Pyopneumopericarditis from a gastropericardial fistula: a case report

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Background	Pyopneumopericarditis is a very rare diagnosis that requires prompt recognition and urgent treatment. It denotes the presence of pus and air in the pericardium with associated inflammation of the fibrous pericardial sac.
Case summary	A 49-year-old gentleman was admitted with pyopneumoperciarditis on a background of a previous uncomplicated Roux-en-Y gastric bypass surgery performed 7 years prior. He underwent emergency surgery for an omental patch repair of an ulcer perforation involving the diaphragm and pericardium. His inpatient stay was complicated by persistent seropurulent output from the pericardial drain, loculated pleural effusion, and deconditioning.
Discussion	Management is extrapolated from the literature regarding purulent pericarditis. This condition albeit rare, requires swift recognition as without treatment mortality approaches 100%. Colchicine is an important adjunctive therapy postoperatively to prevent constrictive physiology.
Keywords	Case report • Pyopneumopericardium • Pyopneumopericarditis • Murmur • Echocardiography

Learning points

- Gastropericardial fistulae are a rare complication of gastrointestinal surgery and can cause pyopneumopericardium.
- Management mandates urgent source control with pericardial drainage, intravenous antibiotics, and repair of any underlying anatomical defects.
- There is a paucity of prospective studies in the management of pyopneumopericarditis.

Introduction

Pyopneumopericarditis denotes the presence of pus and air in the pericardium with associated inflammation of the fibrous pericardial sac. It occurs from microbial seeding into the sterile pericardial sac either from haematogenous spread, contiguous spread of infection in nearby anatomical structures or from a fistulous communication with the tracheobronchial tree or aerodigestive tract.[1–6] There are no prospective clinical trials regarding optimal management and current approaches are extrapolated from the literature regarding purulent

pericarditis, indicating source control with pericardial drainage, initial empirical broad-spectrum, and subsequent culture-guided antimicrobial therapy and repair of any underlying anatomical defects.[1,3–6]

Timeline

Day	Events
Day 1	Arrival into emergency department—0051
	Patient is transferred from a regional centre to our tertiary centre with electrocardiogram and clinical features of pericarditis and a computed tomography chest demonstrating a pneumopericardium with a loculated pericardial effusion
	Surgery—1145
	Patient is taken urgently to the operating theatre for omental patch repair of the chronic ulcer perforation via laparotomy and a pericardial and pleural washout
	Patient is taken to intensive care unit in a stable condition with noradrenaline running at 3 µg/min
	Regular intravenous pantoprazole is commenced and is placed nil per oral for 1 week
Day 4	Pericardial fluid culture grows methicillin-sensitive *Staphylococcus aureus*, *Streptococcus salivarius*, *Streptococcus parasanguinis*, *Escherichia coli*, and *Candida albicans*
	Infectious diseases team advises for ceftriaxone 1 g daily, clindamycin 400 mg TDS, and fluconazole 400 mg daily
Day 7	Gastrograffin follow through the study demonstrates no extravasation
	Patient is transitioned to clear fluids and oral medications
Day 31	Repeat thoracotomy and pericardial washout is performed for ongoing seropurulent output from pericardial and pleural drain
	Postoperatively placed on oral amoxicillin-clavulanic acid
	Repeat fluid microscopy, culture and sensitivities eventually demonstrates no growth in culture
Day 44	New loculated left pleural effusion diagnosed and managed with 28 French bedside intercostal catheter is inserted by cardiothoracic team and left on free drainage, in total 1.5 L is drained
Day 50	Discharged home with a further 2-week course of oral amoxicillin/clavulanate, lifelong pantoprazole and cardiology, upper gastrointestinal, and cardiothoracic clinic follow-up

Case presentation

A 49-year-old man was transferred to our tertiary centre with pyopneumopericardium diagnosed on computed tomography (CT) of the

Video 1 Audio recordings of the unique continuous crunching murmur in the mitral region.
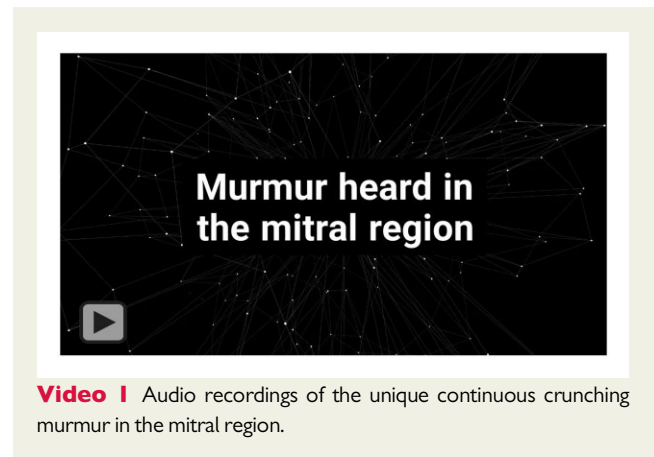
chest. The patient presented with a 1 day history of sharp central pleuritic chest pain and bilateral sharp scapular pain associated with fevers, vomiting, and diaphoresis. The pain was improved by leaning forward and worse when lying flat.

