

# Iatrogenic pneumopericardium following therapeutic pericardiocentesis for pericardial effusion in the emergency department - a case report






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## ABSTRACT

**Background:** This case report highlights a rare iatrogenic complication of pericardiocentesis and discusses its clinical management. In most cases, pneumopericardium is usually self-limiting and does not require any specific treatment. Therefore, a timely diagnosis and urgent treatment are required. Currently, there are only a few reports regarding pneumopericardium following therapeutic pericardiocentesis.

**Case Presentation:** We present a case of an 81-year-old woman who developed pneumopericardium following pericardiocentesis for pericardial effusion, a rare association reported in the literature.

**Conclusion:** Pneumopericardium may develop iatrogenically after pericardiocentesis. Attention should be paid to the puncture site and angle during pericardial puncture, especially in weak patients.

**Keywords:** Pericardial effusion, pericardiocentesis, pneumopericardium, emergency medicine, bedside ultrasonography.

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## Background

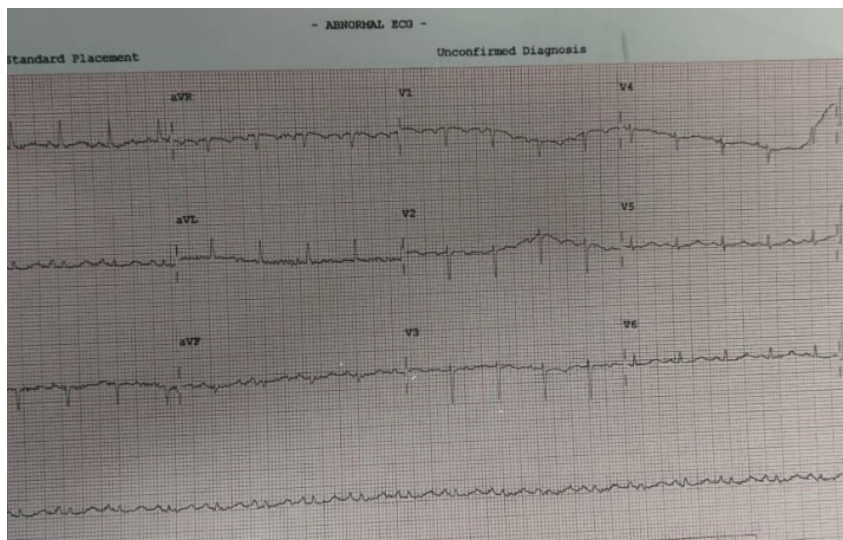
This case report highlights a rare iatrogenic complication of pericardiocentesis and discusses its clinical management. Although pneumopericardium is often self-limiting, its potential progression to life-threatening conditions like tamponade necessitates careful monitoring and timely intervention. However, if tension pneumopericardium occurs in some patients with hemodynamic instability, life-threatening pericardial tamponade may occur. Therefore, you will need to make a timely diagnosis and urgent treatment. So far, there are only limited reports about pneumopericardium after therapeutic pericardiocentesis. We present the case of an 81-year-old woman who developed pneumopericardium following pericardiocentesis for pericardial effusion, a rare association reported in the literature. This clinical case analysis aims to summarize the etiology, clinical features, diagnosis, treatment methods, and complications of pneumopericardium to improve understanding of this rare condition.

## Case

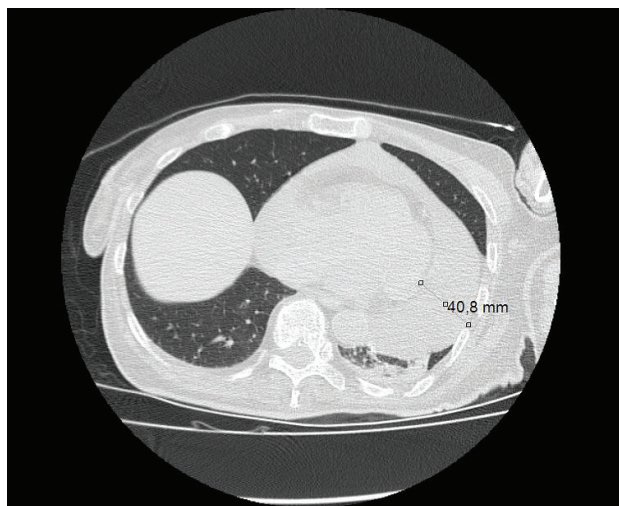
An 81-year-old woman presented with increasing dyspnea during the day. She was cachectic, immobile, and being fed through a PEG tube due to ischemic cerebrovascular disease (CVD). The patient's general condition

