

## CASE REPORT

### CLINICAL CASE

# Purulent Bacterial Pericarditis

## Rare Yet Lethal



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### ABSTRACT

Bacterial pericarditis is a rare phenomenon that progresses rapidly and carries high mortality. Patients presenting with new pericardial effusions are often evaluated for concomitant rheumatologic, oncologic, and infectious diseases. We present a complex case of purulent pericarditis with pneumopericardium. (J Am Coll Cardiol Case Rep 2024;29:102282) Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### HISTORY OF PRESENTATION

A 50-year-old Hispanic man presented to the emergency department with 1 month of progressive dyspnea, dry cough, and chest tightness. On arrival, he was febrile to 39.5°C, tachycardic with heart rate of 140 beats/min, hypotensive with blood pressure of 90/59 mm Hg, and tachypneic with respiratory rate of

27 breaths/min, while physical examination was unremarkable. Initial blood cultures were negative. Computerized tomography (CT) pulmonary angiogram showed trace pericardial effusion, mediastinal lymphadenopathy, and upper lobar pulmonary nodules, consistent with previously known granulomas. Positron emission tomography CT revealed mediastinal and supraclavicular hypermetabolic activity with low standardized uptake values, consistent with sarcoidosis, leading to steroid initiation 3 days after admission.

### LEARNING OBJECTIVES

- To identify and generate differential diagnosis for new-onset pericardial effusion and pneumopericardium.
- To recognize noninvasive and minimally invasive modalities used to evaluate pericardial pathology, including echocardiography, MRI, fluoroscopy, and cardiac catheterization.
- To identify and manage potential complications of purulent bacterial pericarditis, including its high mortality rate and need for urgent surgical intervention.

### MEDICAL HISTORY

A prior diagnosis of granulomatous lymphadenitis was made by ultrasound-guided lymph node biopsy demonstrating non-caseating granulomas (**Figure 1**).

### DIFFERENTIAL DIAGNOSIS

Differential diagnoses include congestive heart failure, pulmonary sarcoidosis, and pericarditis.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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**ABBREVIATIONS  
AND ACRONYMS**

**CT** = computed tomography  
**MRI** = magnetic resonance imaging  
**RIPE** = rifampin, isoniazid, pyrazinamide, and ethambutol  
**TB** = tuberculosis  
**TTE** = transthoracic echocardiogram

**INVESTIGATIONS**

Two days after steroid initiation, he reported worsening dyspnea and pleuritic chest pain. A 12-lead electrocardiogram demonstrated new, diffuse PR-segment depression and ST-segment elevation. Transthoracic echocardiogram (TTE) showed normal biventricular function and moderate pericardial effusion (Figure 2A, Video 1). Ibuprofen and higher-dose systemic steroids were initiated to

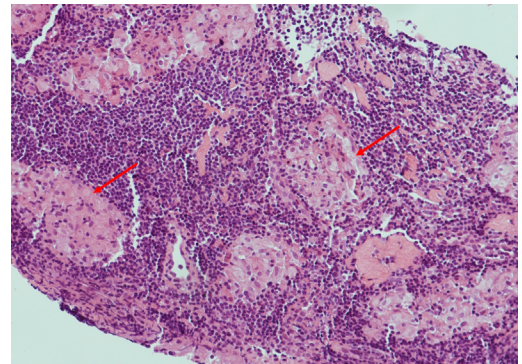
treat acute pericarditis.

Three days later, repeat TTE demonstrated growth of the pericardial effusion with echo-dense bubbles, concerning for pneumopericardium (Figure 2B, Video 2), and features of tamponade. Cardiac magnetic resonance imaging (MRI) confirmed large pericardial effusion (Figure 3, Video 3).

**MANAGEMENT**

Pericardiocentesis and right-sided heart catheterization were performed, demonstrating elevation and equalization of diastolic pressures consistent with constriction (Figure 4A). Fluoroscopy also revealed pneumopericardium (Video 4). After removal of 600 mL of purulent, gaseous fluid (Figure 5), pericardial pressures normalized (Figure 4B) and a pericardial catheter was left in situ. Fluid analysis demonstrated neutrophilic-predominant nucleated cell count of 135 cells/mm<sup>3</sup>, elevated lactate dehydrogenase levels >5,000 U/L, and undetectable glucose levels <2 mg/dL. Fluid and blood cultures grew *Streptococcus intermedius* (anginosus group) with unrevealing fungal and acid-fast studies. Ceftriaxone was initiated with immediate steroid cessation.

