

Spontaneous pneumopericardium

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Gossage, A. A. R., Robertson, P. W., and Stephenson, S. F. (1976). *Thorax*, 31, 460–465. **Spontaneous pneumopericardium.** Spontaneous pneumopericardium is a relatively rare event, although cases have been recorded over the past 130 years. Many were associated with malignancy, trauma, infection or as a complication of recent surgery. Attempts at surgical resolution have been infrequent and survival extremely rare. We describe a patient in whom pneumopericardium developed spontaneously and insidiously, probably being present for some weeks before hospital investigation. Surgical exploration revealed the cause to be a benign gastric ulcer without an hiatus hernia or other diaphragmatic defect. Repair was attempted but the patient died in the early post-operative period. From an extensive review of the literature it is clear that spontaneous perforation of a gastric ulcer into the pericardium must be less rare than some authors have suggested.

The credit for identification of the first case of pneumopericardium is ascribed by some authors to Bricketeau (1844), who proved his diagnosis *post mortem*. There had been earlier descriptions but the details are not recorded. Bricketeau also described the loud metallic sound of water being splashed in a closed cavity containing air, the 'bruit de moulin'.

Pick (1894) published a monograph on perforation of the diaphragm by gastric ulceration and quoted 28 cases, 10 of which included perforation into the pericardium. This monograph was quoted by Tylecote (1913), who reported perforation of the heart by a gastric ulcer. Pneumopericardium was reviewed by Rigler (1925), who recorded 72 cases due to various causes. Shackelford (1931) published a review of the literature for the previous 100 years. He had been able to confirm the records of 76 cases of pneumopericardium, of which nine were due to ulceration from the oesophagus or stomach. Thirty-two of the 76 cases were, however, not spontaneous but traumatic in origin.

Pneumopericardium is well recognized as a complication of malignant lesions of the alimentary tract. One example recorded by Gottesman and Bendick (1926) followed necrosis of a gastric carcinoma after radium implantation. Harp and Peeke (1949) described a further case secondary to carcinoma of the stomach. They were able to cite

only 10 other cases of pneumopericardium occurring since 1931, and none was due to an alimentary tract lesion.

Dassel and Kirsh (1954) reviewed the literature and described one case of carcinoma of the oesophagus and one of benign gastric ulcer with development of pneumopericardium, both ending in the death of the patient within a short time.

Stephenson, Maness, and Scott (1958) were able to list 13 cases of oesophagopericardial fistulae of benign origin; all the patients died. The first survivor of this particular lesion was reported by Dons *et al.* (1964), describing the progress of a 6-year-old girl.

Romhilt and Alexander (1965) described a woman with a benign gastric ulcer leading to pneumopericardium, occurring three years after a lower oesophageal resection for benign stricture. Their patient died during the postoperative period. They could trace only 10 previous cases, with confirmed records, of benign gastric ulceration leading to pneumopericardium.

Liu, Crastnopol, and Phillips (1967) recorded an example of a gastrojejunal ulcer leading to pneumopericardium and associated with the Zollinger Ellison syndrome. The first survivor of pneumopericardium resulting from a benign gastric ulcer was reported by Wegryn, Zarott, and Weiner (1968). Their patient was a woman who had undergone a transthoracic repair of an hiatus

hernia four years earlier and suffered a persisting paralysis of the left diaphragm. They were quick to operate on their patient, before infection or much passage of gastric contents had occurred. A further case of gastropericardial fistula complicating an hiatus hernia and causing the death of the patient was reported by Monro *et al.* (1974). More recently, Lam, Angulo, and Priest (1975) described a recurrent ulcer at the site of an intrathoracic gastro-oesophageal anastomosis which penetrated the heart, producing a fatal haemorrhage, but no pneumopericardium occurred.

Cramm and Robinson (1971), reviewing a case of gastric carcinoma complicated by pneumopericardium, were able to list five previous similar cases. The literature was also reviewed and overall aetiology classified by Meyer (1948), and Dickson and Girling-Butcher (1960) traced a total of 87 cases of spontaneous pneumopericardium.

A rare instance of perforation of a benign gastric ulcer into the pericardium with subsequent successful surgical treatment was described by Gururaja Rao and Masceranhas (1972). Their patient had experienced some minor symptoms for several weeks and acute symptoms for a few hours before investigation but was described as 'not in distress' and was normotensive and without tachycardia or dyspnoea. The authors termed their case 'unique', a phrase also used by Pelligrini and Cenni (1972) when describing a gastric ulcer perforating into pericardium following Thal's oesophago-gastroplasty.

