

Morbidity and mortality of oesophageal perforation

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Thirty-three patients with oesophageal perforation seen within a 20-year period are reviewed. Endoscopic perforation in patients with neoplastic disease of the oesophagus carried a 100% mortality despite early diagnosis and immediate resection of the growth. Only two deaths occurred after instrumental perforation of the thoracic oesophagus for benign pathology in patients who were in the extremes of life.

Twelve cases with spontaneous perforation were seen. Although the mortality figure of only 8% was encouraging, the morbidity in terms of postoperative complications was considerable, occurring in all but one of the survivors.

The importance of early diagnosis and adequate treatment in relation to postoperative morbidity and mortality is discussed.

Perforation of the oesophagus is no longer an uncommon clinical entity. This is the result of an increasing incidence of iatrogenic endoscopic damage (Nealon, Templeton, Cuddy, and Gibbon, 1961) and the earlier clinical recognition of spontaneous rupture (Barrett, 1946; Sealy, 1963).

Despite well documented accounts of both the clinical features and radiological diagnosis of oesophageal perforation (Mathewson, Dozier, Hamill, and Smith, 1962; Hardin, Hardy, and Conn, 1967; Abbott *et al.*, 1970), the morbidity and mortality, particularly after spontaneous rupture, remain alarmingly high (Tuttle and Barrett, 1963; Foster, Jolly, Sawyers, and Daniel, 1965). The importance of early diagnosis in avoiding complications (Nealon *et al.*, 1961) and the value of contrast radiology have been stressed (Christoforidis and Nelson, 1957; Kerr, 1962).

Early direct suture of the thoracic oesophagus after spontaneous perforation has become standard surgical practice following the first successful repair in 1946 (Barrett, 1947; Gibbon, 1962). On the other hand, considerable controversy still remains in regard to the treatment of instrumental perforation, particularly when the pleura or peritoneum have not been breached (Terracol and Sweet, 1958; Mengoli and Klassen, 1965; Groves, 1966).

CLINICAL MATERIAL

The records of all patients with oesophageal perforation treated over the last 20 years (1951-71) in the

Thoracic Department of the General Infirmary at Leeds were studied.

Perforation of the oesophagus occurred in 33 patients; 12 of these followed spontaneous rupture. The remainder were the result of instrumental perforation in 16, foreign body trauma in one, and three occurred after thoracotomy. The records of one patient could not be traced.

Table I shows the mortality rate in relation to the aetiology of oesophageal perforation. Endoscopic

TABLE I
INCIDENCE AND MORTALITY OF OESOPHAGEAL PERFORATIONS 1951-71 (33 CASES)

| Incidence | | Mortality | |
|-------------------------|-----------------|-----------|--------|
| Endoscopic perforations | 16 | 8 | (50%) |
| For carcinoma | 6 | 6 | (100%) |
| For benign pathology | 10 | 2 | (20%) |
| Foreign body trauma | 1 | 0 | |
| Following thoracotomy | 3 | 0 | |
| Spontaneous rupture | 12 | 1 | (8%) |
| Total | 32 ¹ | 9 | |

¹Notes unobtainable in 1 case

TABLE II
MORBIDITY OF OESOPHAGEAL PERFORATION IN SURVIVORS

| | | Incidence of Postop. Complications |
|--------------------------------|----|------------------------------------|
| Endoscopy for benign pathology | 8 | 3 |
| Foreign body | 1 | 1 |
| Following thoracotomy | 3 | 3 |
| Spontaneous rupture | 11 | 9 |
| Total | 23 | 16 |

TABLE III
INSTRUMENTAL PERFORATION

| | Malignant (n=6) | Benign (n=10) |
|----------------------------|--------------------|------------------|
| Average age | 72 years | 50 years |
| Sex groups | 83% Male | 90% Female |
| Sites: Cervical | - | 4 40% |
| Thoracic | 6 100% | 6 60% |
| Diagnosis: Less than 24 hr | 4 66% | 6 60% |
| Treatment: Resection .. | 2 | 1 |
| Repair | - | 4 |
| Conservative | 4 | 6 |
| Mortality | 6 100% | 2 20% |

damage in patients with malignant disease carried an overall mortality of 100%. On the other hand, only two patients died following oesophagoscopy for benign pathology. These occurred in the extremes of life and will be further reviewed. One other fatality was recorded after spontaneous rupture.