The pericardial drain remained in situ due to resource-limited surgical staffing for immediate operation. The output reached a nadir after 3 days, however, repeat CT chest redemonstrated a large, loculated pericardial effusion (Figure 6). Pericardiectomy and debridement of thick, brittle epicardial rind with purulent fluid were performed (Figure 7), but hemodynamics were not repeated. Intraoperative biopsy specimens demonstrated acute and chronic fibrosis of the epicardium and granulomatous disease in mediastinal lymph nodes. Findings were consistent with bacterial pericarditis from systemic immunosuppression. Acid-fast bacilli stain and culture of the pericardium were negative. The patient completed 2 weeks of ceftriaxone, followed by 4 weeks of linezolid.

**FIGURE 1** Ultrasound-Guided Biopsy

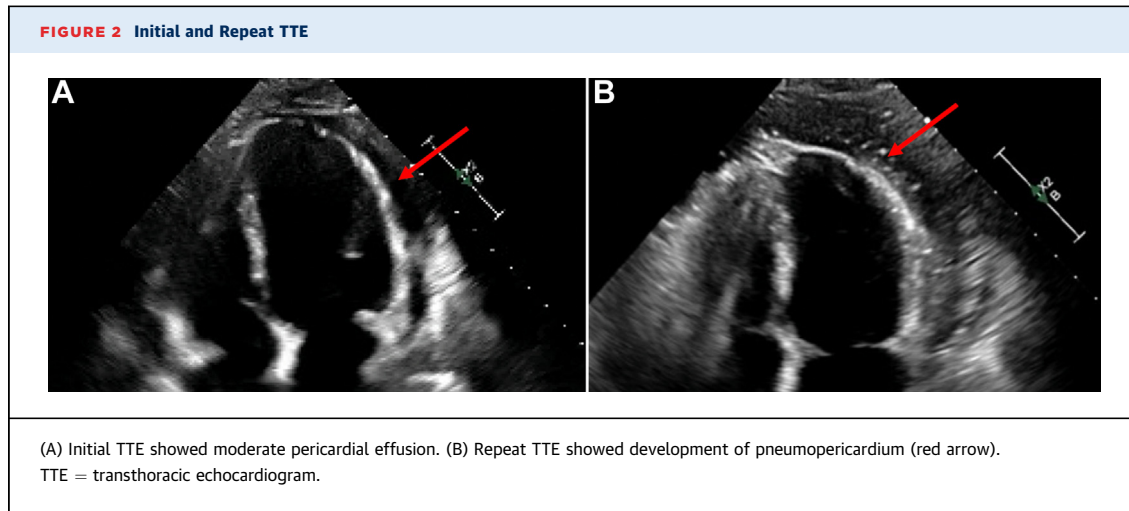
Ultrasound-guided biopsy of the supraclavicular lymph node revealed noncaseating granulomas (red arrows), concerning for sarcoidosis.

After pericardiectomy, his medical history was added with incompletely treated latent tuberculosis (TB) 20 years ago. Given this development, he was additionally treated with rifampin, isoniazid, pyrazinamide, and ethambutol (RIPE), although there was no evidence of *Mycobacterium tuberculosis* based on polymerase chain reaction assay, sputum acid-fast bacilli smears, or resected pericardial tissue cultures. The patient concurrently completed RIPE therapy.

**DISCUSSION**

We report a case of purulent bacterial pericarditis with pneumopericardium caused by *Streptococcus intermedius*, although the exact cause remains unclear. This has been postulated to be multifactorial in the setting of previously untreated TB and glucocorticoid-mediated immunosuppression.

If there is suspicion of pericarditis, TTE is recommended for its high sensitivity in detecting effusions, whereas pericardiocentesis is useful to evaluate the nature. Nonsteroidal anti-inflammatory therapy is the primary treatment for acute pericarditis; however, surgical drainage and antimicrobial therapy are mandatory for bacterial pericarditis. Purulent pericarditis with pneumopericardium can be highly fatal without surgical intervention.<sup>1,2</sup> Even with proper surgical treatment, mortality rate approaches 40% due to cardiac tamponade, constriction, and septic shock.<sup>2,3</sup> The inability to establish immediate surgical intervention after pericardiocentesis led to rapid purulent fluid reaccumulation and risk of sudden

