Case report

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Pneumopericardium caused by tuberculous constrictive pericarditis and pericardiocentesis: A rare case

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Abstract

Pneumopericardium is a rare disease defined by the presence of gas in the pericardial sac, which can be caused by tuberculous constrictive pericarditis and pericardiocentesis. A 23-year-old male was admitted with a chief complaint of intermittent chest pain and severe shortness of breath. Tamponade was first diagnosed and pericardiocentesis was done. Massive pericardial effusion might be due to tuberculous infection (endemic area). Follow-up using chest computerized tomography (CT) after pericardiocentesis showed pneumopericardium. Pneumopericardium can be caused by tuberculous pericarditis and direct injury secondary to pericardiocentesis. This case report highlights the importance of using imaging modalities to detect this disease and provide a new recommendation of treatment for these patients.

Key words: Pneumopericardium, tuberculosis, pericardiocentesis.

Introduction

Pneumopericardium is a rare disease defined by the presence of gas in the pericardial sac, which can be caused by tuberculous constrictive pericarditis and pericardiocentesis among others. (1) A retrospective study found that 4% of 500 patients diagnosed with acute pericarditis were caused by tuberculosis infection. After a 6-year follow-up, it was found that only 1.8% of them developed constrictive pericarditis. (2) Another retrospective study found that pericardiocentesis is associated with 1.4% of major complications, including pneumopericardium. (3) Due to the lack of literature that discusses this disease with its atypical etiology, it is often a challenge in diagnosing and treating the disease. Therefore, we present a rare case of pneumopericardium caused by tuberculous constrictive pericarditis and pericardiocentesis.

Case illustration

A 23-year-old male was admitted to the Emergency Room with a 3-month history of intermittent chest pain, shortness of breath, productive cough, palpitations, decreased appetite, nausea, and weight loss. Physical examination revealed hypotension, tachycardia, jugular vein distention, muffled heart sounds, and a 2-centimeter nodule in the patient's neck. Chest radiography and echocardiography revealed pericardial effusion (**Figure 1**).

The patient was diagnosed with pericardial tamponade and a subxiphoid pericardiocentesis was performed. Approximately 1100 ml reddish-yellow serous discharge was aspirated from the pericardial

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sac and examined. Results showed that the fluid was an exudate with a monocyte predominance. Additional blood work was performed and showed an increased erythrocyte sedimentation rate (46 mm/hour). Nodule biopsy was also performed, and the result showed chronic granulomatous lymphadenitis caused by tuberculosis (**Figure 2**).

Tuberculosis polymerase chain reaction and adenosine deaminase diagnostic kits were not readily available in our center and therefore were not performed. One day after the procedure, the patient had no more complaints and was hemodynamically stable, however distant heart sounds, shifting precordial tympany, and a succussion splash with metallic tinkling were detected. The patient then underwent a chest computed tomography (CT) scan and chest X-ray that showed pneumopericardium with an air-fluid level and chronic tuberculosis in the upper medial right lung (**Figure 3**).

Echocardiography was performed and showed an increase in the medial mitral e' component (12.83 cm/s), which indicated a restrictive process (**Figure 2**). Based on all our findings, the patient was diagnosed with pneumopericardium caused by tuberculous constrictive pericarditis and pericardiocentesis. As for the treatment, the patient was given a combination of four oral anti-tuberculosis drugs (rifampicin, isoniazid, pyrazinamide, and ethambutol) for 2 months, followed by a two-drug oral anti-tuberculosis drug regimen (rifampicin and isoniazid) for 4 months. Corticosteroids were prescribed for 1 month and then tapered off slowly. The patient was also given colchicine 0.5 mg once a day and ibuprofen 400 mg thrice a day as an analgesic. Four weeks after the procedure, the patient underwent chest radiography again and showed complete resolution from pneumopericardium (**Figure 4**).

