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Case Report

Bedside Ultrasound in an Infant With Respiratory Distress: Clue to Congenital Malformation

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A B S T R A C T

Lung ultrasound is an effective tool for diagnosing pediatric respiratory conditions. We present a case that highlights the role of bedside lung ultrasound in identifying congenital pulmonary airway malformation in a 3-month-old male presenting with fever and respiratory distress. The initial chest X-ray was inconclusive, but bedside lung ultrasound revealed cystic lung lesions, later confirmed by high-resolution CT. The case underscores the utility of LUS as a rapid, bedside screening tool for congenital lung anomalies. We discuss the advantages of LUS over conventional imaging and its potential role in early CPAM diagnosis.

Keywords: Congenital Pulmonary airway malformation, Lung ultrasound, POCUS

Introduction

Congenital Pulmonary Airway Malformation (CPAM) is a rare developmental anomaly of the lung, characterized by cystic airway malformations resulting from abnormal branching during fetal lung development. It has an incidence of 1 in 10,000 to 1 in 35,000 births [1] and may present with a wide spectrum of clinical manifestations, ranging from asymptomatic cases to severe respiratory distress in infancy. Diagnosis is often challenging due to its overlap with other respiratory conditions, and imaging plays a crucial role in its identification. While CT remains the gold standard for CPAM diagnosis, recent studies have highlighted the potential of lung ultrasound (LUS) as a non-invasive, radiation-free alternative with high diagnostic accuracy.

Case report

A 3-month-old male infant was admitted with fever and rapid breathing for two days. There was no history of cough, coryza, or noisy breathing. The birth history was suggestive of a preterm infant born at 34 weeks of gestation via vaginal delivery, with a birth weight of 1.8 kg, with no significant antenatal or perinatal complications.

On examination, the patient had tachypnea, subcostal and intercostal retractions, and reduced air entry on the left side of the chest. Cardiovascular, abdominal, and neurological examinations were unremarkable. The infant was started on non-invasive ventilatory support, IV antibiotics (Monocef and Amikacin), and nebulization. Despite initial stabilization, respiratory distress worsened by day 4, with signs of bronchospasm and further reduction in air entry, for which the patient was transferred to the pediatric intensive care unit.

On further investigation, the chest X-ray revealed homogenous opacification of the left hemithorax with lucency in the left middle zone of the lung with obliteration of the diaphragmatic and cardiac silhouette, raising suspicion of CPAM or congenital diaphragmatic hernia (CDH) (Fig. 1). Bedside lung ultrasound showed multiple anechoic lesions present within the left hemithorax, involving the

left lung parenchyma, and the diaphragm outline and contour appear preserved, with no breach in the diaphragm (Fig. 2), suggesting CPAM. High-Resolution Computed Tomography (HRCT) of the chest confirmed Type 1 CPAM, characterized by a well-defined air-filled cyst with a thick wall in the left lower lobe, along with adjacent atelectatic changes (Fig. 3). The patient was managed conservatively with antibiotics and supportive care and was transferred to pediatric surgery for further management.

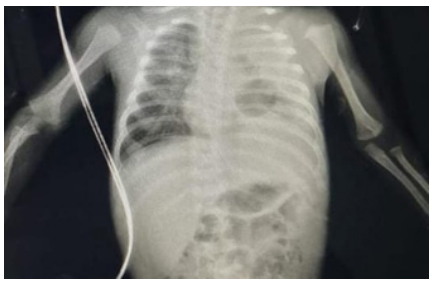

Figure 1.X ray chest showing a cystic lesion in the left lung with underlying consolidation

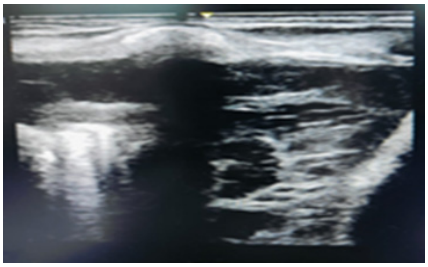

Figure 2.Lung ultrasound showing multiple cystic lesions in the left lung, supporting the diagnosis of CPAM

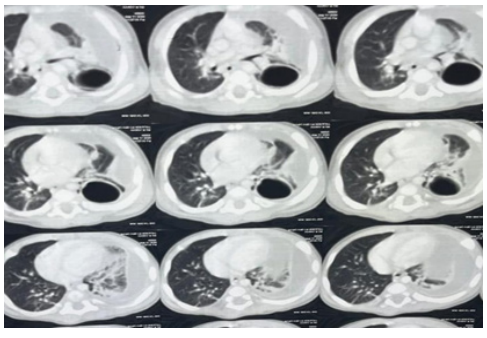

Figure 3.CT scan showing a well-defined air-filled cyst with a thick wall in the left lower lobe, along with adjacent atelectatic changes, confirming Type I CPAM

Discussion

Point-of-care ultrasound (POCUS) has revolutionized the early diagnosis and management of respiratory conditions. Initially introduced for acute respiratory emergencies such as pneumothorax, its utility has expanded to detect a variety of lung pathologies, including congenital malformations. As a bedside tool, POCUS provides real-time, radiation-free imaging, making it invaluable for differentiating CPAM from other pulmonary conditions. Quercia et al. demonstrated that LUS findings strongly correlate with CT imaging, making it a reliable, radiation-free alternative for CPAM diagnosis.[2] They reinforced LUS's ability to classify CPAM based on cyst diameter, aiding in disease management and prognosis. Similarly, Yousef et al. validated LUS as a diagnostic tool, showing that it accurately detects CPAM lesions and differentiates them from other neonatal respiratory conditions.[3] POCUS helps in reducing unnecessary radiation exposure by serving as an effective alternative to repeated chest X-rays.[4]

Beyond CPAM, Donoghue et al. highlighted LUS's utility in diagnosing other congenital chest malformations, including lung agenesis, lung aplasia, pulmonary sequestration, chylothorax, and congenital diaphragmatic hernia.[5] In developed countries, most congenital respiratory tract abnormalities are diagnosed prenatally, with ultrasound as the first-line imaging tool and MRI as the second line for further evaluation.[6] These imaging techniques are essential for diagnosing respiratory problems in newborns because they can find structural problems and tell the difference between congenital anomalies.

While CT remains the gold standard for confirmation and surgical planning, POCUS serves as an effective initial screening tool that ensures timely intervention and improved patient outcomes.

Bedside lung ultrasound and POCUS are safe, effective, and accessible diagnostic modalities for CPAM. They offer significant advantages over traditional imaging methods and should be considered for preliminary evaluation of congenital lung malformations in pediatric emergency settings. Early identification and timely intervention using POCUS can significantly improve outcomes in affected infants.

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