Examination revealed a regular heart rate of 97 beats per minute, blood pressure of 133/93 mmHg, respiratory rate of 22 breaths per minute, and oxygen saturations of 95% on 3 L of oxygen via nasal cannulae. Temperature was 37.3°. A unique continuous murmur was audible throughout the praecordium associated with a pericardial rub and succussion splash (see *Video 1*) which the authors have named the 'Lee-Ramkumar-Dundon' murmur.

The patient's past medical history was significant for obesity (body mass index of 34 kg/m^2), with a previous uncomplicated Roux-en-Y gastric bypass surgery performed in 2013, psoriatic arthritis managed with leflunomide 10 mg daily, type 2 diabetes mellitus managed with metformin, and hypercholesterolaemia well controlled on simvastatin 40 mg daily. He was a non-smoker with no history of ischaemic heart disease or malignancy.

Admission electrocardiogram (ECG) demonstrated widespread PR interval depression, with reciprocal aVR PR interval elevation, 1 mm horizontal ST-segment elevation in leads I, II, aVL and V6, and isolated T-wave inversion in lead III (see *Figure 1*). Blood tests revealed a haemoglobin of 166 g/L (reference range 135–175 g/L), white cell count of 21 200 cells/µL (reference range 4500–11 000 cells/µL), platelets of 223 000/µL (reference range 150 000–450 000/µL), and C-reactive protein of 312 mg/L (reference range 0–8 mg/L). A single troponin I performed 9 h after onset of chest pain was 0.02 µg/L (reference range 0.00–0.08 µg/L). The patient was not bacteraemic.

Chest X-ray demonstrated a heterogeneous gas lucency surrounding the cardiac silhouette (see *Figure 2*). Computed tomography of the chest and the upper abdomen demonstrated a large volume pneumopericardium with air fluid levels and gas locules associated with a direct communicative tract with the gastrojejunostomy (see *Figure 3*).

The purulent pericardial drain fluid grew methicillin-sensitive *Staphylococcus aureus*, *Streptococcus salivarius*, *Streptococcus parasanguinis*, *Escherichia coli*, and *Candida albicans* in culture.