Discussion

In this case report, pneumopericardium can be caused by tuberculous pericarditis and direct injury secondary to pericardiocentesis. The pathophysiology of pneumopericardium caused by tuberculous constrictive pericarditis starts from Mycobacterium tuberculosis infecting the pericardial sac and penetrating through the pericardium layer, creating a communication between the pericardial cavity and an alveolus or a small bronchiole of the lung. This allows air to escape into the pericardium and cause pneumopericardium. (4)

Tuberculous constrictive pericarditis is characterized by constriction of the heart, which results in diastolic dysfunction secondary to pericardial inflammation caused by the Mycobacterium tuberculosis infection. The diagnostic criteria of constrictive pericarditis using echocardiography include ventricular septal shift, medial mitral e'≥9 cm/s, and hepatic vein expiratory diastolic reversal ratio ≥0.79. (5) In this case report, tuberculosis was diagnosed based on the presence of typical symptoms (chronic productive cough and continuous weight loss), a pattern indicative of tuberculosis on chest CT, and also qualitative and quantitative measurements of the pericardial fluid (serous characteristic, high leukocyte count with a predominance of monocytes). Therefore, these findings implicated Mycobacterium tuberculosis as the etiology rather than any other bacterial causes. (6)

Pneumopericardium can be diagnosed by a patient's clinical manifestation, electrocardiography, and several imaging modalities. Patients with pneumopericardium have classical symptoms of dyspnea and pain in the precardiac area. (1) Typical signs that often occur include distant heart sounds, shifting precordial tympany, and a succussion splash with metallic tinkling. Electrocardiography findings can show low voltage, ST-segment changes, and T wave inversion. (7) Chest X-ray, chest CT, and echocardiography can help visualize the presence of air-fluid levels in the pericardium. (1) Therefore, it is important to perform physical examination and imaging modalities in these kinds of patients because pneumopericardium can further progress into tension pneumopericardium and cause cardiac tamponade, which may result in life-threatening hemodynamic disturbances and even death. (8)

Tension pneumopericardium especially caused by tuberculous constrictive pericarditis must be treated promptly with rapid fluid resuscitation, emergent pericardiocentesis, and followed by surgical therapy. (7) In patients without tension pneumopericardium, the optimal therapy that should be given is still controversial. In another case report by Lauro L et al, symptomatic patients with pneumopericardium caused by tuberculous constrictive pericarditis had pericardiectomy as a primary treatment, which was then followed by anti-tuberculosis medications for 6 months, intravenous piperacillin-tazobactam, and steroids. This resulted in the resolution of the disease. (9) Unfortunately, pericardiectomy may cause many complications. In a retrospective study from the United States of America, it was found that pericardiectomy for constrictive pericarditis was independently associated with the highest requirement for cardiopulmonary bypass (odds ratio [OR] 6.41; $p<0.01$) and the incidence of bleeding complications (OR 2.61; $p<0.01$). (10)

Therefore, considering the risks of pericardiectomy and keeping in mind the patient's young age, asymptomatic presentation, and hemodynamically

stable status, we decided against pericardiectomy. Instead, the patient was given anti-tuberculosis drugs, corticosteroids, and non-steroidal anti-inflammatory drugs (NSAIDs). After 4 weeks, the patient underwent chest radiography again and showed complete resolution from the disease. In conclusion, we want to highlight the importance of performing regular physical examination and imaging to rule out the possibility of a fatal cardiac tamponade. Furthermore, we recommend anti-tuberculosis medications, corticosteroids, and NSAIDs as the primary treatment in asymptomatic and hemodynamically stable patients with pneumopericardium caused by tuberculous constrictive pericarditis and/or pericardiocentesis.

Conclusion

Pneumopericardium is a rare disease that can be caused by tuberculous constrictive pericarditis and pericardiocentesis. It can be diagnosed by a patient's clinical manifestation, electrocardiography, and several imaging modalities. In our case, we recommend anti-tuberculosis medications, corticosteroids, and NSAIDs as the primary treatment in asymptomatic and hemodynamically stable patients with pneumopericardium caused by tuberculous constrictive pericarditis and/or pericardiocentesis.

