Malaysian Journal of Medical Research, 10(1), 59-62
https://doi.org/10.31674/mjmr.2026.v010i01.006

MJMR
Malaysian Journal of Medical Research

Malaysian Journal of Medical Research

Online ISSN: 2550-1607

www.mjmr.com.my

Case Study

A Clinical Rescue Pericardiocentesis with Point-of-Care Ultrasound of a Malignant Pericardial Effusion in Emergency Department

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Abstract

Pericardial effusion leading to cardiac tamponade can result from a wide range of underlying causes and may develop either acutely or sub acutely. Because of this variability in presentation, timely recognition and prompt intervention are essential, especially in the emergency department where delays can significantly impact patient outcomes. We describe the case of a 54-year-old woman with advanced lung cancer who presented with progressive respiratory distress. Although her initial vital signs, including blood pressure, appeared relatively stable, further evaluation revealed subtle but important features of early cardiac tamponade. An initial misinterpretation of her electrocardiogram (ECG), along with her seemingly preserved hemodynamics, contributed to a delay in initiating definitive management. Point-of-care ultrasound (POCUS) ultimately played a pivotal role in clarifying her condition. Key sonographic findings—including right-sided chamber collapse, a plethoric and non-collapsible inferior vena cava (IVC), and the characteristic "dancing heart" sign—raised immediate concern for evolving tamponade physiology. Guided by these ultrasound findings, the emergency team proceeded with real-time, ultrasound-guided pericardiocentesis, which resulted in rapid and significant improvement in the patient's clinical status. This case underscores the critical value of POCUS in identifying cardiac tamponade, particularly in patients who do not exhibit the classic triad or expected hemodynamic instability. It highlights the importance of maintaining a high index of suspicion and using bedside ultrasound to support clinical decision-making. Early recognition through POCUS can expedite lifesaving interventions and prevent deterioration in patients with subtle or atypical presentations of cardiac tamponade.

Keywords: *Cardiac tamponade; Pericardiocentesis; Pericardial effusion; Point-of-care Ultrasound (POCUS); Respiratory Distress*

Introduction

Malignant pericardial effusion accounts to about 10-25% and is the second leading cause of all pericardial effusion in developed countries (Ebrahimi *et al*., 2025). Although it may initially appear silent, it may evolve rapidly into cardiac tamponade (Hsu *et al*., 2025) leading to devastating complication for patients with advanced cancer and in worst situations it has high chances of recurrence with a high recurrence rate of 20%. A study has showed that with insertion of a catheter drainage, it has significantly reduced the recurrence rate to 12 % as compared to 52% without extended drainage (Ebrahimi *et al*., 2025). While pericardiocentesis remains the standard of care in symptomatic pericardial effusion, misinterpretation of ECG and targeting clinical stability prior procedure can delay intervention.

Received: 4thOctober 2025; Revised version received on: 5th December 2025; Accepted: 15th December 2025

Case Presentation

A 54 years-old female who had been recently diagnosed with advance lung malignancy complicated with massive pleural effusion and cardiac effusion a week ago presented to us with complain of shortness of breath, cough and worsening constitutional symptoms for 1 week. Otherwise, she denies fever, chest pain or peripheral oedema. Upon arrival to the emergency department, she was alert with GCS of E4V5M6, normotensive with BP 123/87, however tachycardia with HR of 150 beats per min and in respiratory distress with evidence of tachypnoea RR 28 with SPO2 of only 83% under room air. Lung examination revealed reduced air entry bilaterally, while other systemic examinations including cardiovascular examination were unremarkable.

She was put on face mask oxygen 5L/min and attached to a cardiac monitor, which showed electrical alternans ECG pattern. A bedside point-of-care ultrasound (POCUS) revealed massive pericardial effusion measuring 2.5cm and collapsed right atrium and right ventricle with 'dancing heart sign'. IVC was plethoric and bilateral lungs showed pleural effusion with left more than right.

Initial decision was made to insert a left-sided chest drain with the aim of facilitating improvement of the pericardial effusion, hence the clinical condition of the patient. At the same time, she was referred to the medical team.

After assessment by the medical team, they decided to not proceed for pericardial tapping in view of patient is normotensive, able to saturate under face mask oxygen and the ECG was misinterpreted as sinus arrythmia.

However, repeated cardiac ultrasound post pleural drain showed persistent dancing heart sign and notable electrical alternans (Figure 1) on cardiac monitor. Hence, with real-time ultrasound guidance, we promptly performed a bedside pericardiocentesis with placement of triple lumen catheter (Figure 2) at the parasternal region which drained 300cc of haemoserous pericardial fluid (Figure 3). Post procedure the pericardial effusion reduced, the visibility of cardiac chambers improved and there were resolved electrical alternant on cardiac monitoring. Following that procedure, significant clinical improvement was also observed in the patient as she was less tachypnoeic and was able to saturate under nasal prong oxygen.