CASE REPORT

A 54-year-old man presented at our Accident and Emergency Department on 5 August 1974 complaining of some chest discomfort and shortness of breath. These symptoms had begun about two weeks previously when he was on holiday in Palma and had gradually become worse. For the two or three days before attending hospital he had, in addition, developed a cough with some green sputum.

The full significance of the past history was perhaps not appreciated initially. Notes from another hospital for 1966 showed a history of 20 years' dyspepsia. He had been gastroscopied then but nothing was found. Subsequent surgical exploration failed to identify any duodenal or gastric ulceration. A pyloroplasty and vagotomy was performed on 15 September 1966. In 1972, he had attended an orthopaedic clinic complaining of pain along the inner border of the left scapula and dorsal spine. There was some possible association

with deep breathing. Radiographs of the chest and spine at that time were negative. Both the gastric surgery and the later complaint of backache must be regarded as of great importance though the negative laparotomy findings and negative orthopaedic findings were somewhat misleading.

His general condition was quite good and he was not in much distress. Physical findings were few though there was some diminished air entry over the left lower lobe. The abdomen was soft and the blood pressure normal at 140/90 mmHg. A chest radiograph at this time revealed a greatly enlarged heart outline and there was some elevation of the left diaphragm with probably left basal pulmonary changes (Fig. 1). The patient was admitted to a medical ward for investigation.

Subsequent laboratory findings were on the whole unhelpful and there was no gross ECG abnormality, but a repeat chest radiograph on 12 August 1974 showed a normal-sized heart with a hydropneumopericardium (Fig. 2). There was no pneumothorax, but some pulmonary shadowing at the left base persisted.

On the following day the chest was screened and the plain film features were confirmed. The patient was given a small barium swallow and no lesion was seen in the oesophagus. The patient's condition at this time remained fairly good and he was well able to walk about and cooperate normally.

A review of a chest film taken in 1972 (Fig. 3) showed a normal cardiac outline and clear lung fields at that time, though there was some elevation of the left diaphragm.

After confirmation of the spontaneous pneumopericardium the opinion of a thoracic surgeon was sought and, after some preliminary measures (including bronchoscopy, which was negative), thoracotomy was performed on 19 August 1974 (SFS). The clinical condition had by this time deteriorated somewhat, with increasing chest pain and breathlessness. There were signs of cardiac disorder with a raised jugular venous pressure, tachycardia with gallop rhythm, and a pericardial rub.

OPERATIVE PROCEDURE AND FINDINGS

A transthoracic approach was made through the bed of the left sixth rib. The left lung appeared to be normal. The pericardium was seen to be much thickened and adherent to the diaphragm. Incision of the pericardium produced a quantity of brown fluid which proved to be strongly acid and was assumed to be gastric contents. No fistula could be

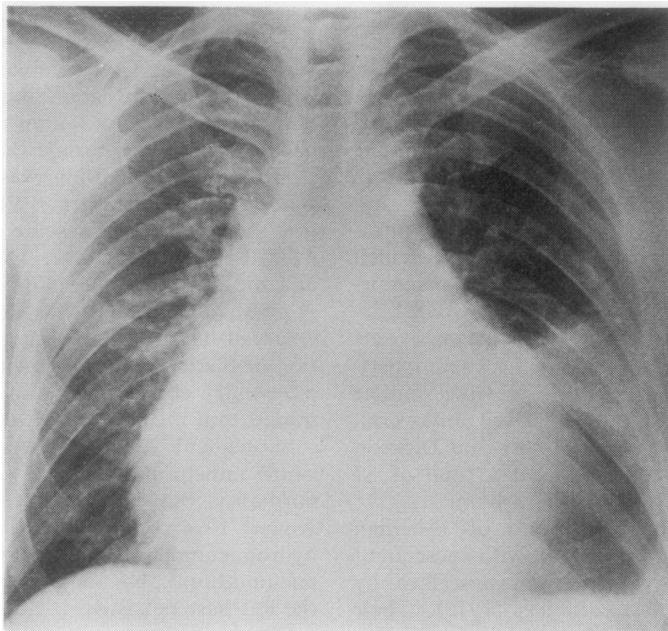


FIG. 1. Original PA chest film (5 Aug 74) from Accident and Emergency Department showing large cardiac shadow, left basal pulmonary changes, and raised left diaphragm.

identified at this stage owing to the dense diaphragmatic adhesions.

