

Description of the position and performance of an echocardiogram by subcostal view during the prone position in a patient with severe pneumonia caused by COVID-19

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DESCRIPTION

Point-of-care echocardiograms are a validated method of haemodynamic monitoring, but there are few reports of their use in the prone position. We provide a brief description of a clinical case to show that a subcostal view is possible in a patient in prone position.

We describe a 54-year-old man who was admitted to a critical cardiovascular care unit for severe COVID-19 pneumonia. He developed catastrophic respiratory failure and required deep sedation, neuromuscular blockade and prone positioning. After placing the patient in the prone position, his left arm was extended overhead, and a pillow was placed only under his left hemithorax to elevate and facilitate an apical and subcostal view of the area (figure 1A). An echocardiogram transducer was placed under the patient in the left subcostal position (figure 1A), and an orientation index marker pointing towards the patient's left shoulder was used to observe the cardiac chambers, which shows a non-dilated right ventricle with adequate systolic function and no evidence of pericardial effusion (figure 1B and videos 1 and 2). Subsequent counter-clockwise rotation of the transducer and subtle upward movement of the transducer tail allowed to view a short-axis of right ventricular outflow tract (RVOT), which provided us to appreciate the opening of the aortic valve and RVOT acceleration time (figure 1C,D). By continuing to rotate the transducer counter-clockwise, it was possible to appreciate the non-compressible dilated inferior vena cava (figure 1E and videos 1 and 2). This same position allowed visualisation of the chambers in the apical view.

Echocardiography is a fundamental tool for the diagnosis and haemodynamic monitoring of critically ill and cardiovascular patients.¹ Transthoracic echocardiography (TTE) has the advantages of being non-invasive and safe, and it has noted availability in critical care environments.¹ TTE recently emerged as an alternative to monitor patients in the prone position, with adequate imaging at possibly greater proximity of the heart to the chest wall in this position than in the supine position.^{2,3} A more favourable angle to evaluate the measurements of the inferior vena cava was also described, it tended to increase in size when passing from supine to prone and its compliance may contribute to the

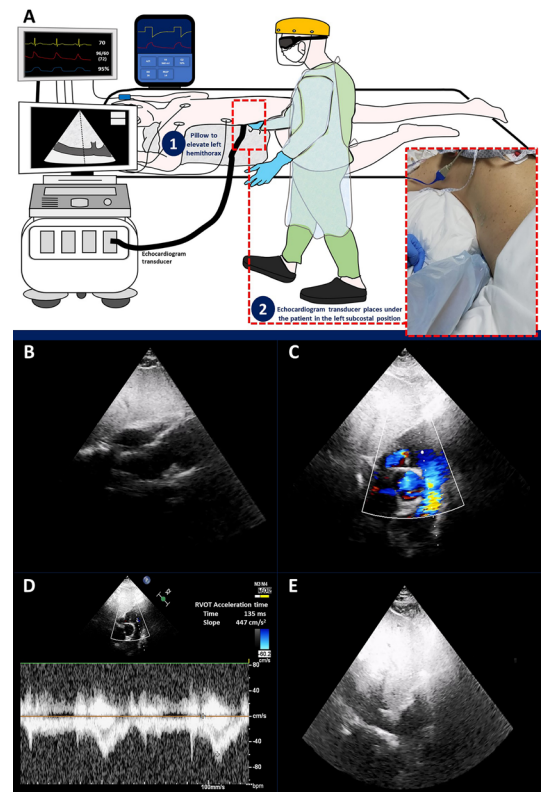


Figure 1 Figure part A shows how to perform subcostal view in prone position. (B) Cardiac chambers. (C) Short-axis RVOT. (D) RVOT acceleration time. (E) Inferior vena cava. Illustration by Johana Vergara. RVOT, right ventricular outflow tract.

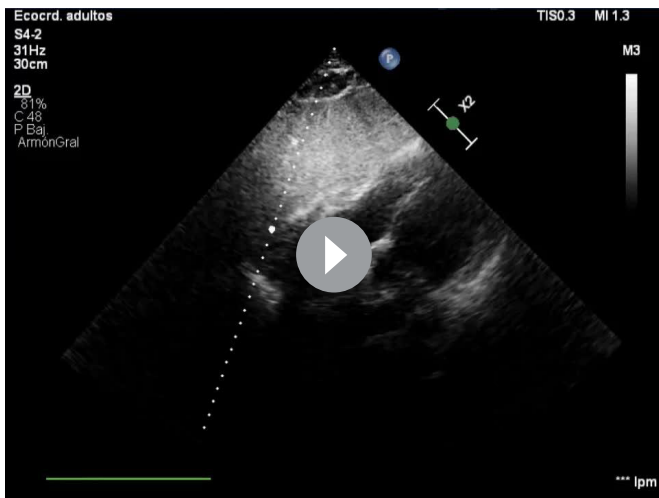
evaluation of the volume status in the prone position.^{4,6} Previous researches described that apical views allowed the evaluation of ventricular and valve function.^{3,6,7} A described position, where the patient's left arm was raised and a pillow placed underneath the midthoracic wall to maintain the left hemithorax in a slightly elevated position, allowed only the apical view to be obtained.⁷ In another position, named the 'swimmer position', the patient's left arm was extended overhead at the shoulder with the elbow bent, and a pillow was placed under the left shoulder to slightly elevate the lateral chest from the bed. The apical view was obtained from the left side of the patient, and the inferior vena cava window was obtained from the



