If this is not recognized, the patient often succumbs during the surgical procedure. Hypovolaemia, septicaemia, anaemia and acid-base disturbances should be aggressively corrected with intravenous fluids, blood, and broad-spectrum antibiotics, guided by serial monitoring of haemodynamic and blood biochemical and gas values, and by blood and pleural cultures. Occasionally, tracheal intubation and assisted ventilation are required.

These patients are frequently extremely malnourished and catabolic; prompt parenteral alimentation should therefore be commenced, followed by full jejunostomy feeds as soon as post-operative ileus subsides, so as to restore immune competence and tissue repair mechanisms.

We recommend oesophageal exclusion or exclusion plus diversion in continuity as life-saving procedures in patients with late-diagnosed oesophageal perforation, as well as for those with leakage and formation of oesophago-pleural fistula after primary closure.

REFERENCES