was assessed as moderate to sound, but communication could not be established due to previous CVD, and information was obtained from relatives. Her medical history shows that pericardiocentesis was done for pericardial effusion, with tests focused on ruling out non-cardiac causes. On physical examination, her blood pressure was 81/64 mmHg, pulse was 116 beats/min, respiratory rate was 16 breaths/min, and saturation was 100%. The heart sounds were rhythmic and deep during auscultation, with no additional sounds detected. Pulmonary and abdominal examinations were regular; venous fullness in the neck and pretibial edema were absent. Electrocardiography (ECG) showed sinus rhythm and left axis deviation. There were no significant ST-T changes and low voltage (Figure 1). Chest computed tomography (CT) demonstrated a pericardial effusion up to 4 cm in size (Figure 2). Bedside ultrasonography (USG) showed an LVEF of 50% and a massive pericardial effusion surrounding the heart with a maximum width of 35 mm in the posterolateral left ventricle and 20 mm in the apex of the right ventricle. Right atrial collapse and floating heart image were observed.

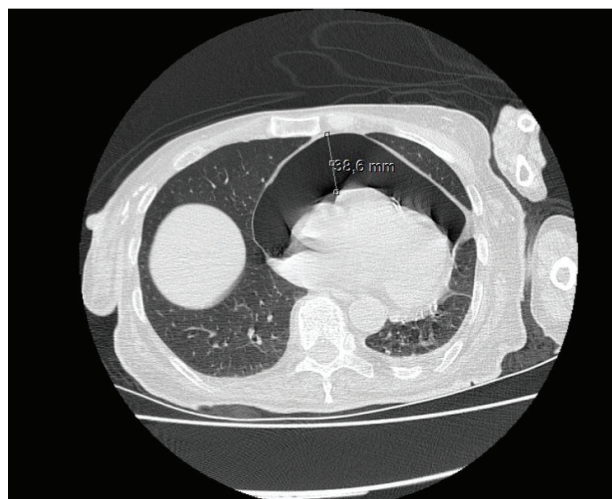
The hematocrit value was 26.6%, leukocytes 9900/mm<sup>3</sup>, and platelets 603000/mm<sup>3</sup>. Troponin-I value was 45 (control value was 46 in the second hour), liver function tests and renal function tests were standard, and CRP



**Figure 1.** ECG showing sinus rhythm and left axis deviation.



**Figure 2.** Chest CT demonstrated a pericardial effusion.



**Figure 3.** A chest CT scan showed a significant pericardial effusion measuring up to 4 cm in width.

level was 78 mg/dl (normal <5 mg/dl). Pericardiocentesis was performed through a subxiphoid approach under echocardiographic guidance. A 7 Fr introducer and a pigtail catheter were inserted into the pericardial cavity, and approximately 250 ml of serous-appearing fluid was drained. We encountered difficulties positioning the patient due to muscle contractures from previous CVD, and it was also a complex procedure because of the heart's position in the cachectic patient. As a result, we conducted follow-up thoracic imaging due to concerns about potential complications. Control thorax CT appeared compatible with pneumopericardium, reaching 38 mm in the widest part with no pericardial effusion (Figure 3). Since there was no evidence of tamponade on control echocardiography (ECHO) and hemodynamics were stable, it was decided to follow the patient with medical treatment. The patient was discharged after 7 days of follow-up in the cardiology department.

