

Oesophageal trauma

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Abstract

Trauma to the oesophagus is a rare but life threatening emergency. The majority of injuries occur as perforations secondary to therapeutic upper gastrointestinal endoscopy and, to a lesser extent, diagnostic endoscopy. The principles of investigation and management are similar for all causes of oesophageal trauma with outcomes more dependent on the severity of the injury than the cause. These remain difficult conditions to manage as the diagnosis is frequently overlooked and through the lack of exposure and experience amongst clinicians in dealing with the spectrum of oesophageal trauma. A high index of suspicion is therefore required. Initial investigation with chest radiography or contrast swallow is standard but CT and endoscopic assessment are used increasingly to make the diagnosis and to monitor the status of the injury or its repair. Non-operative management is possible in carefully selected patients. Surgery, when indicated, should be performed in a specialist oesophago-gastric centre.

Keywords Boerhaave's syndrome; caustic injuries; endoscopic perforation; iatrogenic perforation; spontaneous oesophageal perforation

Introduction

The oesophagus lies in the neck, mediastinum and abdomen, and is protected from most external injuries other than penetrating or 'extreme' blunt trauma. Technical misadventure therefore accounts for the majority of oesophageal injuries, particularly given the escalating use of diagnostic and therapeutic upper gastrointestinal endoscopy. Oesophageal perforation carries high morbidity and mortality due to the difficulty of access to the oesophagus, the unusual blood supply, the lack of a strong serosal layer and the proximity of vital structures. In addition, clinicians gain limited exposure to these cases due to their rarity. Timely management is essential to a successful outcome with delays in intervention associated with a significantly higher mortality rate.

Pathophysiology

Full-thickness disruption of the oesophageal wall rapidly leads to mediastinal and pleural contamination as acidic gastric secretions and bacteria are disseminated by negative intrathoracic pressure. Resulting untreated sepsis from bacterial mediastinitis will swiftly progress to a profound systemic inflammatory response, multi-organ dysfunction syndrome and death. The degree and extent of contamination, the patient's underlying physical fitness and associated comorbidities are important factors that determine outcome.

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Aetiology

Iatrogenic perforation of the oesophagus

Endo-oesophageal instrumentation accounts for the majority of iatrogenic oesophageal perforations. This may be diagnostic flexible video endoscopy (overall perforation rate: 0.05%) or therapeutic endoscopic procedures for benign disease such as pneumatic balloon dilatation (e.g. for achalasia) or malignancy, such as palliative endoscopic stent placement. These procedures carry a risk of perforation of about 2.6%, which is elevated further in patients who have received prior chemotherapy or radiotherapy. Rigid oesophagoscopy is still performed by ENT or thoracic surgeons and is associated with greater risk of perforation, similar to that of therapeutic intervention. Recent developments in endoscopy such as endoscopic mucosal resection (EMR), endoscopic submucosal dissection (ESD) and per-oral endoscopic myotomy (POEM), carry a higher risk of perforation and leakage of around 5%. Placement of transoesophageal echocardiography probes during cardiac surgery can also directly injure the oesophagus or lead to pressure necrosis as these monitoring devices are left in situ for prolonged periods of time.

The majority of iatrogenic endoscopic injuries occur in the distal oesophagus (90%) often in the presence of an underlying abnormality such as an oesophageal stricture. Proximal cervical perforation is rare, usually occurring in the presence of a diverticulum or pharyngeal pouch. Rarely, trauma can occur through shearing forces as the scope passes through cricopharynx; elderly patients are particularly at risk of such an injury due to limited neck extension and sharp cervical osteophytes impinging on the posterior oesophageal wall.

Iatrogenic trauma may be sustained to the oesophagus from the outside during open and laparoscopic surgical approaches in close proximity to the oesophagus, for example during Nissen's fundoplication particularly when revisional anti-reflux surgery is being performed. Similarly, mucosal injury is possible during cardiomyotomy for achalasia and during dissection of giant para-oesophageal hiatus hernias. Oesophageal trauma has also been described following head and neck, spinal and thoracic operations.

Iatrogenic perforation is classically associated with limited contamination as these frequently occur in fasted patients and the injury is more rapidly diagnosed.

Spontaneous perforation

The rare, eponymous Boerhaave's syndrome is defined as full-thickness disruption of the oesophageal wall occurring in the absence of pre-existing oesophageal pathology. It is characterized by barogenic oesophageal injury leading to immediate and gross gastric content contamination of the pleural cavity, with rapid and catastrophic onset of chemical and bacterial mediastinitis. A typical specialist oesophagogastric centre in the UK may expect to see one or two cases of this per year. The characteristic injury is longitudinal, in the left posterolateral wall, 2–6 cm above the diaphragm with the length of the tear between 0.5 and 20 cm. Rupture of other regions of the oesophagus is rare.

Penetrating injuries of the oesophagus

External penetrating injuries of the oesophagus are most common as it passes through the neck. These injuries often occur in conjunction with other serious injuries to surrounding viscera so

are easily missed. Consequent delay greatly increases morbidity and mortality.

