

CASE REPORT

INTERMEDIATE

CLINICAL CASE: ACC.23

CT-Guided Pericardiocentesis in a Case of Tension Pneumopericardium and Tamponade Secondary to an Enteropericardial Fistula



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ABSTRACT

Tension pneumopericardium is most commonly traumatic. Nontraumatic etiologies are rare, but have been reported with gastropericardial and esophagopericardial fistulas. We present the case of a 54-year-old patient who developed a tension pneumopericardium with tamponade secondary to a perforated marginal ulcer in the proximal jejunum with an enteropericardial fistula. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2023;18:101909)
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Pneumopericardium, air in the pericardial cavity, is most commonly traumatic. Tension pneumopericardium can cause tamponade.

HISTORY OF PRESENTATION

A 54-year-old man presented with 3 to 4 days of chest pain, dyspnea, fever, myalgia, and flu-like symptoms. He had persistent, nonradiating, substernal heaviness-like chest pain. His temperature was 102.6 °F, heart rate 145 beats/min, and blood pressure

88/43 mm Hg. Lung fields were clear to auscultation. Heart sounds were normal, regular and without murmurs. An electrocardiogram (**Figure 1**) showed sinus tachycardia at 146 beats/min, left axis deviation, possible left atrial enlargement, but no ST-segment elevation or depression. He received 3 L of intravenous lactated Ringer's solution with improvement of his blood pressure to 97/50 mm Hg.

PAST MEDICAL HISTORY. He had history of hypertension, type 2 diabetes mellitus, obstructive sleep apnea, remote colectomy for mesenteric ischemia, and bariatric Roux-en-Y gastric bypass 4 years before presentation.

DIFFERENTIAL DIAGNOSIS. Septic shock was on top of the differential diagnosis for his presentation with tachycardia, hypotension, and fever. Cardiogenic shock was less likely because he had no cardiac history and did not present with acute coronary syndrome. However, he had risk factors for

LEARNING OBJECTIVES

- To recognize the common etiologies of pneumopericardium.
- To recognize tension pneumopericardium as a potential cause of tamponade.
- To recognize the role of CT-guided pericardiocentesis in cases of pneumopericardium.

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**ABBREVIATIONS
AND ACRONYMS****CT** = computed tomography**EPF** = enteropericardial fistula

cardiovascular disease. Obstructive shock was also considered, pending further workup.

INVESTIGATIONS. A chest radiograph (Figure 2) showed a lucency along the left heart border suggestive of pneumopericardium. Echocardiography was severely limited by air artifact (Video 1). A computed tomography (CT) scan of the chest (Figure 3) revealed a small pericardial effusion and a large pneumopericardium. White blood cell count was 12,000/mm³. Venous lactate was 4.0 mmol/L. High-sensitivity troponin I level was 20.9 pg/mL (reference value, <5 pg/mL).

MANAGEMENT. The patient was aggressively fluid resuscitated. Blood cultures were collected, and broad-spectrum antibiotics were empirically started. He underwent emergent CT-guided pericardiocentesis (Figure 4). A large volume of air (200 mL) and a small amount of pus (8 mL) were drained. A 5-F catheter was advanced into the pericardial sac and secured in place.

Blood cultures were negative. Pericardial fluid culture grew *Lactobacillus fermentum*, *Streptococcus vestibularis*, and *Candida albicans*. X-ray esophagram and a CT scan of the chest with oral contrast revealed

no evidence of an esophagopericardial fistula. The patient continued to have reaccumulation of air and fluid after pericardiocentesis with continued drainage from the pericardial drain. Upper gastrointestinal endoscopy (Figure 5) revealed a large penetrating marginal ulcer at the gastrojejunal junction, with a patent fistula. A CT scan of the abdomen with oral contrast (Figure 6) showed extension of oral contrast through a fistula extending from the proximal jejunum across the diaphragm and into the pericardium.

DISCUSSION

Pneumopericardium is the accumulation of air or gas in the pericardium. If a tension pneumopericardium develops, it can lead to tamponade with a high mortality rate.¹ The mechanism is similar to that of tension pneumothorax, with rapid accumulation of air, often with a 1-way valve effect.²

Uncomplicated pneumopericardium commonly presents with shortness of breath and chest pain. Tension pneumopericardium can manifest as cardiac tamponade and hemodynamic instability.³

Two-thirds of pneumopericardium cases are traumatic. Tracheobronchial tree rupture owing to