The morbidity in those who survived was assessed in terms of postoperative complications, as seen in Table II. Although a low mortality followed spontaneous rupture, the morbidity in the survivors was considerably higher than in those with perforations occurring after endoscopic damage.

In order to investigate the factors involved in the morbidity and mortality, the importance of early diagnosis and management was evaluated.

PERFORATION FOLLOWING ENDOSCOPY Perforation following instrumentation for oesophageal carcinoma occurred in six patients; three were the result of attempted palliation with a Souttar's tube for intractable dysphagia. The majority of these patients were men over the age of 70 years and half the neoplasms were gastric in origin. Damage occurred entirely within

the thoracic oesophagus and despite early diagnosis in four, the mortality rate was 100% even though aggressive surgery with resection had been undertaken in two cases (Table III).

In comparison, perforation occurred in 10 patients following oesophagoscopy for benign pathology; nine were women in the fifth decade. Damage to the cervical oesophagus occurred in four cases. Although there were a larger number in whom the diagnosis was made after 48 hours, the mortality was only 20%. Further analysis was undertaken in this group according to the site of perforation.

Perforation of the cervical region after oesophagoscopy occurred largely in patients with severe kyphosis. They presented with dysphagia, cervical pain, and swelling and surgical emphysema of the neck (Table IV). The radiographic features included enlargement of the superior mediastinum with evidence of a secondary retropharyngeal abscess in two (Fig. 1). In three patients the diagnosis was made at least four days after endoscopy. Despite this there were no deaths. No attempt was made to repair the perforation and only one patient developed a fistula which closed after a short period of conservative therapy. Those patients whose convalescence was complicated by the development of a retropharyngeal abscess were treated by drainage procedures alone.

Perforations in the thoracic oesophagus principally followed the dilatation of strictures; three were peptic in origin, one a caustic stricture, and the fifth was a long-standing lesion in the middle third. Perforation in one case occurred after endoscopic treatment of achalasia with the Negus bag. Chest pain and dyspnoea, with subcutaneous emphysema of the neck and signs of fluid or air in the affected hemithorax, were the main clinical features. These findings were substantiated by a chest radiograph and by the demonstration of mediastinal emphysema or gas under the diaphragm in the remainder. Although the diagnosis was made largely within 24 hours of perforation (five

TABLE IV
ENDOSCOPIC PERFORATION FOR BENIGN PATHOLOGY (10 CASES)

| | Cervical (n=4) | | Thoracic (n=6) | |
|-------------------|-------------------------------|---|---------------------------------|---|
| Aetiology | Oesophagoscopy + kyphosis | | Dilatation of stricture | |
| Features | Pain and dysphagia | 3 | Chest pain and dyspnoea | 5 |
| | Swelling in neck | 4 | Effusion or pneumothorax | 3 |
| | Surgical emphysema | 2 | Surgical emphysema | 2 |
| | | 2 | Abdominal pain | 2 |
| X-ray | Retropharyngeal abscess | 2 | Air/fluid in hemithorax | 4 |
| | Enlarged superior mediastinum | 2 | Pneumoperitoneum | 1 |
| | | | Mediastinal emphysema | 2 |
| Diagnosis | Less than 24 hours | 1 | Less than 24 hours | 5 |
| | More than 48 hours | 3 | More than 24 hours ¹ | 1 |
| Treatment | Drainage of abscess | 2 | Resection/repair | 5 |
| | Conservative | 2 | Conservative ¹ | 1 |
| Mortality | | 0 | | 2 |
| Morbidity | Fistula | 1 | Leak + emphysema | 2 |

¹Hospital mortality

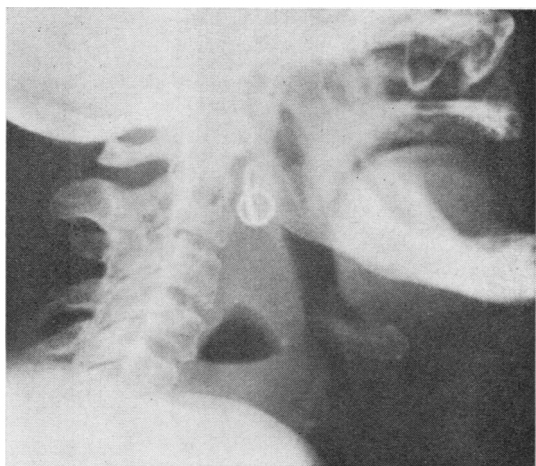


FIG. 1. Lateral radiograph of the neck to show a retropharyngeal abscess occurring after instrumental perforation of the oesophagus.

cases) and despite direct suture or resection in five, two patients died in hospital.