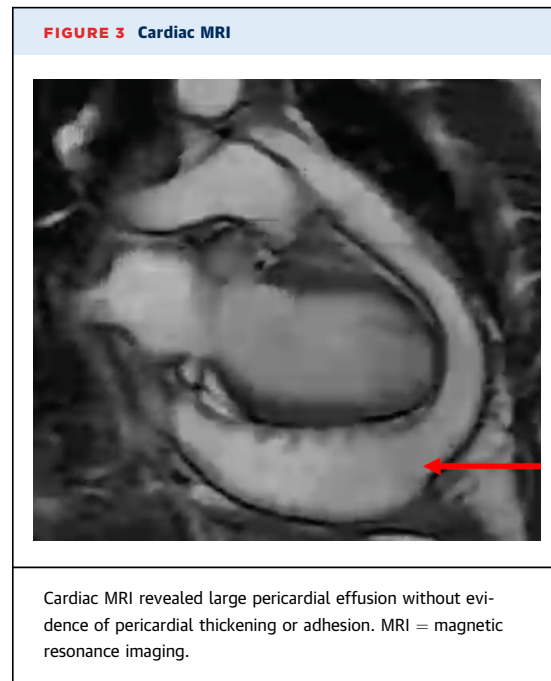


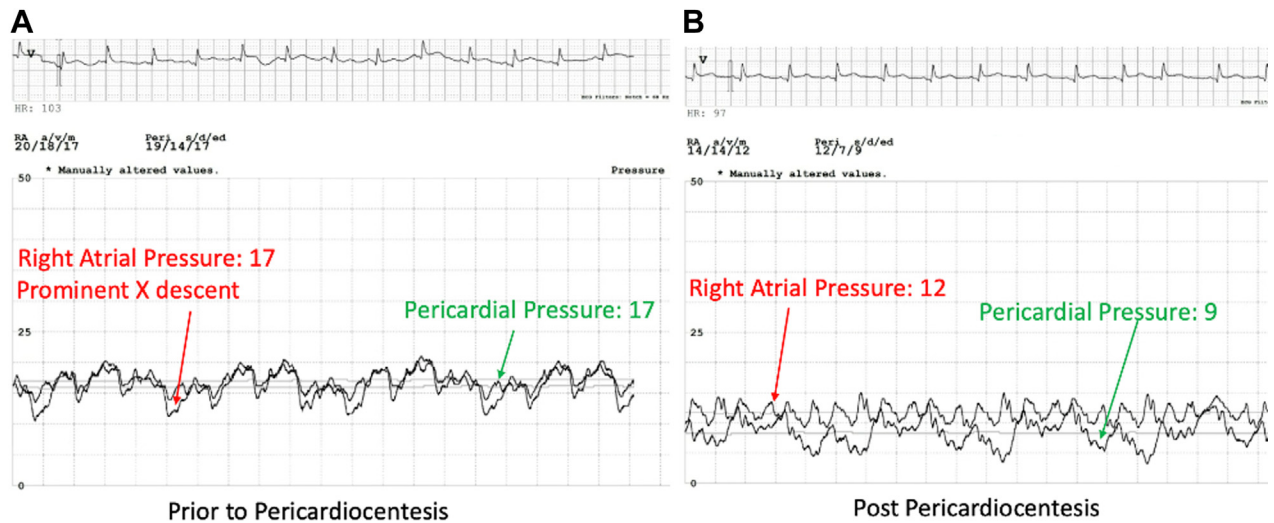
decompensation given the constrictive physiology at diagnosis.

Bacterial pericarditis is rare with the rise of modern antibiotics. Risk factors include immunosuppression, pre-existing pericardial disease, effusions, malignancies, chest trauma, and prior surgery.<sup>3</sup> Common organisms include *Streptococci*, *Staphylococci*, *Haemophilus*, and *Mycobacterium tuberculosis*.<sup>2,3</sup> *Streptococcus anginosus* is a gram-positive, catalase-negative facultative anaerobe part of normal body flora that can cause pyogenic infections involving the skin, oropharynx, and abdomen, but is rarely associated with purulent pericarditis.<sup>4</sup> Broad-spectrum antimicrobials are indicated for purulent pericarditis, and fungal coverage is recommended in severely immunosuppressed patients.<sup>5</sup>

Adjunctively, TB and sarcoidosis are both alternative causative agents for pericarditis. Tuberculosis, caused by *Mycobacterium tuberculosis*, remains a global pandemic affecting more than 25% of the population, typically affecting the lungs with sequelae of dissemination if left untreated.<sup>6,7</sup> Tuberculous pericarditis is the most common cause of pericarditis in TB-endemic countries, but accounts for less than 5% of cases in developed countries.<sup>6</sup> Our patient's risk for TB was elevated because he previously lived in an endemic region. Tuberculous pericarditis presents with nonspecific symptoms, such as night sweats, fevers, and unintentional weight loss. Definitive diagnosis requires demonstration of TB bacilli within the pericardial fluid or pericardium. RIPE therapy is highly effective in increasing survival for patients with extrapulmonary TB, but the benefit of adjunctive corticosteroids remains uncertain.

