

Bedside ultrasonography for the diagnosis of pneumonia

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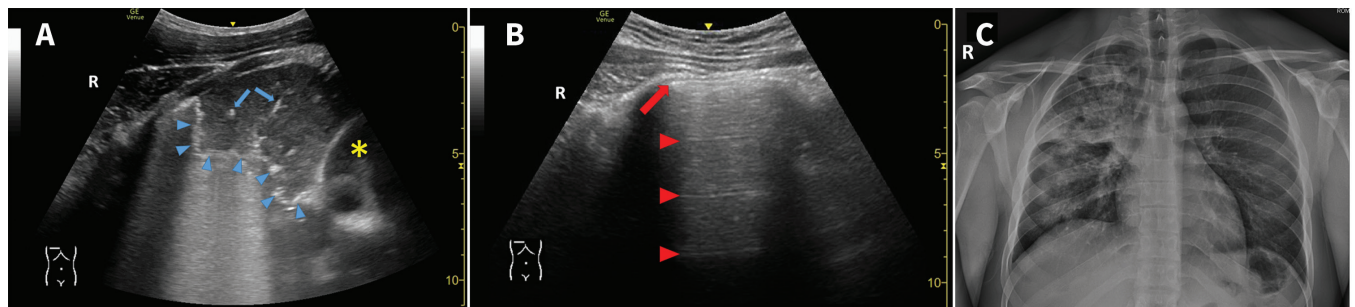


Figure 1: (A) Ultrasonogram from intercostal anterior transverse view (obtained with a 1–5 MHz convex probe) showing pneumonia, seen as a hepatic area, which acts as an acoustic window that allows for visualization of the heart (asterisk). A hyperechoic, irregular line (arrowheads) with sound artifacts represents the deep border of the consolidation. Air bronchograms (arrows) appear as hyperechoic structures within lung consolidation; their movement with breathing can be appreciated in the video (Appendix 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.210038/tab-related-content). (B) Ultrasonogram of a normal lung, obtained with the same probe. Pulmonary parenchyma cannot be seen, as most ultrasound waves are reflected back from the pleura, which appears as a hyperechoic line (arrow), resulting in horizontal, repetitive artifacts called A-lines (arrowheads). (C) Chest radiograph showing consolidation of the right upper and middle lobes.

A 25-year-old man presented to the emergency department with a 7-day history of fever and productive cough. On admission, his temperature, blood pressure and pulse were normal; however, his respiratory rate was 24 breaths per minute, and his oxygen saturation on room air was 94%. We heard diminished breath sounds and inspiratory crackles on right upper chest auscultation. Laboratory results showed high levels of C-reactive protein and leukocyte count within normal range. We performed point-of-care ultrasonography (Figure 1A), which showed a well-defined, wedge-shaped consolidation with tissue-like echotexture in the right upper and middle lobes of the lung (i.e., hepaticized lung), suggestive of pneumonia. The transition between consolidated and normally aerated areas appeared as an irregular, hyperechoic line (shred or fractal sign).¹ We observed dynamic air bronchogram (i.e., air in the bronchi, seen as branching hyperechoic structures within the consolidated lung that move with breathing), another sign suggestive of pneumonia. We performed chest radiography, which confirmed extensive consolidation of the right lung (Figure 1C). We admitted the patient to hospital and treated him empirically for pneumonia with a third-generation cephalosporin and clarithromycin dual therapy. The causative infectious agent could not be identified, and we discharged the patient after 6 days of clinical improvement.

Sonographic artifacts in lung ultrasound imaging provide valuable information about pulmonary parenchyma that may be underappreciated on chest radiographs.^{1,2} Extensive pneumonias with the features observed in this case can be relatively easily identified.³ More subtle signs, such as unilateral, abolished pleural sliding with breathing and focal B-lines (i.e., hyperechoic, vertical lines arising from the pleura), may help identify smaller consolidations in certain clinical contexts.^{1,2} Furthermore, ultrasonography may show complications, such as pleural effusion.^{1–3} Although operator expertise may be limited,³ point-of-care ultrasonography of the lung can be a useful initial imaging test for suspected pneumonia in both inpatient and outpatient settings, given its diagnostic accuracy (overall sensitivity and specificity of 85%–95% and 75%–90%, respectively),³ fast learning process, safety, portability, relatively low cost and widespread availability.

References

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A video of the point-of-care ultrasonography of a 25-year-old man with pneumonia is available at Appendix 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.210038/tab-related-content

Clinical images are chosen because they are particularly intriguing, classic or dramatic. Submissions of clear, appropriately labelled high-resolution images must be accompanied by a figure caption. A brief explanation (300 words maximum) of the educational importance of the images with minimal references is required. The patient's written consent for publication must be obtained before submission.