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Case Report

Point-of-Care Ultrasound in Paediatric Cardiac Tamponade: A Case Report of Rapid Diagnosis and Guided Pericardiocentesis in a Resource-Limited Setting.

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Abstract

The case report demonstrates the utility of point-of-care ultrasound (POCUS) for both diagnosis and ultrasound-guided intervention in managing cardiac tamponade in a paediatric patient. A 10-year-old child presented with a six-week history of cough, weight loss, and a two-week history of respiratory difficulty, orthopnoea, and generalized body swelling, starting in the legs. He had progressive easy fatigability over the last three months. An external chest X-ray indicated a globular heart, suggestive of pericardial effusion to rule out cardiomyopathy. Cardiac POCUS revealed a massive pericardial effusion with tamponade physiology. Immediate ultrasound-guided pericardiocentesis was performed, draining 800 ml of purulent fluid, followed by an additional 200 ml with an underwater seal setup. Post-procedure, serial POCUS examinations were conducted to monitor for adequate drainage and to detect any possible re-accumulation of pericardial fluid. The symptoms resolved, and a 2-week follow-up showed sustained improvement. This case underscores the vital role of POCUS in both the prompt diagnosis and safe, accurate ultrasound-guided pericardiocentesis in emergent cardiac care for paediatric patients.

Keywords: Cardiac Tamponade; Point-of-Care Ultrasound; POCUS; Paediatrics.

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Introduction

Cardiac tamponade is a potentially life-threatening condition in children with pericardial effusion [1], which often poses a diagnostic challenge because symptoms overlap with respiratory or cardiovascular conditions [2]. Further, the classic Beck's triad (JVD, hypotension and muffled heart sounds) seen in adults is variably found in less than half of paediatric patients and has very low sensitivity [3]. Even as the signs are elicited, they can hardly be correlated with the severity of the effusion [2]. In recent years, point-of-care ultrasound (POCUS) has emerged as a reliable tool for rapid diagnosis and expediting therapeutic interventions in emergencies [3,4]. POCUS reduces the time to pericardiocentesis by more than fivefold compared to formal echocardiography or computed tomography [5]. Furthermore, it guides procedures such as pericardiocentesis, ensuring precision and safety in critically ill paediatric patients [4]. This report highlights the dual role of POCUS in the diagnosis and management of cardiac tamponade in a 10-year-old child.

Case Presentation

A 10-year-old child presented with a six-week history of a persistent cough, progressive weight loss, and a two-week history of breathing difficulty, orthopnoea, chest pain, paroxysmal nocturnal dyspnoea (PND), and leg swelling. He had progressive easy fatigability earlier over the previous three months. A chest radiograph done at another facility showed a globular heart with increased pulmonary vascular markings- features consistent with pericardial effusion; cardiomyopathy was also considered. Examination revealed the patient had tachycardia (130 beats per minute), blood pressure of 96/80 mmHg (about 40th percentile), elevated jugular venous pressure, diffuse apex beat, no muffled heart sounds, tender hepatomegaly, and peripheral edema. Given the acuity of the patient's worsening symptoms, cardiac POCUS was immediately performed. This revealed a massive opalescent pericardial effusion measuring 5.0 cm, with signs of right atrial, right ventricular collapse, and inferior vena cava plethora- features highly suggestive of tamponade physiology.
Figures 1 and 2 are images from apical four-chamber (A4C) and parasternal short-axis (PSAX) views demonstrating 'circumferential' pericardial effusion with diastolic right ventricular collapse.

