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Visual Case Discussion

Pericardial Effusion Identified by Point-of-Care Ultrasound in a Pediatric Patient with Covid-19

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1. Overview

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2. Discussion

POCUS has been shown to be an invaluable tool in the diagnosis of pericardial effusions and tamponade and can identify tamponade physiology prior to any clinical evidence. Furthermore, in at least one study it has been found to lower the average time to diagnosis for pericardial effusions, which is critical given that some of these effusions require swift and appropriate intervention.^{1,2} Pericardial effusions have multiple etiologies including infectious causes, and new literature is emerging of Covid-19 as a potential cause of pericardial effusions and tamponade, although most cases thus far have been characterized in adults.³ Our case demonstrates a pediatric patient presenting to an emergency department for shortness of breath in the setting of Covid-19, in which POCUS was used to identify a pericardial effusion with concern for early cardiac tamponade.

3. Visual Case Discussion

A 17-year-old female with no significant past medical history

presented to an emergency department due to shortness of breath. She was diagnosed with Covid-19 nine days prior, although was initially asymptomatic. She developed symptoms several days after the initial diagnosis, with fever, fatigue, cough, which progressed to shortness of breath. These symptoms worsened two days prior to presentation and furthermore on presentation. On initial presentation she was in respiratory distress, hypoxic, and tachycardic. She was placed on oxygen on arrival with some improvement, though was persistently hypoxic.

A point-of-care ultrasound (POCUS) was performed which included a lung ultrasound and echocardiogram. On point-of-care echocardiography, a significant pericardial effusion was visualized (Fig. 1). The heart can also be visualized moving within the pericardial sac. M-mode was utilized in the parasternal long axis view which showed mild RV collapse during diastole.

The POCUS finding of RV collapse during diastole in the setting of a visualized pericardial effusion is concerning for early cardiac tamponade physiology, though the patient was determined to not be in tamponade clinically. Based on these findings, cardiothoracic surgery and pediatric cardiology were both promptly consulted, and recommendations were made for drainage of pericardial effusion and transfer to another hospital for further care. Following drainage, serial repeat echocardiograms were performed during admission and there was no re-accumulation of fluid with significant improvement of the patient.

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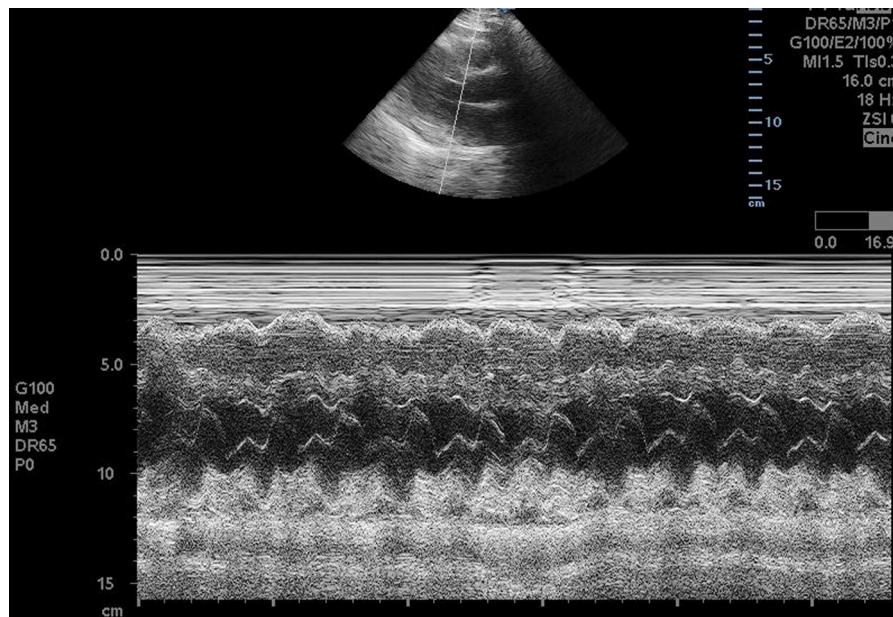


Fig. 1. POCUS Echocardiogram parasternal long axis showing pericardial effusion with M mode that demonstrated mild RV collapse during diastole.

3.1. Questions and Answers with a Brief Rationale True & false and / or multiple-choice questions

3.1.1. Question 1

Question Type (please choose one option) **multiple choice** / image
 What is often the earliest ultrasound finding of cardiac tamponade?
 Answer Options

- a) Diastolic right ventricle collapse
- b) Plethoric IVC
- c) Systolic right atrial (RA) collapse
- d) Swinging heart
- e) Doppler surrogate of pulsus paradoxus

Correct Answer = C

Right atrial collapse is often observed prior to ventricular collapse in the progression of cardiac tamponade due to lower pressure of the RA in systole. RA collapse is commonly seen in systole in tamponade and the specificity of this finding increases as the duration of chamber collapse increases.⁴

3.1.2. Question 2

Question Type (please choose one option) **multiple choice** / image
 Which of the following is the most specific finding of cardiac tamponade on ultrasound?
 Answer Options

- a) Diastolic right ventricle collapse
- b) Plethoric IVC
- c) Systolic right atrial collapse
- d) Swinging heart
- e) Doppler surrogate of pulsus paradoxus

Correct Answer = A

In normal physiology, the right ventricle fills during diastole which can be visualized in multiple views and ways on ultrasound. In tamponade however, the RV will instead collapse due to physical properties. This finding has higher specificity than other findings of tamponade with a specificity of 75-90% and lower sensitivity of 48-60%, which is more specific than RA collapse.⁵

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.visj.2022.101462](https://doi.org/10.1016/j.visj.2022.101462).

References

- 1 Ceriani E, Cogliati C. Update on bedside ultrasound diagnosis of pericardial effusion. *Intern Emerg Med*. 2016;11(3):477–480. <https://doi.org/10.1007/s11739-015-1372-8>.
- 2 Hanson MG, Chan B. The role of point-of-care ultrasound in the diagnosis of pericardial effusion: a single academic center retrospective study. *Ultrasound J*. 2021; 13(1). <https://doi.org/10.1186/s13089-021-00205-x>.
- 3 Raymond TT, Das A, Manzuri S, Ehrett S, Guleserian K, Brenes J. Pediatric COVID-19 and pericarditis presenting with acute pericardial tamponade. *World J Pediatr Congenit Heart Surg*. 2020;11(6):802–804. <https://doi.org/10.1177/2150135120949455>.
- 4 Pérez-Casares A, Cesar S, Brunet-Garcia L, Sanchez-de-Toledo J. Echocardiographic evaluation of pericardial effusion and cardiac tamponade. *Front Pediatr*. 2017;5. <https://doi.org/10.3389/fped.2017.00079>.
- 5 Alerhand S, Carter J. What echocardiographic findings suggest a pericardial effusion is causing tamponade? *Am J Emerg Med*. 2019;37(2):321–326. <https://doi.org/10.1016/j.ajem.2018.11.004>.