



Point of Technique Cardiac Critical Care

Diagnosing Pneumothorax with Bedside Ultrasound in a Neonate Post-cardiac Surgery

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Received : 25 February 2023
Accepted : 25 April 2023
Published : 30 May 2023

DOI
10.25259/JCCC_13_2023

Quick Response Code:



ABSTRACT

Ultrasonography at bedside has become the standard for diagnosing pleural pathologies such as pneumothorax, pleural effusions, and lung parenchymal lesions like consolidation, collapse at ease with a very high sensitivity and specificity at 87% and 99%, respectively, in emergency rooms and intensive care units. Moreover, it is easy, quicker, repeatable, and without radiation exposure compared to chest X-ray. However, in neonates and infants in early post-cardiac surgery period, it becomes difficult to conduct lung ultrasound due to various reasons such as sternotomy/thoracotomy wound, large dressings over the chest, chest drains, soft-tissue edema, lung congestion post-surgery, and logistically it is difficult to fit the conventional USG probe on the tiny chest walls. Literature also is scarce in these subset of patients regarding ultrasound diagnosis of pneumothorax. We describe an infant who developed sudden massive pneumothorax and we diagnosed by lung ultrasound.

Keywords: Pneumothorax, Bedside ultrasound, Neonate, Post-cardiac surgery

THE CASE VIGNETTE

A 1-month-old baby weighing 3 kg diagnosed with congenital cyanotic heart disease, Tetralogy of Fallot, reduced pulmonary blood flow, long segment pulmonary atresia, and left pulmonary artery stenosis at origin. The child underwent right modified Blalock-Taussig shunt using 3.5 mm PTFE graft. Postoperatively, the patient developed features of shunt overflow with interstitial edema and third spacing with generalized anasarca requiring diuretics. Longer endotracheal intubation and invasive mechanical ventilation landed the Patient in sepsis with respiratory secretions yielding multidrug resistant acinetobacter. Patient was treated with colistin and tigecycline. Patient had extubation failure twice; hence, surgical tracheostomy was performed with 3.5 mm cuffed tracheostomy tube. Post-tracheostomy auscultation revealed reduced air entry in the right side of the chest, the infant remained stable hemodynamically and SpO₂ read 84%, his arterial blood gas analysis showed severe respiratory acidosis with PH: 6.87, PO₂: 64.3 and PCO₂: 103.5.

Pneumothorax was suspected in view of reduced air entry in right side and high CO₂ and call sent for urgent chest X-ray. In mean time, lung ultrasound was done with conventional adult linear adult probe (6–13 Hz, Sonosite, Fujifilm) which showed the lung point shifted posteriorly and in M mode Stratosphere sign changing into Barcode sign at the level of lung point [Figure 1]. Pneumothorax was diagnosed and arrangements were done for intercostals drain (ICD) insertion. ICD was inserted in the fourth right intercostal space in midaxillary line and pneumothorax



Figure 1: Lung ultrasound, M-mode. The blue arrow head shows lung point and here the stratosphere sign changes to Barcode sign.

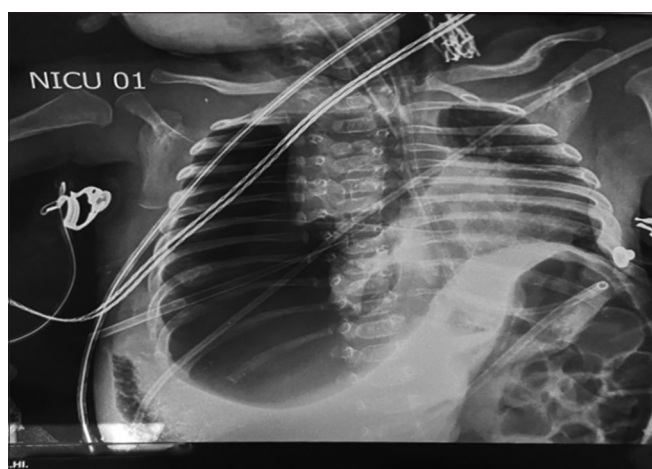


Figure 2: Chest X-ray showing massive right-sided pneumothorax with mediastinal shift to the left.

was decompressed. Clinically, air entry to right lung and arterial blood gas improved, respiratory acidosis resolved. Chest X-ray done just before ICD insertion showed a large pneumothorax (15 min later when film was collected) in the right side with mediastinal shift [Figure 2].

The present day trend is to diagnose pleural pathologies such as pneumothorax, pleural effusion, lung consolidation, and collapse with bedside ultrasound with almost 100% accuracy. The bedside ultrasonography has been documented to be highly sensitive (87%) and specific (99%) for diagnosing pneumothorax in emergencies and intensive care units.^[1] However, many a times, it becomes difficult in early

post-operative cardiothoracic surgical patients to perform lung ultrasound due to sternotomy/thoracotomy, chest drains, soft-tissue edema, high skin turgor, lung congestion and/or infection, and large surgical dressings. Moreover, also it further becomes inadequate in neonates and infants post-cardiac surgery due to above factors and ultrasound probe not fitting too well to the tiny chest wall. However, in this neonate, it was post-operative day 7 and main sternotomy wound was healing well and dressings were removed as skin had healed and healthy. We could successfully perform ultrasound and diagnose massive right pneumothorax and ICD was inserted before tamponade and hemodynamic collapse occurred. Whereas lung ultrasound has a sensitivity and specificity of 99% and 98%, respectively, for diagnosing neonatal pneumothorax,^[2,3] but the same has not been documented in the literature for post-cardiac surgical neonates and infants.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Rajeev M, Sahu M, Singh U, Balyan SK. Diagnosing pneumothorax with bedside ultrasound in a neonate post-cardiac surgery. *J Card Crit Care TSS* 2023;7:102-3.