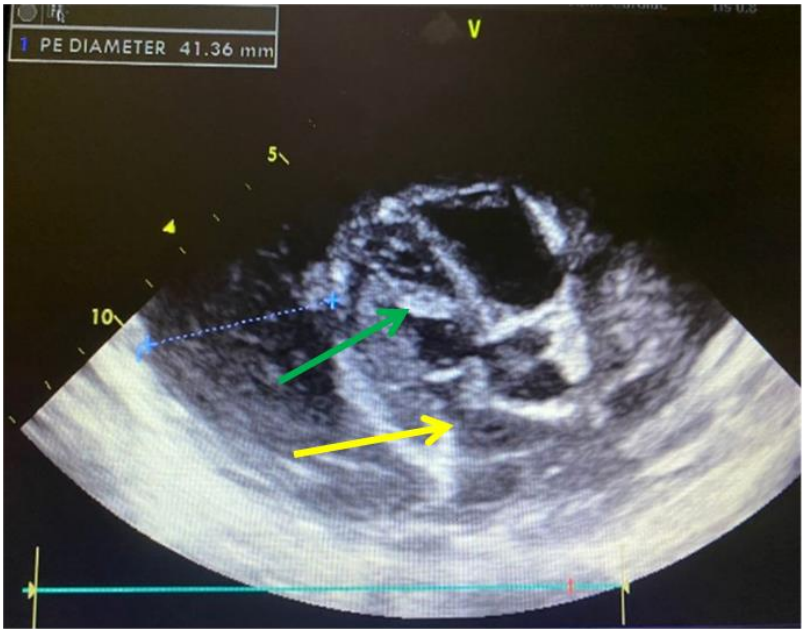

Figure 1: Echocardiogram, A4Ch, shows massive effusion with diastolic RV (green arrow) and RA (yellow arrow) collapse.

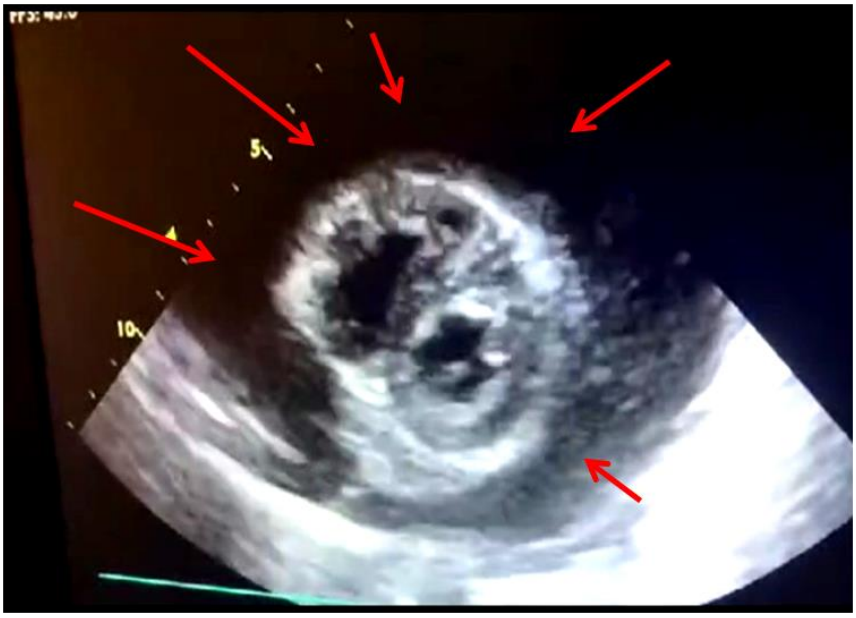

Figure 2: PSAX view showing circumferential pericardial fluid (red arrows)

Management

An ultrasound-guided pericardiocentesis was immediately performed under aseptic conditions using the Seldinger technique. A total of 800 ml of purulent pericardial fluid was drained initially (Figure 3). An underwater seal was set up post-procedure to continue draining any residual fluid, with an additional 350 ml drained over the next 48 hours.

Figure 3: Purulent pericardial fluid drained into a kidney dish.

Subsequently, serial POCUS examinations were performed to monitor for adequate drainage and to detect any potential re-accumulation. These repeat assessments confirmed continued resolution of the effusion and provided reassurance that tamponade physiology was no longer present.
The patient's symptoms resolved shortly after the procedure, and the child was observed in the hospital for signs of recurrence or complications. Following stabilization, the patient was discharged and showed continued improvement at follow-up visits. Samples of the drained fluid were sent for microbiological analysis, including microscopy, culture, sensitivity (MCS), and acid-fast bacillus (AFB) testing to identify the underlying aetiology. Both were negative for organisms.

Discussion

This case illustrates the pivotal role of POCUS, performed by non-cardiologists, in both the rapid diagnosis and ultrasound-guided management of cardiac tamponade in paediatric patients.

The utility of POCUS in this scenario underscores its role as an extension of the physical examination, particularly in resource-limited settings where access to advanced imaging modalities may be delayed. Moreover, POCUS not only expedited the diagnosis of the life-threatening pericardial effusion but also enhanced the safety and efficacy of pericardiocentesis by providing real-time visualization of anatomical structures and needle placement. The use of ultrasound guidance during pericardiocentesis provided three

key benefits:

Diagnostic accuracy: Real-time visualization ensured precise needle placement within the pericardial space, minimizing the risk of injury to surrounding structures.