Statement of ethics

Written informed consent was obtained from the patient for publication of this case report.

Disclosure statement

The authors have no conflicts of interest to declare.

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Figure 1. Chest X-ray (a) and echocardiography (b) showed pericardial effusion (red arrows)

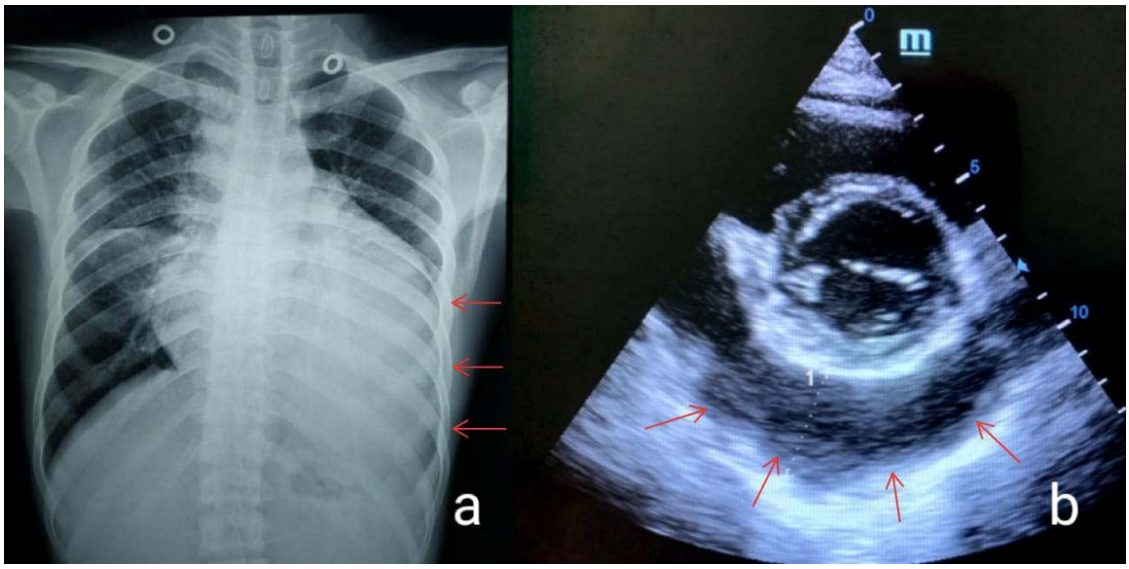
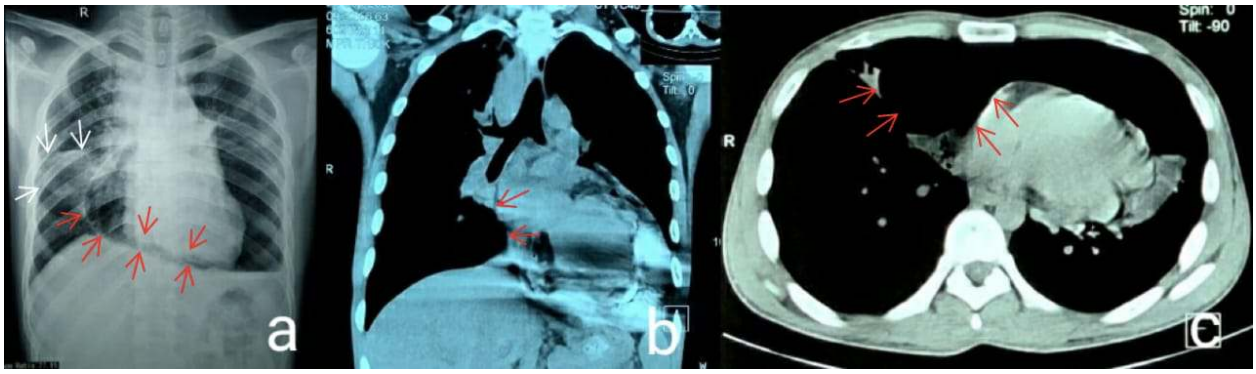


Figure 2. Chest X-ray (a) and CT scan axial view (b) and coronal view (c) showed pneumopericardium (red arrows) and chronic tuberculosis in the upper medial right lung (white arrows)



Legend: CT=computed tomography.

