



# Comparing Pulmonary Ultrasound Findings When Viewing Lung Pleura Beneath Costal Cartilage Compared to Costal Bones

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## Introduction

Pulmonary ultrasound is one modality to quickly diagnose pneumothoraces and other lung pathologies in critically ill patients. Studies have demonstrated pulmonary ultrasound to be superior to chest radiographs in diagnosing pneumothoraces.<sup>1-2</sup> Unfortunately, the bones of the chest wall often produce shadowing that can make it difficult to visualize the lung pleura. We aim to compare the ease of identifying lung sliding when viewing the pleura beneath rib cartilage located closer to the sternum versus rib bone more laterally.

## Methods

Five volunteers acted as ultrasound models for scans performed by a single ultrasound credentialed emergency medicine physician using a Sonosite X-Porte L25xp linear transducer. For each model, bilateral lung ultrasounds were performed adjacent to the sternum over rib cartilage and at the same rib laterally over rib bone. The transducer was placed in 3 locations at each rib level: directly over the rib, partially over the rib, and between ribs. Forty-five participants were enrolled including resident and attending physicians at all levels of training. Participants reported their level of confidence in identifying clear lung sliding the recorded scans. A five-point scale was used with 1 signifying “not at all clear” and 5 being “very clear”. The Wilcoxon Signed Rank Test was used for statistical calculations.