A transthoracic echocardiogram performed postoperatively demonstrated normal left ventricular size and normal left ventricular
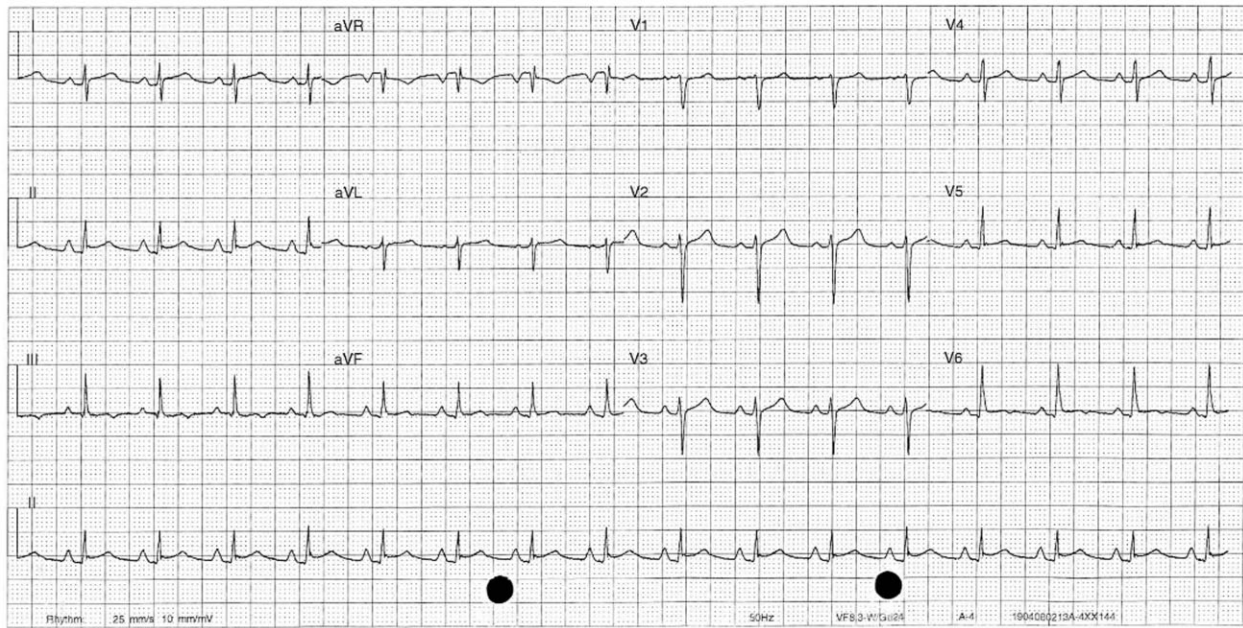
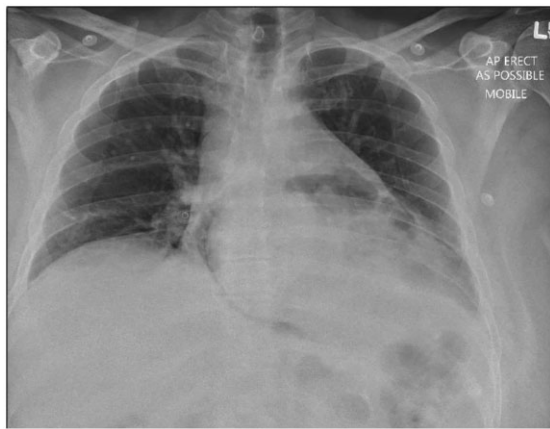**Figure 1** Electrocardiogram demonstrating PR depression and reciprocal PR interval elevation in aVR.

Figure 2 Chest X-ray demonstrating pneumopericardium and enlargement of the cardiac silhouette.

ejection fraction of 60%. There was echogenic material in the pericardial space associated with ventricular interdependence and annulus reversus.

The patient was taken urgently to the operating theatre where a chronic ulcer perforation involving the diaphragm and pericardium was demonstrated. This was repaired with an omental patch. The small pleural and pericardial effusions were drained by left thoracotomy. An omental repair drain, and an underwater joint pleural and pericardial drain were placed. Postoperatively, the patient was commenced on culture-guided intravenous ceftriaxone, clindamycin, and fluconazole as per the infectious diseases team.

After 1 week of bowel rest with parenteral nutrition to allow adequate healing of the gastro-jejunostomy repair site, a gastrograffin follow through the study was performed, demonstrating no contrast extravasation. Subsequently, the omental drain tube was removed and the patient's diet was slowly upgraded to a puree diet on postoperative day 14.

The patient's postoperative course was complicated by persistent purulent output from the joint pleural and pericardial drain as well as re-accumulation of a loculated left-sided pleural effusion. This was managed with a repeat pericardial washout and intercostal catheter insertion on postoperative days 31 and 44, respectively.

The patient was discharged home after a 49 days hospital admission with two further weeks of oral amoxicillin/clavulanic acid and with pantoprazole 40 mg daily for ulcer prophylaxis. The patient attended a 2 months of follow-up with the upper gastrointestinal surgeons and were clinically stable with no recurrent chest pain or infective symptoms. A repeat CT chest abdomen and pelvis 10 months post-admission demonstrated no intra-abdominal collection and a small volume pericardial fluid which had reduced in size since the patient's admission. A timeline of the patient's hospital stay is provided in the *Timeline* section.

Discussion

The various reported aetiologies are presented in *Table 1*.