The left diaphragm was incised between branches of the phrenic nerve. There were many adhesions in the abdomen and the upper part of the lesser curve and posterior surface of the stomach were fused in an indurated mass on to the inferior surface of the diaphragm behind the left lobe of the liver.

The stomach was opened and a large gastric ulcer, high on the lesser curve, was found to be penetrating the pericardium through the diaphragm. A probe could be passed into the pericardial sac through a fistula in the base of the ulcer.

The stomach was separated from the ulcer base and surrounding induration. No attempt was made to resect the ulcer itself or to close the fistula. A large hole now remained in the stomach high on the lesser curve close to the cardia. This was closed in two layers, though with considerable technical difficulty owing to thickening of the gastric wall and fear of narrowing the oesophago-gastric junction. A nasogastric tube was passed and the anterior gastric incision was closed. The

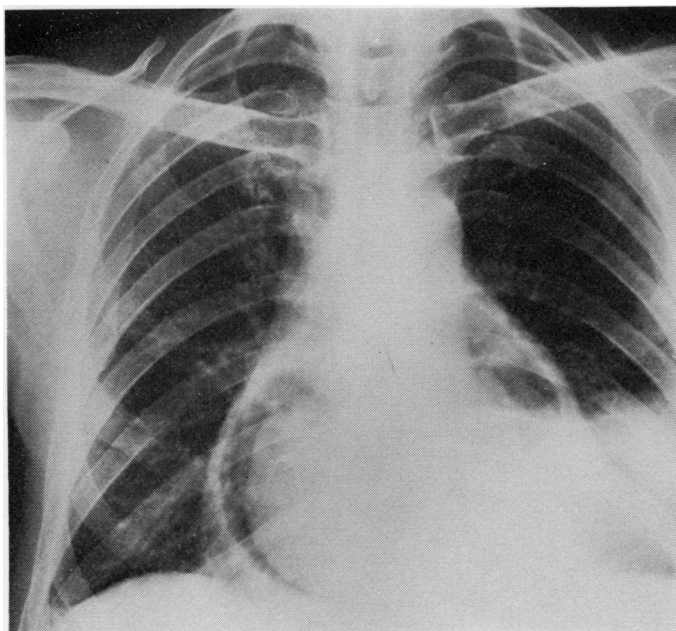
diaphragm was repaired and the chest was closed leaving one pleural drainage tube.

SUBSEQUENT COURSE

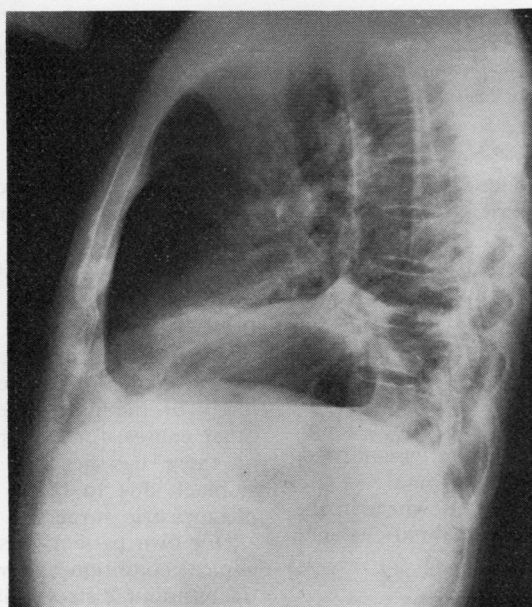
The patient's general condition gave rise to some anxiety through the first postoperative night with rapid shallow respiration and tachycardia. By the following morning his condition was only fair, and by mid-day he had deteriorated greatly; he developed a cardiac arrest and died in the early afternoon some 24 hours postoperatively.

POST-MORTEM FINDINGS

A suture line about 4 cm long at the upper end of the lesser curve and adjoining the anterior gastric wall was noted. Two small perforations communicating with the lesser sac were identified. A further incision, 7 cm in length, on the anterior wall of the stomach was firmly closed by sutures. The first suture line represented the site of a peptic ulcer, now separated from its base on the inferior surface of the left diaphragm. The floor of this ulcer, measuring 2×1.8 cm, freely communicated through a fistula (diameter about 1 cm) with the



(a)



(b)

FIG. 2. PA and lateral chest films (12 Aug 74) showing gas within the pericardium surrounding a normal-sized heart. Left basal pulmonary changes persist.