Both deaths occurred in the extremes of life. One was a girl of 18 months with a caustic stricture. Numerous operations had been undertaken because of a persistent leak from the oesophagus. Despite a successful pharyngojejunostomy death occurred suddenly from peritonitis, due to damage to the bowel adjacent to the feeding jejunostomy tube. The other case occurred in a frail 75-year-old woman. She was readmitted seven days after endoscopy, too ill to withstand surgery, and died shortly after admission despite intravenous fluids and intercostal drainage.

FOREIGN BODY PERFORATION One boy, 2 years of age, was admitted cyanosed with a large hydropneumothorax 36 hours after swallowing a knitting needle. Gastrografin swallow demonstrated the site of perforation in the root of the neck. He was successfully treated by intercostal drainage and direct suture of the oesophagus through a collar incision; the only complication following surgery was a transient Horner's syndrome on the same side as the repair.

POST-THORACOTOMY LEAK Leakage from the oesophagus occurred in three patients after thoracotomy. Two followed lung surgery for carcinoma; one of them presented nine days after lower lobectomy with a persistent effusion which drained large quantities of fluid down the intercostal tube. The other patient developed severe dysphagia, and a leak was demonstrated 30 days after intrapericardial pneumonectomy. In both cases, the perforation was localized at the lower end of the oesophagus and treated by direct suture and a jejunostomy. Although the oesophageal suture line broke down in each case, both patients

remain well without evidence of recurrence at follow-up.

Leakage from the lower end of the oesophagus presented as a persistent sinus in the thoracotomy wound of one patient 23 months after hiatus hernia repair. This was successfully treated by jejunostomy and drainage following rib resection.

SPONTANEOUS PERFORATION Twelve patients during the last 20 years have been admitted with spontaneous perforation. The majority (nine cases) were men with an average age of less than 60 years. These patients presented with a history of severe chest pain and dyspnoea or sudden abdominal pain occurring immediately after vomiting or where attempts had been made to suppress this. In four, a definite history of phrenic nerve irritation with shoulder-tip pain was also recorded (Table V). Surgical emphysema and evidence of a pneumothorax or effusion on clinical or radiological grounds were commonly demonstrated together with radiographic evidence of air in the mediastinum or peritoneal cavity (Fig. 2). Where Gastrografin swallow was performed, the site and extent of rupture were visualized in every case (Fig. 3). Oesophagoscopy, on the other hand, was less reliable as a diagnostic aid.

Although in six patients a correct diagnosis was made within 24 hours of perforation, there were three in whom the time lapse between perforation and diagnosis was between five and 12 days.

Direct suture of the torn lower third of the oesophagus was undertaken in all cases and this was covered by a feeding jejunostomy in five. It must be

TABLE V
SPONTANEOUS PERFORATIONS (12 CASES)

| Av. age 57 yr (range 45–75 yr) 9 Male : 3 Female | | |
|---|---|--|
| Symptoms .. | Chest pain and dyspnoea Abdominal pain Shoulder-tip pain | 11 7 4 |
| Signs .. | Effusion or pneumothorax Abdominal signs Surgical emphysema Cyanosis | 9 (2 with tracheal shift) 8 7 5 |
| X-ray .. | Surgical emphysema Hydropneumothorax Effusion only Mediastinal emphysema Pneumoperitoneum | 9 8 3 3 1 |
| Diagnosis .. | Less than 24 hours 24–48 hours After 48 hours | 6 3 3 (5, 7, 12 days) |
| Treatment .. | Direct suture (+ jejunostomy 5) | 12 |
| Mortality .. | | 1 |
| Morbidity .. | Empyema 7 Fistula/sinus 5 Leaking suture line 3 Late abscess 3 | 10 |
| Re-operation for complications in | | 6 |