Patients present with pericarditic chest pain, dyspnoea, fever, and tachycardia.[1–6] There are no examination signs specific to pyopneumopericarditis. If the pneumopericardium component is significant, there may be a loud churning 'mill wheel' murmur, also known by its eponymous name '*Bruit de Moulin*', or an audible mediastinal
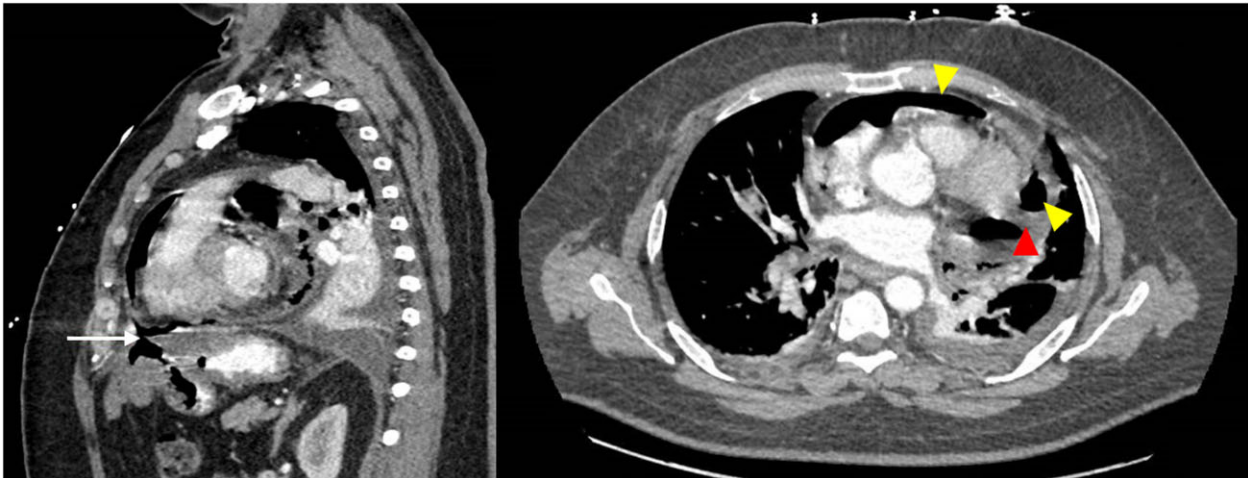
Figure 3 Sagittal and axial views of the admission chest computed tomography. The white arrow on the sagittal view demonstrates the fistulae between the gastrojejunostomy and the pericardium. The yellow arrowheads on the axial view demonstrate gas, whilst the red arrowhead demonstrates a locule of the pericardial effusion.

Video 2 Audio recordings of the unique continuous crunching murmur in the pulmonary region.

Table 1 Aetiology of pyopneumopericarditis in the 42 cases published online in the English medical literature

Cause	Percentage
Perforated gastric ulcer	26.1% (11/42)
Unidentified	19% (8/42)
Iatrogenic fistulae	19% (8/42)
Malignancy	16.6% (7/42)
Infection in contiguous organ	9.5% (4/42)
Non-iatrogenic fistula	4.7% (2/42)
Trauma	4.7% (2/42)

crunching/rasping sound synchronous with the heartbeat, which is known as 'Hamman's sign'.[6]

Echocardiography is the investigation of choice. It allows quantification of the effusion size, characterization of simple or complex effusions, demonstration of tamponade physiology and assistance with pericardiocentesis, however significant locules of air within the pericardial space may impede adequate image acquisition.[1,7] Long-term echocardiography is important to monitor for signs of constrictive pericarditis.[3,7] Adjunctive investigations include ECGs and chest X-rays, however CT of the chest provides greatest anatomical detail, demonstrating loculated or septated effusions, fistulous communications, foreign bodies, and features suggestive of malignancy.[7]

There are no prospective clinical trials regarding optimal management and current approaches are extrapolated from the literature regarding purulent pericarditis, indicating source control with pericardial drainage, initial empirical broad-spectrum, and subsequent culture-guided antimicrobial therapy and repair of any underlying anatomical defects.[1,3–6] Without treatment, mortality approaches 100%.[6] Prevention of transient and chronic constrictive pericardial disease with colchicine may be an important adjunctive therapy as the risk of constrictive physiology post-purulent pericarditis is substantially higher than viral or idiopathic causes of pericarditis, quantified as 20–30% and <1%, respectively.[7]

In regards to management of complications described in the literature, heart failure was managed with pericardial drainage, intravenous diuresis, and fluid restriction.[4] Cases of tamponade and tension pyopneumopericardium mandated urgent decompressive pericardiocentesis.[2,5] Constrictive pericarditis was successfully managed with pericardiectomy.[3] Long-term clinical outcomes and incidences of complications such as chronic infection, nutritional deficiency, chronic pain, and gastro-oesophageal dysmotility are not known given the paucity of data in the medical literature.

Conclusion

This is the first case of pyopneumopericarditis manifesting with a continuous 'crunching' heart murmur. The key to management of this

rare condition is early recognition, swift pericardial drainage, intravenous antibiotics, and surgical repair of underlying anatomical defects.

Lead author biography

Dr John Lee is a registrar who has completed his basic physician training at Monash Health in Melbourne, Victoria. He completed his Doctor of Medicine at the University of Melbourne.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient's family in line with COPE guidance.

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