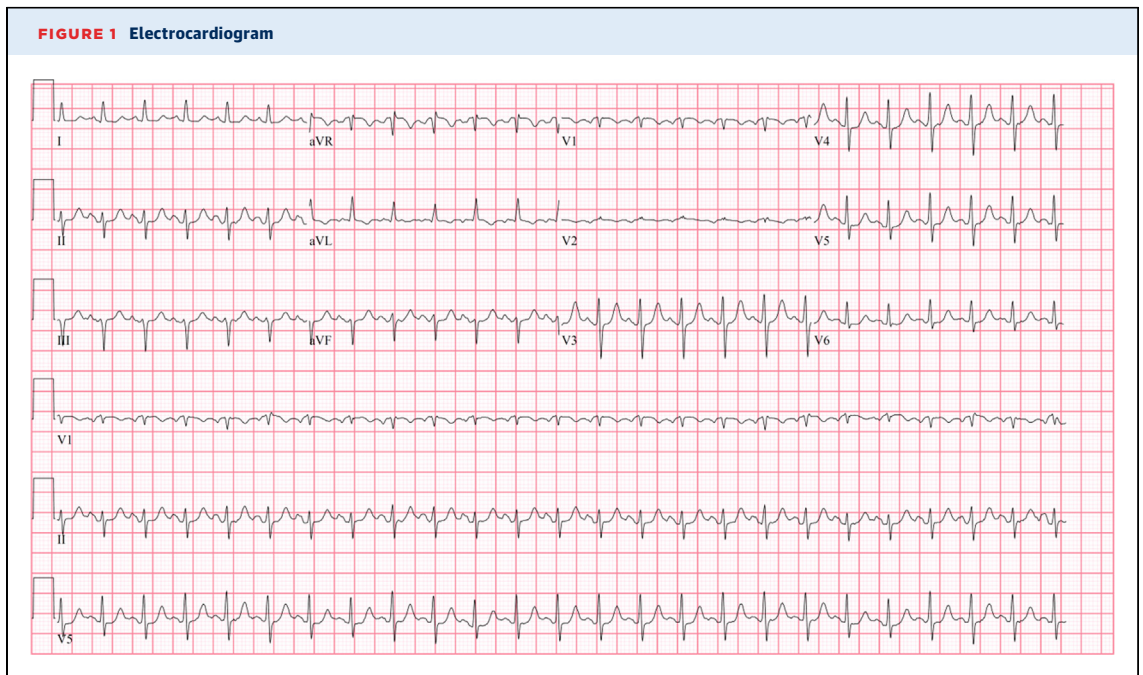
FIGURE 1 Electrocardiogram

FIGURE 2 Chest Radiograph

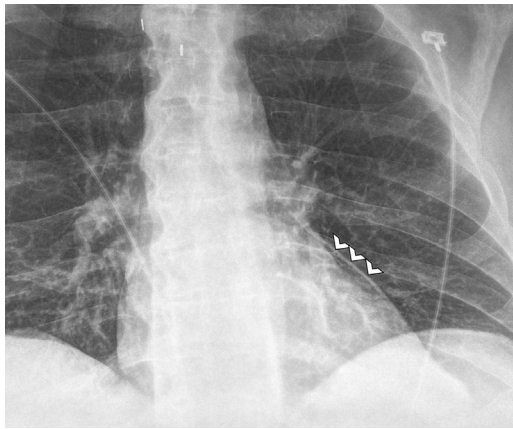


FIGURE 4 Computed Tomography-Guided Pericardiocentesis



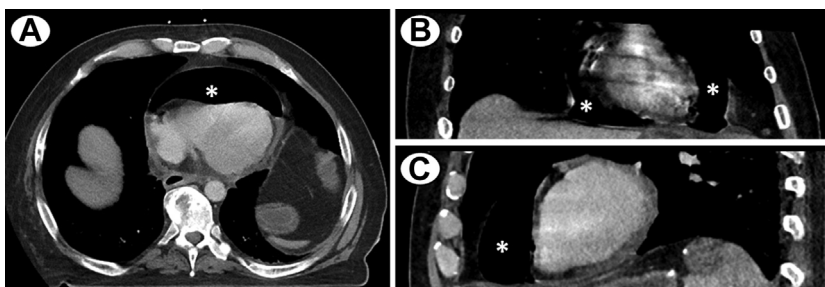
positive pressure ventilation, severe asthma, or blunt trauma is the most common cause. A fistulous connection is the second most common cause.⁴ An enteropericardial fistula (EPF) is a direct communication between the upper gastrointestinal tract and the pericardium.⁵ EPF has been reported owing to trauma, malignancy, peptic ulcer disease, medication use (nonsteroidal anti-inflammatory drugs, and the bisphosphonate alendronate), severe pleural or abdominal infections, or foreign bodies.⁵⁻¹¹ Hamid et al⁵ reviewed 95 cases of EPF where the origin of EPF was from the stomach (46%), esophagus (38%), colon (11%), jejunum (2%), or duodenum (1%). Fifty-eight percent of the cases developed postoperatively.⁵

Our patient had an EPF formation as a delayed complication of Roux-en-Y gastric bypass. Reviewing the literature, we found 4 reports of EPF after Roux-en-Y gastric bypass surgery.¹¹⁻¹⁴ The time interval