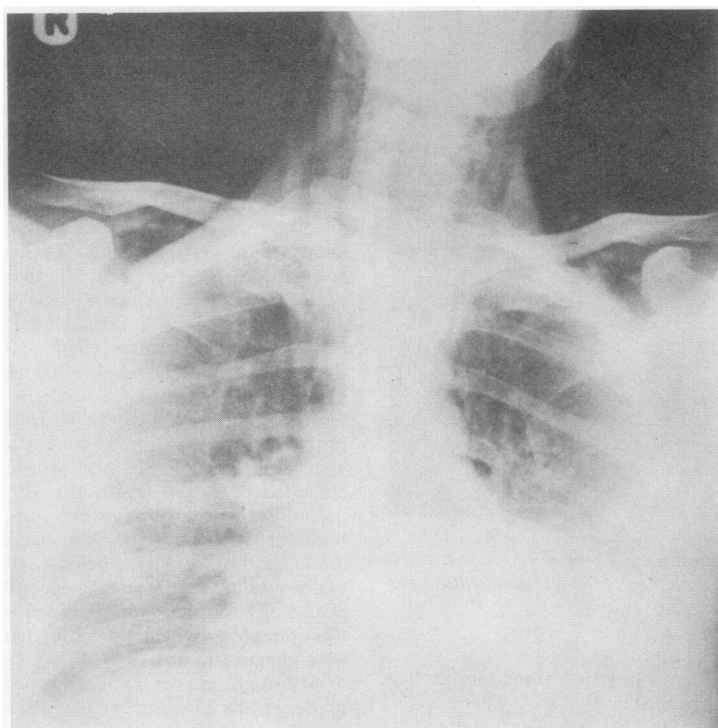


FIG. 2. Antero-posterior chest radiograph showing surgical emphysema of the neck, a pneumoperitoneum, and fluid in the affected hemithorax following spontaneous rupture of the oesophagus.

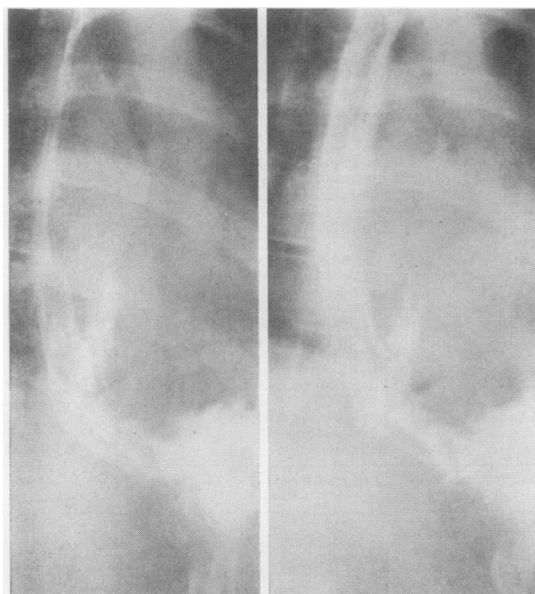


FIG. 3. Gastrografin swallow to demonstrate the site of perforation after spontaneous rupture of the oesophagus.

assumed that the high incidence of complications in these patients (84%) occurred largely as a result of leakage from the site of repair. This was reflected by the frequency of empyema formation, oesophago-pleural fistula, local secondary abscess, and a leaking suture line shown by postoperative contrast radiology (Table V).

Only one patient died following spontaneous perforation. He was transferred seven days after the onset of chest pain with a huge tension pyopneumothorax requiring immediate decompression. During operation he developed a tension pneumothorax on the opposite side and a cardiac arrest; despite successful resuscitation and resuture he died within 24 hours.

DISCUSSION

The foregoing results have outlined the principal causes and diagnostic features of iatrogenic and spontaneous perforation seen within one hospital unit over a 20-year period.

This survey has shown that where perforation is the result of instrumentation for carcinoma, despite early diagnosis of iatrogenic damage and attempted resection, the mortality rate was extremely high. The appalling results of neoplastic perforation in the thoracic region treated con-

servatively have been quoted elsewhere (Foster *et al.*, 1965). It is concluded that endoscopic perforation for carcinoma is an extremely serious complication, particularly following attempted palliation with the Souttar's tube. It has been suggested that this mortality is likely to improve only if early aggressive resection is undertaken (Groves, 1966).