## Discussion

Pneumopericardium is a rare clinical condition caused by many different things. The most common etiologies include trauma, fistula formation between the pericardium and adjacent hollow organs, and iatrogenic causes. It may develop due to high-pressure mechanical ventilation, mediastinal tumors, tuberculosis, gastropericardial fistulas, and iatrogenically after endomyocardial biopsy and pacemaker application [1-3]. On the other hand, pneumopericardium is a rare complication of pericardiocentesis and mainly develops as a result of a direct pleuropericardial connection. The current gold standard for pericardial fluid aspiration is ultrasound-guided pericardiocentesis, and the apical and subxiphoid approaches are the two most commonly used methods for pericardiocentesis. The literature describes that the apical approach is the preferred location in 69%–79% of the cases, compared with the subxiphoid approach preferentially selected. In

such cases, the procedure success rate for pericardiocentesis was 97%–99%. Patients are typically positioned in a supine or semi-reclining posture [4]. Complications are more common during the subxiphoid approach when adequate care is not taken, especially in weak patients. The sudden movement of the patient during a puncture may change the puncture angle and cause complications in an uncontrolled puncture. Furthermore, if a connection between the pleura and pericardium occurs during the puncture of a small amount of localized fluid, it may result in pneumopericardium after pericardiocentesis [5,6]. Xu et al. [7] reported a case in which the catheter was not placed in the expected location during the procedure, and the right ventricle was damaged by inappropriate puncture, leading to hemopericardium. Similar to our case, Schulte-Hermes et al. reported intestinal perforation after pericardiocentesis in an 81-year-old cachectic patient presenting with heart failure [8].

In most cases, iatrogenic pneumopericardium absorbs spontaneously and does not require special treatment. However, if tension pneumopericardium occurs in some patients with hemodynamic instability, life-threatening pericardial tamponade may occur. Therefore, timely diagnosis and urgent treatment are required [5,6]. Hemodynamic instability varies depending on the amount of accumulated air and the accumulation rate. While up to 60 ml of air with rapid accumulation causes hemodynamic instability, even up to 500 ml of air with slow accumulation does not cause significant hemodynamic instability. Patients are given bed rest and close hemodynamic monitoring with chest radiography and ECHO. Spontaneous resolution is observed in patients who do not develop tension pneumopericardium [9]. Patients are given bed rest and close hemodynamic monitoring with chest radiography and ECHO. Spontaneous resolution is observed in patients who do not develop tension pneumopericardium [9]. Zhang et al. [4] proposed pericardiocentesis via an apical approach under USG guidance in a sitting position to reduce unwanted damage to the heart and nearby organs. No significant complications were observed in their study with this method, and they suggest that 8% of minor complications occurred, which is a feasible technique. Mohammed et al. [10] proposed performing pericardiocentesis using an in-plane technique with a high-frequency probe through the right parasternal route, employing a lateral-medial approach to minimize complications.

## Conclusion

This case emphasizes the need for meticulous technique during pericardiocentesis and vigilant post-procedure monitoring to promptly identify and manage rare complications like pneumopericardium. Attention should be paid to the puncture site and angle during pericardial puncture, especially in weak patients. Spontaneous recovery is

usually possible, but due to the invasiveness of the procedure, it has risks; hence, it is important to conduct complete and comprehensive assessments and preparations before the procedure.

## What's new

Pneumopericardium should be considered in patients with hypotension, bradycardia, and decreased heart sounds following interventional procedures. Rapid diagnosis and a multidisciplinary approach are crucial for managing these cases.

## List of Abbreviations

CRP	C-reactive protein
CT	Computed Tomography
CVD	Cerebrovascular disease
ECG	Electrocardiography
ECHO	Echocardiography
LVEF	Left ventricular ejection fraction
USG	Ultrasonography

## Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

## Funding

None.

## Consent for publication

Due permission was obtained from the patient to publish the case and the accompanying images.

## Ethical approval

Our institution does not require ethical approval to publish an anonymous case report.

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### Summary of case

1	Patient (gender, age)	81 years, female
2	Final diagnosis	Iatrogenic Pneumopericardium
3	Symptoms	Dyspnea
4	Medications	Pericardiocentesis
5	Clinical procedure	Hemodynamic monitoring
6	Specialty	Emergency Medicine