Sarcoidosis is an inflammatory disorder characterized by noncaseating granulomas, often affecting multiple organs. Cardiac sarcoidosis occurs in less than 7% of cases, resulting in conduction disturbances, ventricular arrhythmias, heart failure, pericarditis, and sudden death.<sup>8</sup> Pericardial effusion is even rarer, seen only in 20% of cases with confirmed cardiac involvement.<sup>8</sup> Diagnosis requires tissue pathology and exclusion of alternative causes of granulomatous burden.<sup>9</sup> Prognosis depends on the extent



**FIGURE 4** Right Heart Catheterization

Right-sided heart catheterization performed with pericardiocentesis. (A) The prominent x descent and elevation and equalization of diastolic pressures were consistent with constriction. (B) After pericardiocentesis, the pressure waves separated after relief of pressure in the pericardial space.

of involvement. Although systemic corticosteroid therapy is the mainstay of treatment, orthotopic heart transplantation may be offered in those with refractory, end-stage disease. Although our patient had biopsy specimens demonstrating noncaseating

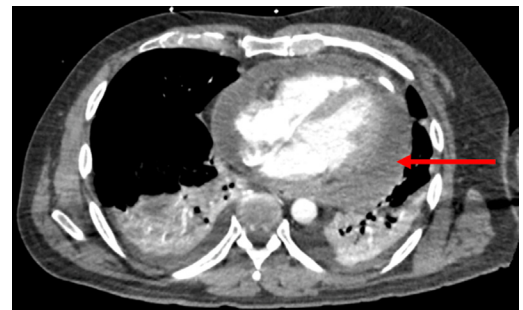
granulomas, cardiac MRI did not demonstrate characteristic abnormalities in wall thickness, motion, or contrast-enhancement patterns, making cardiac sarcoidosis less likely.

#### FOLLOW-UP

Repeat positron emission tomography CT after completion of all antimicrobials demonstrated improvement of lymphadenopathy. He continues to follow up in clinic for routine surveillance and has not been reinitiated on immunosuppression.

**FIGURE 5** Fluid

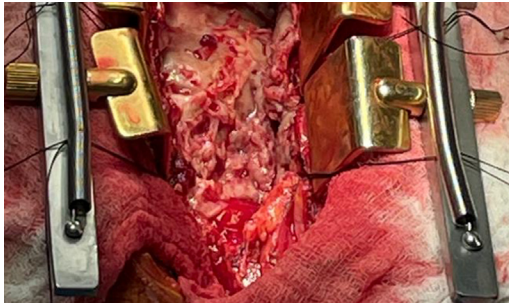
Purulent, gaseous fluid drained from pericardiocentesis.

**FIGURE 6** CT

CT chest after pericardiocentesis and pericardial drain placement re-demonstrated large pericardial effusion. CT = computed tomography.



**FIGURE 7** Epicardial Rind



Epicardial rind with fibrosis seen during pericardiectomy.

diagnosis in the context of immunosuppression. Although the patient had an unremarkable oral examination on presentation, *Streptococcus* infection is part of normal flora and hematogenous spread was most likely from systemic immunosuppression and potentially untreated TB (**Central Illustration**). A high index of suspicion is required to diagnose bacterial pericarditis while management necessitates aggressive antimicrobials and urgent surgical treatment.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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**CONCLUSIONS**

Our case of purulent pericarditis reinforces the importance of maintaining a broad differential

**CENTRAL ILLUSTRATION A Case of Purulent, Bacterial Pericarditis**

**Presentation and Initial Management**



One month of progressive dyspnea, dry cough, chest tightness



Fever: 39.5 C  
 BP: 90/59 mmHg  
 Heart rate: 140 bpm  
 Respiratory rate: 27/min

**Workup**

**12-Lead EKG**

Diffuse PR-segment depression and ST segment elevation



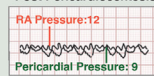
**Right Heart Catheterization**

Elevation and equalization of diastolic pressures consistent with constriction

Pre Pericardiocentesis

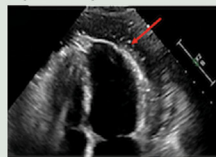


Post Pericardiocentesis



**TTE**

- Moderate pericardial effusion
- Echogenic bubbles concerning for pneumopericardium



**Cardiac MRI**

- Large pericardial effusion
- No abnormalities in wall thickness or motion



**Management**

**Pericardiocentesis**

600 mL of purulent, gaseous fluid removed. Fluid analysis with neutrophilic predominant nucleated cell count of 135 cells/mm<sup>3</sup>, elevated lactate dehydrogenase levels >5,000 U/L, and undetectable glucose levels < 2mg/dL. Fluid and blood cultures grew *Streptococcus intermedius*. Ceftriaxone initiated and steroids stopped.



**Pericardiectomy**

Debrided thick, brittle epicardial rind with purulent fluid. Intraoperative biopsies with acute and chronic fibrosis of the epicardium and granulomatous disease in mediastinal lymph nodes. Findings consistent with bacterial pericarditis.



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Presentation, diagnostics, and interventions on a case of purulent, bacterial pericarditis from a combination of immunosuppression and untreated tuberculosis.

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**KEYWORDS** bacterial pericarditis, pneumopericardium, purulent pericarditis

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 **APPENDIX** For supplemental videos, please see the online version of this paper.