The incidence of fatal complications following instrumentation for benign pathology in this review was similar to the experience of others (Nealon *et al.*, 1961; Alford, Johnson, and Harris, 1963). Our results have also confirmed the importance of the site of perforation in relation to post-operative mortality and morbidity, as demonstrated by Mathewson and his colleagues (1962) and Foster and his colleagues (1965).

Although there are some who feel that primary repair of the perforated cervical oesophagus is essential surgical practice (Rietz and Werner, 1959; Groves, 1966), most authors are of the opinion that antibiotic therapy and intravenous fluids alone are sufficient, provided suppurative complications are adequately drained (Korkis, 1952; Terracol and Sweet, 1958; Mathewson *et al.*, 1962; Mengoli and Klassen, 1965). The results of conservative management in cervical perforations from this survey have supported the protagonists of this school of thought.

The importance of early diagnosis and direct suture in the thoracic oesophagus in the avoidance of a high mortality following endoscopic damage is well recognized (Overstreet and Ochsner, 1955; Nealon *et al.*, 1961; Gibbon, 1962). Resection should also be considered in the presence of obstruction distal to the site of perforation (Groves, 1966). Our results have shown that only one patient (aged 75 years) died as a direct result of oesophageal damage, because of delayed diagnosis and conservative management.

Perforation is a well documented complication of paraoesophageal surgery including hiatus hernia repair and vagotomy (Foster *et al.*, 1965). Damage resulting in perforation following lung surgery has not been emphasized in recent publications. In two of our cases this followed resection for carcinoma. There was no histological evidence of recurrent growth adjacent to the oesophageal wall in either case. Although the site of perforation was identical with those following spontaneous rupture, one should assume that local damage might have occurred as a result of direct surgical trauma or ischaemic necrosis. The site of perforation in one case lay adjacent to the tip of the intercostal drain-tube.

Although damage to the oesophagus is a serious complication of balloon tamponade for bleeding varices, none was found in our series although a large number of patients entered this unit with portal hypertension. Perforation following endoscopic biopsy and gastrostomy did not occur, and direct trauma from penetrating injuries was not encountered. Perforation is a recorded complication of Negus bag dilatation for achalasia, and our experience includes two cases.

The postoperative mortality following spontaneous rupture, despite a delay in diagnosis of over five days on three occasions, was encouraging with only one death in a group of 12 patients. These figures compare favourably with the mortality from the recent literature (Mathewson *et al.*, 1962; Sealy, 1963; Abbott *et al.*, 1970). We feel that the low mortality in this group was largely the result of prompt and adequate intercostal drainage with early re-expansion of the affected lung and subsequent jejunostomy as either a primary or secondary procedure. The results of direct suture, however, were disappointing. Despite early operation in 50% of cases, evidence of subsequent leakage was demonstrated in nine of the 11 survivors.

The morbidity following spontaneous rupture when compared with instrumental perforation was considerable. Tuttle and Barrett (1963) have reported similar findings. It is well established that damage occurs to the mediastinum and perioesophageal tissues following spontaneous perforation, probably as a result of autolysis from gastric contents entering the mediastinum under high pressure. The mortality and morbidity following spontaneous rupture might be attributed to this phenomenon. It is for this reason that other means of primary repair have been advocated (Thal and Hatafuku, 1964; Abbott *et al.*, 1970).

In view of the high incidence of postoperative complications following spontaneous rupture, we feel that the importance of early diagnosis and treatment cannot be overstressed. It is conceivable that inadequate primary suture of the oesophagus may be an important factor in the aetiology of these complications. This is the subject of a more detailed study and is beyond the scope of this report. The diagnostic value of emergency Gastrografin swallow has been well documented elsewhere (Christoforidis and Nelson, 1957; Kerr, 1962).

It is suggested, therefore, that the only means of reducing the high morbidity and mortality following perforations of the thoracic oesophagus lies in the increased awareness of this condition.

The importance of early contrast radiology to define the site and extent of perforation cannot be overemphasized so that resuture of the torn oesophagus with adequate debridement of the mediastinum can be undertaken as early as possible.

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