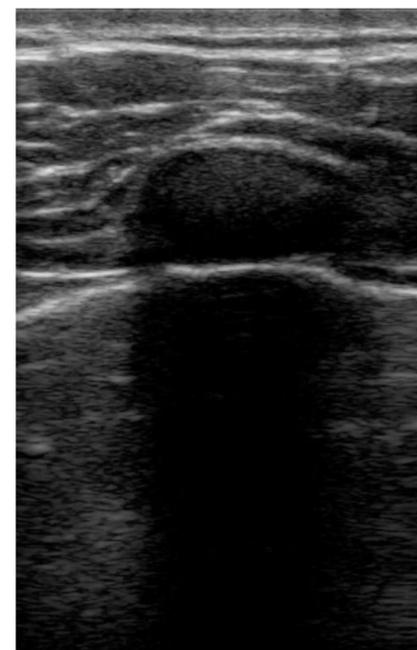


Image 1: Lung sliding between cartilage

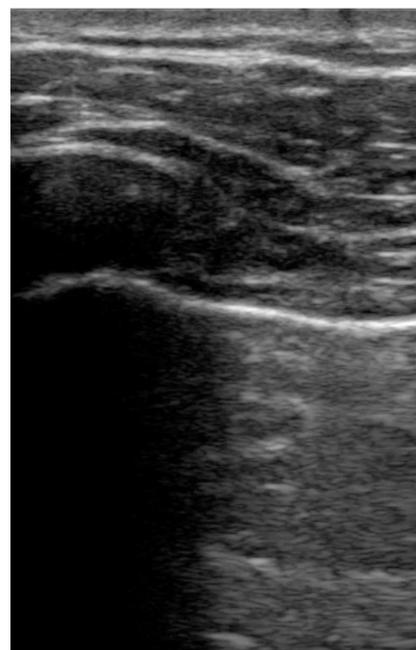


Image 2: Lung sliding directly over cartilage

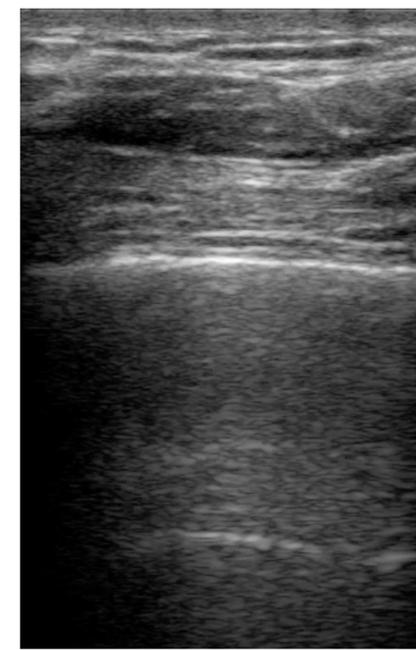


Image 3: Lung sliding partially over cartilage

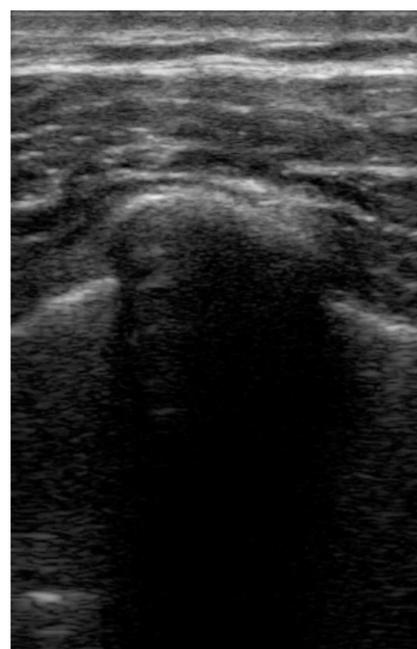


Image 4: Lung sliding between bone

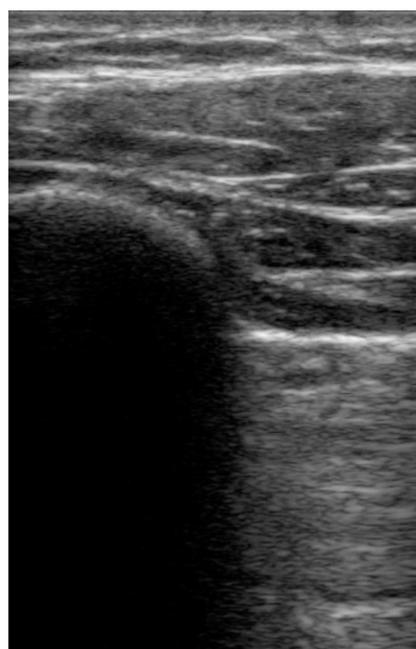


Image 5: Lung sliding directly over bone

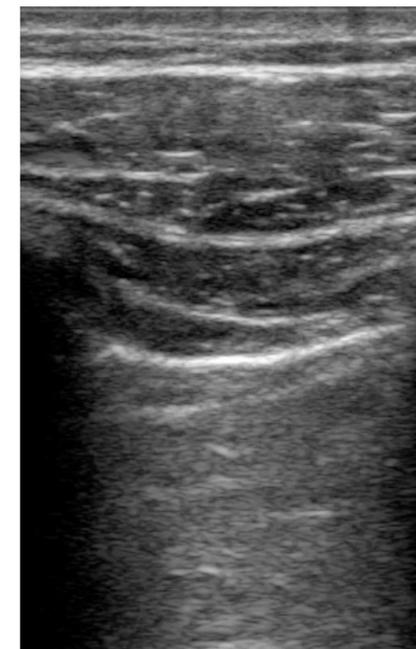


Image 6: Lung sliding partially over bone

## Results

Overall, the composite scores of lung sliding clarity were greater for images performed medially over costal cartilage compared to laterally over bone (3.5 vs 3.3,  $p=0.02$ ).

When stratified by the location of cartilage or bone within the image, lung sliding demonstrated greater clarity when viewed directly over cartilage versus bone (3.0 vs. 2.4,  $p<0.01$ ) or partially over cartilage versus bone, (3.4 vs 3.1,  $p<0.01$ ).

No statistical difference was found when viewing images of lung sliding between cartilage versus bone (3.7 vs 3.7.  $p=0.26$ ).

## Conclusion

Assessing lung sliding using pulmonary ultrasound demonstrated greater clarity when performed near the sternum over the rib cartilage versus placing the probe laterally over rib bone.

This study suggests that Emergency Medicine clinicians should consider performing ultrasounds over rib cartilage when evaluating lung pathology.

## References

1. Alrajab S, Youssef A, Akkus N, et al. Pleural Ultrasonography versus Chest Radiography for the Diagnosis of Pneumothorax: Review of the Literature and Meta-Analysis. *Crit Care*. 2013;17(5): R208
2. Alrajhi K, Woo MY, Vaillancourt C. Test Characteristics of Ultrasonography for the Detection of Pneumothorax: A Systematic Review and Meta-Analysis. *Chest*. 2012;141(3):703-708.