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Title: Diagnostic accuracy of trans-thoracic chest ultrasonography in patients with acute respiratory failure

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Body: Background: The aim of this prospective study was to define the accuracy of chest ultrasound (CU) in patients with pulmonary diseases resulting in acute respiratory failure (ARF). Methods: Fifty nine patients with ARF underwent CU examination as part of their evaluation blinded to their diagnosis. We compared CU results and final diagnosis based on laboratory, chest radiography and/or CT scans. Different CU findings were assessed including horizontal A lines, vertical B lines, lung sliding (LS), alveolar consolidation (AC), and/or pleural effusion. These patterns were correlated with final clinical diagnoses. Results: For pulmonary edema (n=16), anterior bilateral B lines had 96% specificity and 95% sensitivity. For COPD and asthma (n=14), anterior-predominant A lines with lung sliding had 96% specificity and 86% sensitivity. For pneumonia (n=12), different patterns were seen; AC (n=5), anterior-predominant B lines on one side and predominant A lines on the other (n=4), and A lines plus pleural effusion (n=3) with 92% specificity and 85% sensitivity. For pulmonary embolism (n=5), unilateral anterior predominant bilateral A lines associated with LS with or without peripheral hypoechoic lesion showed 95% specificity and 79% sensitivity. For pneumothorax (n=4), absent anterior LS, anterior A lines, and positive lung point had 100% specificity and 75% sensitivity. For all patients, CU correlated with final diagnoses in 90% of cases. Conclusions: CU is a simple, bedside noninvasive tool that can help making rapid diagnosis in critically ill respiratory patients with ARF. Despite its adequate sensitivity, other imaging modalities may be needed in certain clinical situations.