Figure 3. Nodule biopsy (a) showed epithelioid cells and histiocyte formed to create a granuloma (red arrows), and echocardiography (b) showed a constrictive process (medial mitral e' 10.83 cm/s)

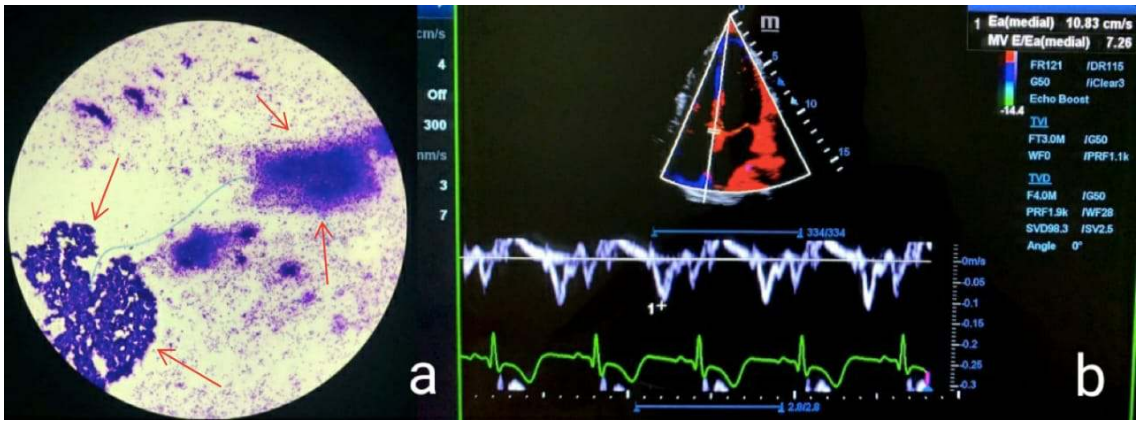
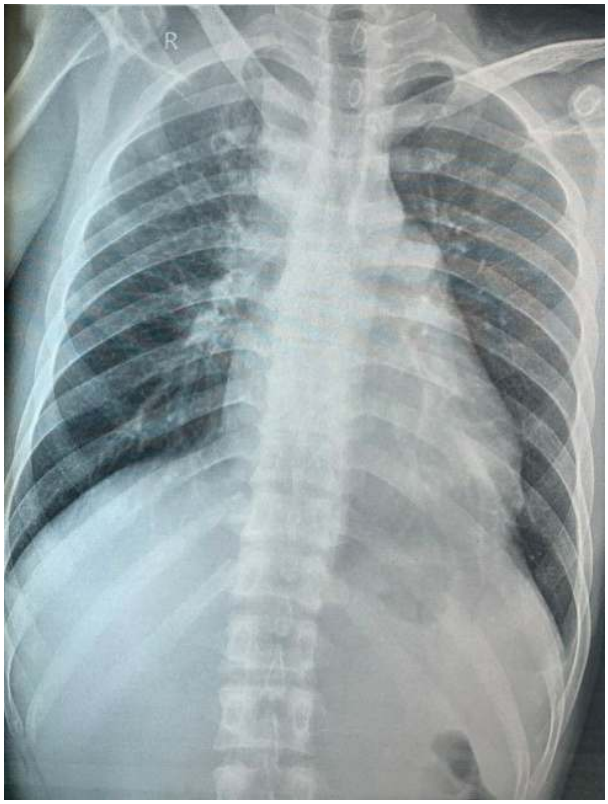


Figure 4. Chest X-ray showed complete resolution of pneumopericardium



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