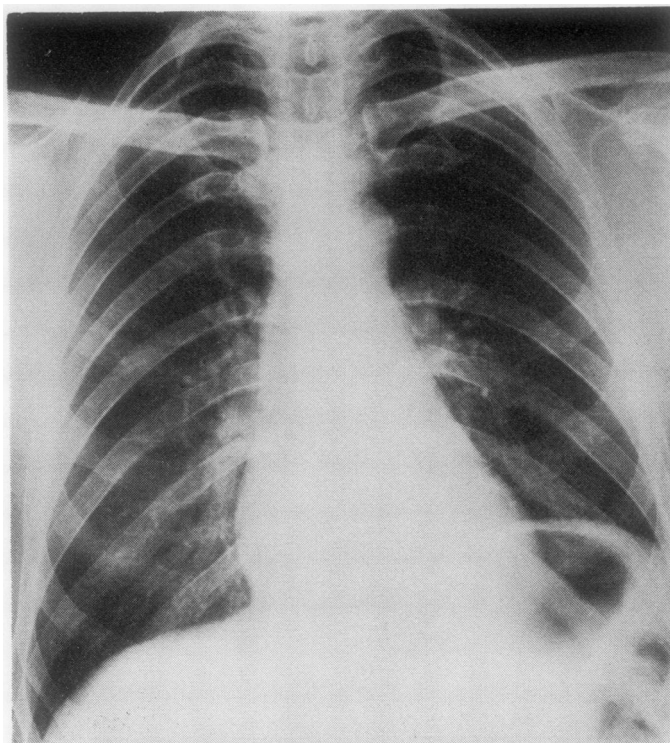


FIG. 3. PA chest film (6 Aug 72) showing normal cardiac outline and some elevation of the left diaphragm. This film was taken because of backache.

pericardial sac. There was evidence of generalized peritonitis and there were many adhesions in the abdomen.

The anterior part of the pericardial cavity was obliterated by fibrous adhesions just above the diaphragm, and there were scattered adhesions at the base of the heart. A layer of epicardial fat or fibrous tissue everywhere separated the myocardium from the surface of the visceral pericardium. The pericardium was thickened to about 1 cm. The myocardium was flabby but otherwise normal. There was moderate coronary atheroma.

No major lesion was identified elsewhere in the body apart from bronchopneumonia and evidence of a previous vagotomy.

POST-MORTEM HISTOLOGY

Microscopical examination showed peptic ulcers of the stomach with no evidence of neoplasm on the under-surface of the diaphragm or in a lymph node. There was organizing pericarditis with a

considerable thickness of granulation tissue, ie, a lesion of some duration.

DISCUSSION

The case we describe is particularly unusual in that the condition was spontaneous and of relatively insidious onset and was due to a benign gastric ulcer lying beneath the diaphragm. In so many of the past series there have been either other causes, for example trauma or malignancy, or there has been an intrathoracic portion of stomach due to hiatus hernia or previous oesophagogastric surgery.

Our own patient presented in remarkably good clinical condition and was ambulant and in relatively minor distress with few physical signs. The significance of the initial chest radiograph was not at once appreciated. The large cardiac shadow and the left basal pulmonary shadowing were assumed to arise from cardiac or pulmonary causes and admission was into a general medical ward. The

patient's condition did not change much in the first few days but the second chest film, showing a normal-sized heart within a pneumopericardium, indicated an entirely unexpected development. The fact that there had been no dramatic clinical incident or complaint during the disappearance of a large quantity of pericardial fluid made communication with gut almost certain. The oesophagus was thought to be the most likely on anatomical grounds but a simple barium swallow showed no oesophageal connection with the pericardium.

The exact date of perforation into the pericardium cannot be determined and might have been some weeks before admission. A chronic penetrating gastric ulcer had presumably been present for years, and in retrospect it seems likely that a high gastric ulcer was overlooked by the surgeon in 1966.

The absence of any dramatic episode and the generally insidious onset of the final complication might be noted. This contributed to the delay in surgery and may have worsened the prognosis from the cardiac aspect.

Failure to ensure complete closure of the upper end of the suture line was unfortunate. Despite the technical difficulties and inadequate exposure, a better repair might have been achieved if an oesophageal bougie had been passed, thus facilitating a more effective closure without risk of narrowing the gastro-oesophageal junction.

We wish to thank Dr. R. G. F. Parker for the necropsy report.

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