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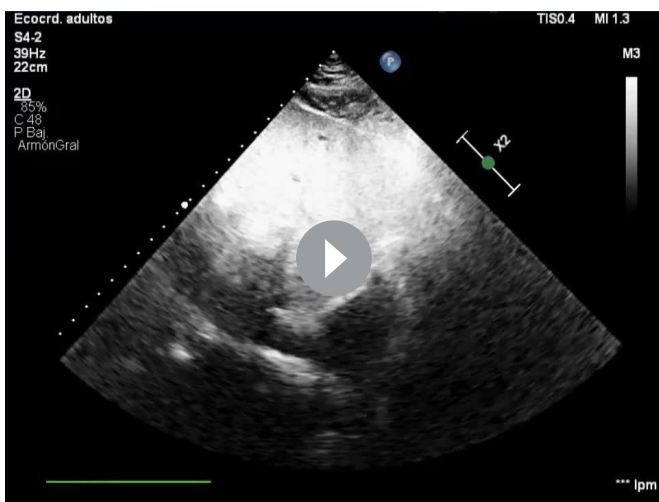
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Video 1 Subcostal view: cardiac chambers

right side of the patient, which only described the apical view and inferior vena cava.⁶ However, none of the aforementioned positions described the subcostal view in detail.

Our technique has the advantage of performing both views, apical and subcostal, at the same side. This view allowed assessments of the right ventricle, pericardial effusion and the volume status. Evaluation of the pulmonary valve was performed, which allows the determination of the presence of pulmonary hypertension by measuring the RVOT acceleration time that was not described in previous publications.⁸ The prone position with a pillow under the hemithorax is easily obtainable in most mobilisation protocols for these patients, without increasing the risk of them. In addition to these factors, adequate apical windows are not always obtained in critically ill patients with invasive



Video 2 Subcostal view: inferior vena cava

Patient's perspective

I hope that this image be useful to promote the use and training of all the tools that are available to health personnel. Also, that it is useful to improve the management of patients in my same position.

Learning points

- ▶ Subcostal view is possible in prone position.
- ▶ Subcostal view is an important complement in the haemodynamic evaluation of the patient in prone position.

mechanical ventilation, and the realisation of the subcostal view as we described is a valid alternative. Finally, this publication describes the novel use of TTE in the prone position, providing the possibility to perform cardiovascular assessments in the subcostal view.

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REFERENCES

- 1 Vieillard-Baron A, Millington SJ, Sanfilippo F, *et al*. A decade of progress in critical care echocardiography: a narrative review. *Intensive Care Med* 2019;45:770–88.
- 2 Chino JP, Marks LB. Prone positioning causes the heart to be displaced anteriorly within the thorax: implications for breast cancer treatment. *Int J Radiat Oncol Biol Phys* 2008;70:916–20.
- 3 Ugalde D, Medel JN, Romero C, *et al*. Transthoracic cardiac ultrasound in prone position: a technique variation description. *Intensive Care Med* 2018;44:986–7.
- 4 Hensley J, Wang H. Assessment of volume status during prone spine surgery via a novel point-of-care ultrasound technique. *Cureus* 2019;11:e4601.
- 5 Ho JD, Dawes DM, Moore JC, *et al*. Effect of position and weight force on inferior vena cava diameter—implications for arrest-related death. *Forensic Sci Int* 2011;212:256–9.
- 6 Gibson LE, Di Fenza R, Berra L, *et al*. Transthoracic echocardiography in prone patients with acute respiratory distress syndrome: a feasibility study. *Crit Care Explor* 2020;2:e0179.
- 7 García-Cruz E, Manzur-Sandoval D, Gopar-Nieto R, *et al*. Transthoracic echocardiography during prone position ventilation: lessons from the COVID-19 pandemic. *JACEP Open* 2020:1–7.
- 8 Parasuraman S, Walker S, Loudon BL, *et al*. Assessment of pulmonary artery pressure by echocardiography—A comprehensive review. *Int J Cardiol Heart Vasc* 2016;12:45–51.

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