

Emergency Point of Care Thoracic Ultrasound for Diagnosis of Empyema in Children

Sudha Chandelia*, Sarita Jilowa**

Abstract

Respiratory distress is a common presentation in pediatric emergency and pneumonia with empyema is one of the important causes requiring immediate drainage. Accurate and fast diagnosis is the key to successful management. The diagnosis is usually made by chest X ray. X rays take time to diagnose, involve radiation exposure to children and most importantly may miss the diagnosis. We present a case of pneumonia with empyema that was diagnosed using emergency point of care thoracic ultrasound. Following this intercostal chest drainage tube was put and pus was drained. Chest X ray later on showed corroborate findings. This case suggests that point of care ultrasound is feasible and useful investigation for diagnosing empyema in children in emergency and can be used to take a decision for intercostal drainage.

Keywords: Thoracic Ultrasound; Point of Care Ultrasound; Empyema; Emergency.

Introduction

Conventional radiography is routinely used to confirm the diagnosis of empyema in pediatric emergency. It takes time and may delay the diagnosis and treatment. Point of care ultrasound can diagnose it faster and accurately resulting in earlier intercostal drainage and improved outcome.

Case Report

An eight years old boy presented with fever and cough for four days and respiratory distress for a couple of hours. On examination he was febrile and had increased work of breathing in the form of tachycardia, tachypnea and intercostal retractions. On chest auscultation, air entry was decreased on right side over middle and lower lung zones.

Crepitations were also appreciated over right chest in corresponding areas. Left chest had normal air entry. A clinical diagnosis of pneumonia was made and chest X ray was ordered. Oxygen, fluid and Antibiotic therapy were started. Meanwhile thoracic point of care ultrasound (POCUS) was performed using both a lower frequency 5 MHz and a higher frequency 7.5 MHz probe. Each lung was divided into six areas (superior and inferior of anterior, lateral and posterior zones). Anterior axillary line divided anterior from lateral and posterior axillary line divided lateral from posterior area. The lungs were scanned with probe orientation both vertical (with the transducer orientation marker pointed towards cephalad); and horizontal to the ribs. It showed a wide separation of parietal and visceral pleura due to presence of fluid in the pleural space. Pleural space appears usually like a thin line. In this case the pleural line was thicker than usual. The pleural space fluid also showed presence of fibrinous strands and septations, suggestive of its exudative nature i.e empyema. Right lower lung showed presence of air bronchogram which were of dynamic nature, suggestive of consolidation. The diagnosis of pneumonia with empyema was made. Diagnostic pleural tap was done which revealed pus. Intercostal drainage tube was put immediately and pus was drained. Later on chest X ray was collected which showed opacification of lung in corresponding areas. Bacterial culture of the right pleural fluid sample grew *Staphylococcus aureus*. The child was monitored by

Author Affiliation: *Assistant Professor, Division of Paediatric Critical Care, Department of Pediatrics, **Associate Professor, Department of Radio-Diagnosis, PGIMER and Associated Dr. R.M.L. Hospital, New Delhi, India.

Reprint Request: Sudha Chandelia, 403, PGIMER, Administrative Building, Dr. Ram Manohar Lohia Hospital, New Delhi, 110001.

E mail: Sudhach83@rediffmail.com

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daily POCUS and a chest X ray was done on 7th day which showed complete lung aeration.

Discussion

Patients coming to emergency at odd hours are usually very sick. If they need X rays to be done on them, it has to be a supine antero-posterior view due to their inability to stand. Literature shows that Supine anterior-posterior chest radiographs may fail to diagnose a pleural effusion that is easily picked up by chest CT and ultrasound [1,2]. For detection of

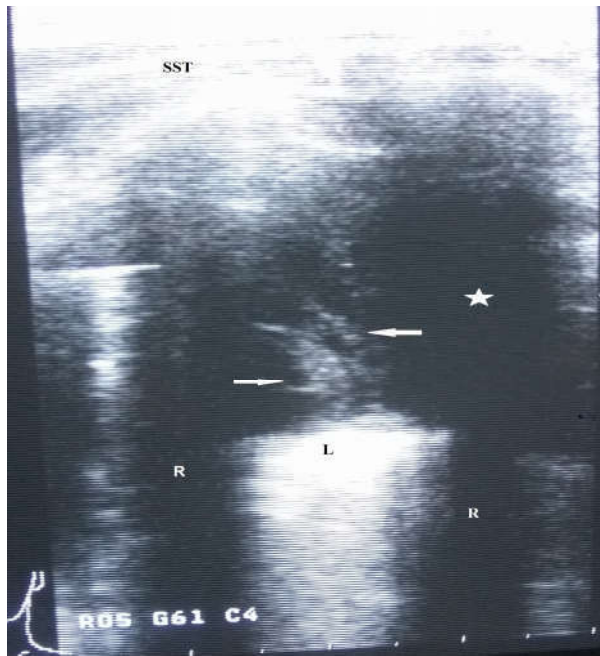


Fig. 1: Showing a large intrapleural collection shown by star. Fibrinous strands and septations are shown by arrows. Rib acoustic shadow (R), lung surface (L), skin and subcutaneous tissue (SST).

pleural effusion, upright postero-anterior and lateral chest radiographs are better views but these can also miss a considerable number (upto 10%) of cases, requiring drainage. As far as transthoracic/pleural ultrasound is concerned, it has been documented to be superior to radiography for exposing an effusion. Many studies have demonstrated its high sensitivity (94%), specificity (98%) in various clinical settings [3]. Pleural ultrasound can detect fluid as low as upto a volume of 20 mL reliably [4]. Moreover a Chest X ray does not differentiate between types of fluid (transudate/exudates) collected whereas ultrasound can reliably do that [5]. Exudative fluid is suggested by the presence of fibrinous stranding, septations, and loculations. These look like white thin fibers swimming in the dark grey-black fluid. Sometimes these may appear like honeycomb or cobweb. Whatever the appearance is, these can be easily

identified on lung ultrasound and the need of CT may be reduced as Chest CT does not provide any additional information as compared to chest ultrasound. [6]. Rather in one report ultrasound was found to be better than CT [7]. This is also applicable to patients where decision for intrapleural fibrinolytic therapy is needed. It can be decided with confidence on ultrasound evidence of septations in the presence of empyema in a sick child with respiratory distress. An emergency physician can appreciate these findings after seeing these only once. Also the response can be documented daily bedside and further surgery may be planned in case of non-response. We have enough data in favour of ultrasound. But most of the studies have been done and published by radiologists. There is need to build up data in emergency situations by emergency clinicians. There are very few case reports which used POCUS in emergency diagnosis of empyema. But these have been done on adult patients [8-10]. This case suggests that POCUS can also be done easily and rapidly in pediatric emergency also. POCUS is a great adjunct to Physical chest examination because it cannot differentiate the type of fluid collections and amount of fluid. Also it takes years of practice and experience to appreciate clinical findings so at times it may be difficult to diagnose by postgraduates and residents on duty. On the other hand POCUS findings are objective and so it leaves very little space for any confusion. Hence POCUS is an important bedside tool to confirm physical examination in cases with empyema and pneumonia presenting in emergency. POCUS is a better diagnostic modality over chest radiographs so Chest X rays can be avoided and patient monitoring can be done with thoracic ultrasound. Thoracocentesis can be decided upon bedside ultrasonography without waiting for radiograph report.

Conflict of Interest: None

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Declaration

The patient's written consent to publication has been obtained.

Author Contribution

SC: concept, literature review, manuscript draft and final approval.

SJ: manuscript draft and final approval.

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