Figure 1: Subtle Electrical Alternans on Cardiac Monitor

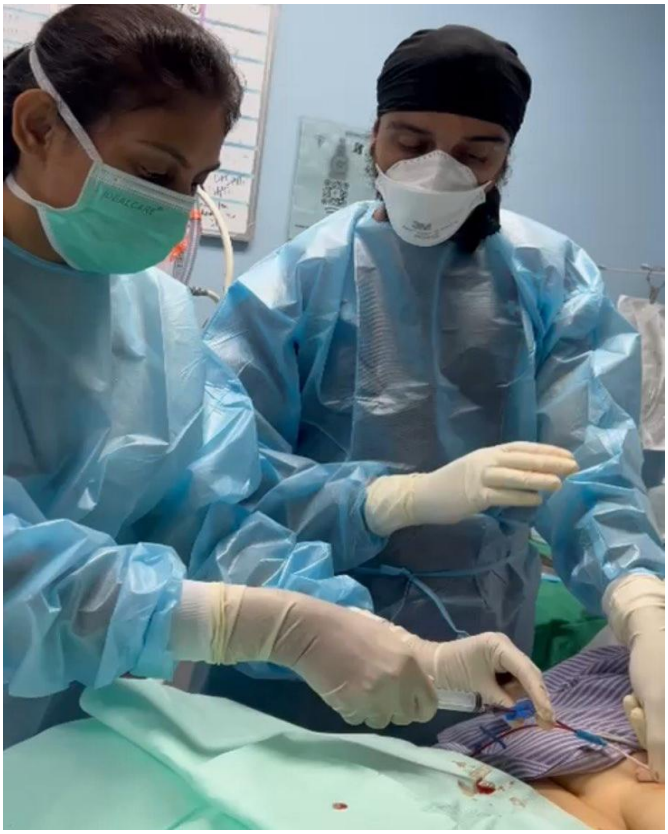

Figure 2: Performing a Bedside Pericardiocentesis with Real-Time Ultrasound Guidance

Figure 3: Draining 300cc of Haemoserous Pericardial Fluid

Discussion

This case highlights the false clinical reassurance given by the presentation of normal blood pressure, adding to the challenges of differentiating electrical alternans from sinus arrythmia in patients who have POCUS findings of chamber collapse and plethoric IVC which strongly suggest early tamponade physiology.

Although the decision and timing to perform a pericardiocentesis depends on clinical presentation, hemodynamic, aetiology and sonographic finding, waiting for Beck's triad (hypotension, distended jugular venous pressure, muffled heart sound) to appear will only be futile and may even be too late to rescue the patient as its sensitivity remains questionable and an uncommon presentation in impending cardiac tamponade. (Alerhand *et al*., 2022)

That said, a bedside pericardiocentesis with pericardial drain placement was extremely crucial (Ynalvez *et al*., 2025) and draining the pleural fluid alone may not help alleviate the pericardial pressure. The fasters and safest technique of performing a bedside pericardiocentesis is the real-time, in-plane

parasternal approach as it offers a superior visualization of needle trajectory and helps to avoid unnecessary complication in the already chaotic emergency department (Osman *et al*., 2018).

Another critical learning point in this case was the misinterpretation of electrical alternans ECG as sinus arrythmia. Electrical alternans on ECG is a relatively specific marker of a large pericardial effusion with swinging heart motion, although occasionally may be subtle on the cardiac monitoring, it is often missed if a clinician does not have a high suspicion index. (Rosser *et al*., 2025). In this context, the use of POCUS showing 'dancing heart sign' would help to bridge this diagnostic gap in the emergency department.

Hence in similar oncology emergencies, physicians should be more vigilant on recognizing early tamponade features by carefully correlating the clinical presentation, the ECG findings and as well as the bedside ultrasound to diagnose an impending cardiac tamponade and strongly consider an early pericardial catheter insertion rather than relying on only one component above the other and delay the definitive management for such patients.

Conclusion

Early recognition and intervention in cases of pericardial effusion with tamponade physiology are crucial to avoid clinical deterioration, especially in cancer patients. Reliance on clinical signs or ECG alone may delay diagnosis. This case demonstrates how a bedside ultrasound plays a key role in detecting tamponade in detecting tamponade features and guiding safe and effective pericardiocentesis in the emergency department. Clinicians should maintain a high level of suspicion for tamponade in similar patients and utilize POCUS to guide timely intervention, regardless of the presence or absence of hypotension.

Conflict of Interest

The author(s) declare that there is no conflict of interest regarding the publication of this article.

Acknowledgement

The authors would like to acknowledge all participants and staff who contributed to this study, as well as the support provided by the institution throughout the research process.

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