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Ultrasound in Emergency Medicine

POINT-OF-CARE ULTRASOUND DIFFERENTIATION OF LUNG CONSOLIDATION AND NORMAL THYMUS IN PEDIATRIC PATIENTS: AN EDUCATIONAL CASE SERIES

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☐ **Abstract—Background: There is a growing body of evidence to support the utility of lung point-of-care ultrasound (POCUS) in pediatric patients with multiple pulmonary pathologies, particularly pneumonia. As we increase our use of lung POCUS for pediatric patients with respiratory complaints, we must be mindful of the normal anatomy and sonographic findings within the pediatric chest and aware of how to distinguish normal findings (e.g., thymus) from pathologic findings (e.g., consolidation). Case Reports: We report four cases of pediatric patients who presented to the Emergency Department with respiratory complaints for which POCUS was able to distinguish lung consolidation and normal thymus in the anterior chest. Why Should an Emergency Physician Be Aware of This?: The use of lung ultrasound to detect pneumonia is extensively documented in the pediatric literature. Emergency physicians may not be aware of how to discriminate the normal sonographic appearance of the thymus from lung consolidation on POCUS. The ability to identify normal and pathologic findings within the pediatric chest by POCUS will be increasingly important to appropriately reduce the use of plain radiography for pediatric patients with respiratory complaints.** **© 2018 Elsevier Inc. All rights reserved.**

☐ **Keywords—point-of-care ultrasound; emergency department; pediatrics; thymus; pneumonia**

INTRODUCTION

Lung point-of-care ultrasound (POCUS) has been shown to be an important tool for efficiently triaging and diagnosing pediatric patients with respiratory complaints. There is extensive evidence to support the use of POCUS for diagnosing community-acquired pneumonia as well as many other pulmonary disease processes (1). The test characteristics for POCUS-diagnosed pneumonia are similar to those of plain radiography, suggesting that POCUS may be an acceptable alternative to chest x-ray (CXR) (2). Increased use of lung POCUS in place of plain radiography may allow reduction in ionizing radiation exposure for young patients, but emergency physicians must be able to distinguish the normal sonographic appearance of the thymus from lung consolidation, as these are both commonly encountered.

The thymus is sonographically visible in the anterior thorax in pediatric patients, especially infants. The thymus is generally located within the anterior mediastinum but may extend into the neck, middle, or posterior mediastinum (3). It is easily visualized from either suprasternal or parasternal views given its anterior location (4). The incompletely ossified costal cartilage and sternum in young children provide ideal acoustic windows (3). The shape, location, and symmetry of the thymus within the anterior mediastinum varies, and its size changes based on age and physical health. Although it is most commonly visualized on plain radiography of infants

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and young children, it is persistent and sonographically visible in school-age children and teenagers as well. As the appearance of the thymus on plain radiography can be confused with cardiomegaly, or parenchymal or mediastinal processes, its sonographic appearance can also be confused with lung consolidative processes, most commonly pneumonia (3,5).

CASE REPORTS

Case 1

An 8-month-old boy with hemoglobin sickle cell disease presented to the Emergency Department (ED) for evaluation of fever. He had mild nasal congestion but no cough or respiratory distress. On examination, his vital signs were: temperature 38.8°C (101.8°F), heart rate 164 beats/min, respiratory rate 48 breaths/min, and oxygen saturation of 98% on room air. His lungs were clear to auscultation bilaterally without focal findings or accessory muscle use. As part of a more comprehensive lung POCUS study, ultrasound of the anterior chest via parasternal windows was performed with a 12-4 MHz linear transducer in both sagittal and transverse views. A well-circumscribed structure was identified in the anterior, superior left hemithorax with echogenic internal linear structures and punctate foci. There were no surrounding b-lines or parenchymal changes in the adjacent lung tissue (Figure 1A). A CXR was performed and revealed no focal airspace opacities and a thymic shadow on the left (Figure 1B). After obtaining a blood culture, the patient had received a dose of intravenous antibiotics given the risk of bacteremia in children with sickle cell disease but was discharged home in improved condition off antibiotics after a brief period of observation.

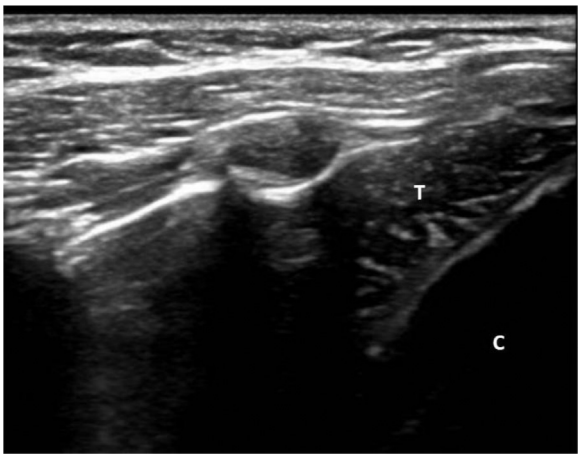

Figure 2. Sonographic appearance of normal thymic tissue on longitudinal view of the left anterior chest superior and anterior to the cardiac silhouette. T = thymus; C = cardiac silhouette.

Case 2

An 11-month-old girl presented to the ED with first-time wheeze. She had 1 week of rhinorrhea prior to developing a cough, fever, and audible wheeze on the day prior to presentation. There was no concern for foreign body aspiration. On arrival, vital signs were: temperature 37°C (101.6°F), heart rate 154 beats/min, respiratory rate 48 breaths/min, and oxygen saturation 95% on room air. Breath sounds were symmetric bilaterally with expiratory wheeze in all fields. POCUS, as above, revealed a well-defined structure in the anterior, superior left hemithorax that conformed to the heart border and contained echogenic internal linear structures. There were no surrounding b-lines or parenchymal changes in the adjacent lung tissue (Figure 2). The patient was given a single albuterol

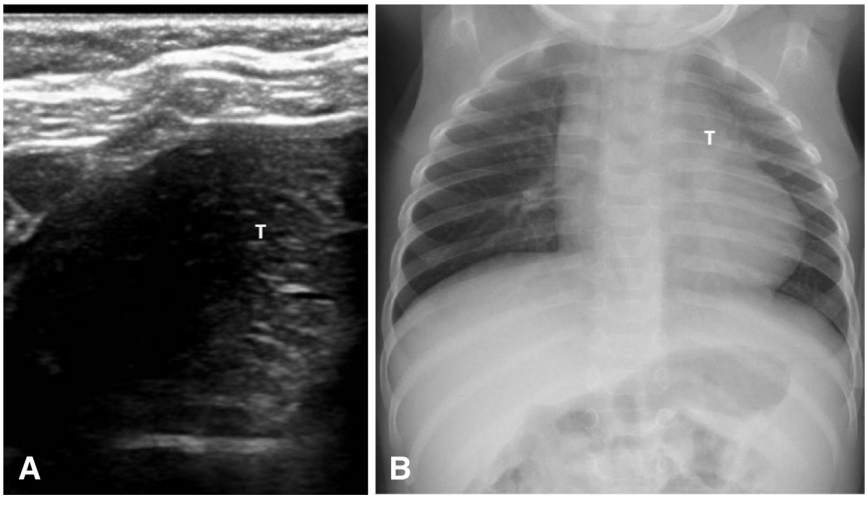

Figure 1. (A) Sonographic appearance of normal thymic tissue on longitudinal view of the left anterior chest. (B) Chest x-ray of the same patient with thymic shadow on the left. T = thymus.