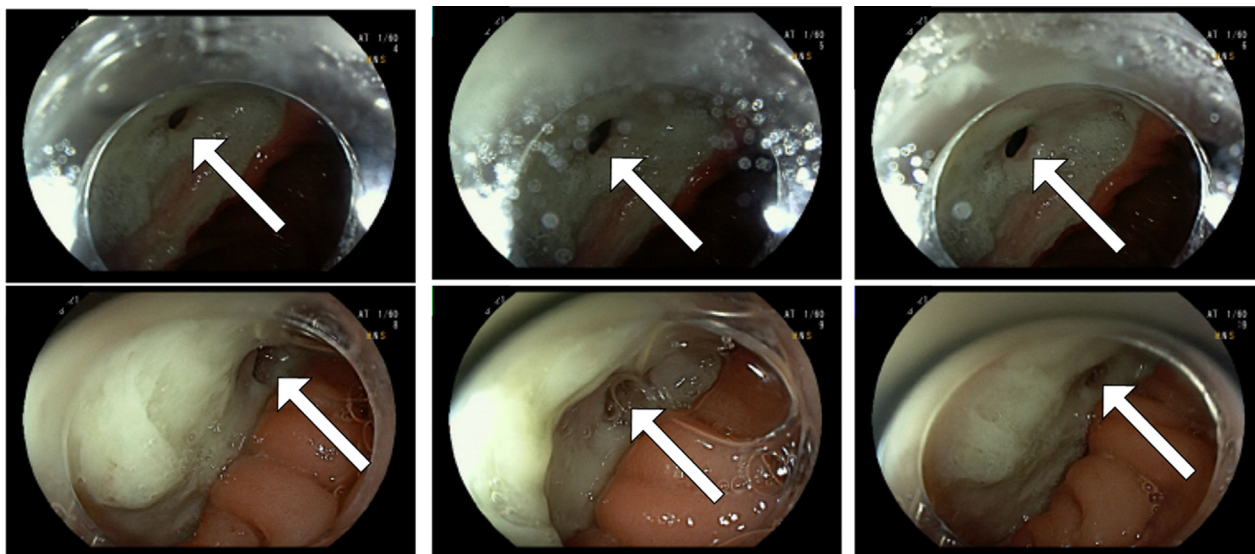
between gastric bypass and fistula development ranged from 1 month to 11 years. The exact mechanism is not yet elucidated. Ongoing peptic ulceration secondary to alkaline reflux, gastric distension, stitch abscess, and ischemia seem to be contributing factors.¹⁵ A high index of suspicion in individuals with previous gastroesophageal or diaphragmatic procedures is critical.⁵

A standard chest radiograph can detect most cases of pneumopericardium. An additional lateral view can help to detect pneumopericardium that might be missed on a single view chest radiograph.¹⁶ Echocardiography is limited in cases of pneumopericardium because air conducts ultrasound waves poorly. A limitation that is also known as the air gap sign. This sign refers to synchronous loss of cardiac image during systole, as the heart size decreases, and more air moves anteriorly between the transducer and the heart. In diastole, the size of the heart increases, displacing the air, which leads to more clear images.¹⁷ In the case of our patient, the heart was neither

FIGURE 3 Computed Tomography Scan with Intravenous Contrast



(A) Axial. (B) Coronal. (C) Sagittal. A large amount of air (*) within the anterior pericardial sac. Flattening of the right ventricular free wall is also evident.

FIGURE 5 Esophagogastroduodenoscopy

A marginal ulcer was seen. Notice the patent proximal meatus of the fistula.

visualized during systole nor diastole, because of the large volume pneumopericardium.

Most adults with simple pneumopericardium and no evidence of tamponade do not usually require treatment. Infants with simple pneumopericardium are at risk for rapid deterioration and need urgent intervention, even in the absence of tension pneumopericardium.¹⁸ In 13 patients with pyopneumopericardium, the mortality rate approached 100%. In those patients, early recognition and surgical treatment are vital for survival.¹⁹ When tension pneumopericardium is suspected, the standard treatment is pericardiocentesis with treatment of the

cause.⁴ Echocardiography-guided pericardiocentesis remains the first-line treatment. In our case, this was severely limited by air artifact. CT-guided pericardiocentesis provides an alternative approach in such cases.²⁰

FOLLOW-UP

The patient remained hemodynamically stable after pericardiocentesis. After stabilization, he underwent successful surgical revision of his gastrojejunal anastomosis.

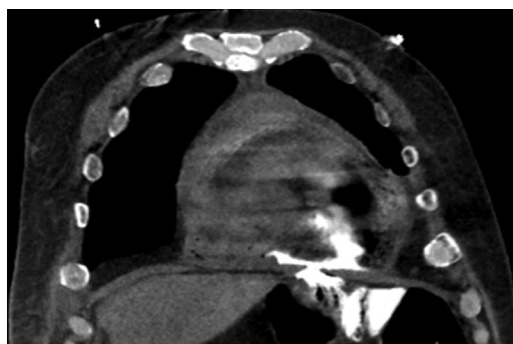
CONCLUSIONS

Although uncommon, fistulous or nontraumatic tension pneumopericardium should be considered in cases of cardiac tamponade. CT-guided pericardiocentesis can be used in cases where echocardiography is limited by air artifact.

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FIGURE 6 Computed Tomography Scan With Oral Contrast, Coronal View

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KEY WORDS cardiac tamponade, purulent pericarditis, tension pneumopericardium

APPENDIX For a supplemental video, please see the online version of this article.