Safe procedure: POCUS enabled continuous monitoring of the effusion during drainage, reducing the risk of complications.

Therapeutic efficacy: Ultrasound-guided drainage allowed rapid resolution of the patient's symptoms, contributing to a swift clinical improvement

Notably, since the introduction of POCUS in the facility, the turnaround time for performing pericardiocentesis has decreased significantly from approximately 12 hours to just around 30 minutes. This is consistent with the 'reduced time to pericardiocentesis' reported by Alpert et al in-POCUS group compared to the control [5]. Hitherto, pericardiocentesis had been associated with significant risks when performed blindly, especially in paediatric patients. However, ultrasound-guided pericardiocentesis has been shown to markedly reduce procedural risks by allowing real-time visualization of needle insertion (needle tracking), thereby avoiding injury to critical structures and ensuring effective fluid drainage [6]. This corroborated the reduced complication rate from 25% to 3% as found by Amare et al. Tsang et al reported 99% success rate in paediatric ultrasound-guided pericardiocentesis, with 93% on the first attempt and less than 3% major and minor complications [7,8].
Serial POCUS assessments after the procedure provided an effective and non-invasive means to monitor the pericardial space for any re-accumulation, allowing prompt intervention if necessary and reinforcing the utility of ultrasound as an essential tool in post-procedural follow-up. This real-time monitoring capability is especially beneficial in settings with limited access to more advanced imaging modalities.

Conclusion

The use of cardiac POCUS in this case facilitated not only the rapid diagnosis of cardiac tamponade but also ensured a safe and effective ultrasound-guided pericardiocentesis. Post-procedure, serial POCUS evaluations provided critical monitoring to assess the success of drainage and the absence of re-accumulation. This case underscores the importance of integrating POCUS into emergency pediatric care, especially for conditions requiring immediate intervention, such as cardiac tamponade. As demonstrated, POCUS is invaluable in both diagnosing pericardial effusions and guiding therapeutic procedures, ultimately enhancing patient outcomes in critical scenarios [9].

References

1. Peter ID, Asani MO, Aliyu I. Pericardial effusion and outcome in children at a tertiary hospital in North-Western Nigeria: A 2-year retrospective review. Res Cardiovasc Med. 2019; 8:14-8.

2. Corsini I, Leardini D, Carfagnini F, Pession A, Maecello L. Massive pericardial effusion in a 14-year-old girl with mild fatigue and neck pain. Pediatr Rep. 2022;14(1):8-12.

3. Amare S, Tadele H. Pericardial effusion in children a tertiary national referral hospital, Addis Ababa, Ethiopia: a 7-year institution-based review. BMC Emerg Med. 2024;24(6). https://doi.org/10.1186/s12873-023-00922-7

4. Scheier E. Cardiac POCUS in paediatric emergency medicine: a narrative review. Clin Med. 2023;12(7):5666. doi.org/10.3390/jcm12175666

5. Alpert EA, Amit U, Guranda L, Mahagna R, Grossman SA, Bentancur A. Emergency department point-of-care ultrasound improved time to pericardiocentesis for clinically significant effusions. Clin Exp Emerg Med. doi.org/10.15441/ceem.16.169

6. Willner DA, Shams P, Grossman SA. Pericardiocentesis. In: StatPearls [internet]. Treasure Island: StatPearls Publishing; 2025 [cited 2025 May 10]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470347

7. Tsang TS, El-Najdawi EK, Seward JB, Hagler DJ, Freeman WK, O'leary PW. Percutaneous echocardiographically guided pericardiocentesis in paediatric patients: Evaluation of safety and efficacy. J Am Soc Echocardiogr. 1998;11:1072-7.

8. Persson JN, Kim JS, Good RJ. Diagnostic utility of point-of-care ultrasound in the paediatric cardiac intensive care unit. Curr Treat Options Ped. 2022;8:151-73

9. Eke OF, Selame L, Gullikson J, Deng H, Dutta S, Shokoohi H. Timing of pericardiocentesis and clinical outcomes: is earlier pericardiocentesis better? Am J Emerg Med. 2022; 54:202-7.