Blunt injuries of the oesophagus

Oesophageal trauma as a result of blunt injury is very rare, occurring almost exclusively to the thoracic oesophagus with blunt cervical trauma only occurring in high-velocity accidents. Trauma can result from vascular thrombosis from traction laceration in rapid deceleration events or as a modern phenomenon from airbag deployment leading to barogenic damage.

Clinical presentation

The clinical features of oesophageal perforation depend on the cause, site and delay from injury.

Iatrogenic injuries

These tend to be full-thickness injuries and are often, but not always, recognized at the time of injury with a visible defect or even visualization of mediastinal/pleural or peritoneal structures. Chest pain is the most common reported symptom. Signs including surgical emphysema are unreliable, subtle, absent or only noticeable with time. Similarly, systemic symptoms are uncommon other than mild tachycardia as pre-procedure fasting limits any mediastinal or pleural contamination. Cervical injuries present with neck pain and hoarseness.

Spontaneous perforation

Unlike iatrogenic perforations these occur in a patient who has not been fasted and lead to rapid soiling of the mediastinum and pleural cavities with subsequent sepsis. Therefore, presentation may be profound with systemic upset and septic shock. Classically, patients complain of excruciating substernal pain after vomiting or retching. As per the original description of this condition, the typical patient is male between 40 and 60 years who has overindulged in food and alcohol. The triad of subcutaneous emphysema, chest pain and vomiting is not often seen. Similarly, physical examination may be absent or misleading so it is important that oesophageal perforation is included in the differential diagnosis of any patient who presents with acute cardiorespiratory distress of uncertain aetiology. Differential diagnoses for oesophageal perforation include the more commonly occurring myocardial infarction, leaking or dissecting aortic aneurysm, gastroduodenal ulcer perforation, acute pancreatitis and incarcerated paraoesophageal hiatus hernia. As a result, many patients with spontaneous oesophageal perforations have a delayed diagnosis and develop overwhelming bacterial mediastinitis leading to multi-organ failure.

Penetrating oesophageal trauma

This type of trauma manifests in a similar fashion, but a high index of suspicion based on the tract of the injury is essential for diagnosis. Damage should be suspected in any transcervical or transmediastinal wound, especially when gunshot derived.

Investigations

With the exception of iatrogenic perforation a diagnostic delay of more than 12 hours is seen in the majority of cases. The importance of a high index of suspicion cannot be overemphasized as an active approach to making the diagnosis may be life saving. A

careful history and examination, full blood count, urea and electrolytes, amylase and C-reactive protein (CRP) alongside arterial blood gases, blood grouping and a 12-lead electrocardiogram should be performed.

Plain radiography

The classical findings of oesophageal perforation on a chest radiograph are pleural effusion, pneumomediastinum, subcutaneous emphysema, hydropneumothorax, pneumothorax and collapse or consolidation. Pleural effusion is usually left sided but may be right sided or even bilateral. These features may be subtle and easily missed. Particular care must be taken to examine the subcutaneous tissues on the radiograph for surgical emphysema and for the presence of pneumomediastinum.

Computed tomography (CT)

Contrast-enhanced CT (Figure 1) is increasingly used to make the diagnosis and is particularly useful when oesophageal perforation is suspected in a critically ill patient as it can be performed in a ventilated patient and in those in whom alternative differential diagnoses may be possible (e.g. aortic dissection). It is diagnostic, delineates mediastinal or pleural contamination and may facilitate drainage of any collections.

Contrast radiography

Oral contrast radiography (Figure 2) is the standard investigation to confirm perforation of the oesophagus particularly when iatrogenic injury is suspected, but is being superseded by CT scanning. Water-soluble contrast is used initially, but if negative the radiologist may choose to use dilute barium, which outlines better detail.

Upper gastrointestinal endoscopy

Flexible video endoscopy (Figure 3) not only confirms the diagnosis but allows for assessment of perforation size and associated pathology. Furthermore, it allows placement of a nasogastric tube for drainage and a nasojejunal tube for feeding. Endoscopy is especially useful in an 'on table' situation where trauma is suspected but where other injuries preclude radiological examination.

Other

Drainage of gastric contents on thoracocentesis is diagnostic and may be aided by measurement of pH, amylase or microscopy for squamous cells. Administration of oral dyes, such as methylene blue, in the presence of a communicating drain may also be useful.

The sequence and combination of radiological/endoscopic investigations will depend on the index of suspicion, clinical circumstances and expertise available rather than a 'one size fits all' approach.

Management

Timely management is essential for a successful outcome and a multidisciplinary and pro-active approach should be taken to these patients. Full resuscitation with early involvement of a critical care team along with close liaison to a regional oesophagogastric unit is crucial. Survival is reliant on avoiding or controlling mediastinal and pleural contamination and surgery being mandatory when gross contamination is present.

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