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Case Report
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Lung Ultrasound in a Critically Ill Trauma Patient: A Case of Haemothorax Overlooked with Chest Radiograph and Computerised Tomography

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Abstract

Critical care ultrasound has earned its place not just as a further investigation step but as a bedside physical assessment and monitoring tool. Its potential to become the twenty-first-century stethoscope has proved its accuracy by many protocols so far.

Keywords: Bedside lung ultrasound, blue protocol, critically ill

Introduction

Lung ultrasound in critically ill (LUCI) has many advantages over chest X-ray and computed tomography (CT). Besides its easy availability, reproducibility, cost-effectivity and absence of radiation, bedside lung ultrasound in emergency (BLUE) protocol has enabled immediate life-saving decision making in trauma patients with high accuracy.

We present a case of blunt trauma diagnosed as haemothorax not identified at the same time chest X-ray or CT but with ultrasonography (USG).

Case Presentation

A 34-year-old female patient presented to our emergency room with a history of suicidal attempt from a high bridge. She was rescued after a brief time in the sea.

Upon physical examination, she was confused with a Glasgow Coma Scale of 14. She was stable with a heart rate of 100 and a blood pressure of 90-60. There was no trauma sign at abdominal and extremity examination other than contusions.

She had spontaneous breathing with a rate of 20 min^{-1}. Lung sounds were identified in every zone with rales. In chest X-ray, there were bilateral wedge-shaped nonhomogenous opacities; pulmonary sinuses were intact. She had an oxygen mask supply of 4 L min^{-1} and a oxygen saturation (SPO_2) of 94%.

She was transmitted to the intensive care unit (ICU) for close monitoring with a diagnosis of aspiration pneumonia and acidosis.

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Figure 1. Chest X-ray.

We planned antibiotic therapy, fluid resuscitation and intermittent noninvasive ventilation (NIMV). One hour after ICU admission oxygenation and ventilation were better and acidosis was healed. The patient needed less NIMV support and oxygen supply.

On day 1, we applied BLUE protocol and found loss of A-lines with fractal or shred sign at apical zones and multiple B lines at basal zones bilaterally incompatible with pneumonia and interstitial syndrome.

On days 2 and 3, the patient was followed with a well progressed clinical presentation and normal physical examination other than diminished lung sound at right basal. Besides on the night of the third-day, erythrocyte was supplemented according to a striking fall of haematocrit level.

On the fourth day morning, her clinic deteriorated suddenly; she had tachypnoea, dyspnoea and needed more oxygen supply. At auscultation, there were no sounds at the right basal and diminished sounds at the middle level. On portable chest X-ray, there were no signs other than resolved bilateral opacities; sinuses are intact (Figure 1). For further evaluation, she was taken to the radiology department for CT, with an oxygen supply of 6-minutes and SPO_2 90%.

At the CT report, bilateral hemithorax were symmetrical. At right hemithorax, there was pleural effusion, 17 mm at thickest point and bilateral consolidation zone with coexisting ground glass appearance (Figure 2). When we consulted with our thoracic surgeon, we were advised just for clinical support and not for a thoracentesis.

One hour after the CT scan, we re-evaluated her with USG. We found out prominent quad sign at the right basal and middle zones (definitely at the right lower blue point and posterolateral alveolar or pleural syndrome (PLAPS) point) (Figures 3 and 4).

Consequently, we made thoracentesis and acclaimed haemothorax. We collected 600 cc haemorrhagic fluid by thorax tube placement and her clinic improved dramatically.

After one more day with intermittent NIMV and oxygen support her oxygenation and ventilation were healed. One day later, we pulled out the thorax tube and the patient was discharged to the clinic just with respiratory physiotherapy advice. At last, she was discharged from the hospital on her eighth day of emergency service admission.

Discussion

Ultrasound has proved its role as a bedside critical care tool, managing acute respiratory and circulatory failure with easy availability and high accuracy.

The impact of lung ultrasound on clinical decision making has been highlighted recently. Xirouchaki et al.[1] showed that after LUCI, the patient management was changed in 119 out of 253 cases (47%). In 81 cases, invasive interventions were needed that were not foreseen before. In 53 out of 253 cases (21%), LUCI revealed findings that supported diagnoses not suspected by the primary physician similar to our situation.

LUCI, which is a quick time lung visualisation, consists of signs indicating several pathologies. Furthermore, there are protocols like FAST (focussed assisted with sonography in trauma), BLUE and FALLS (fluid administration limited by lung sonography) using these signs, allowing more definite differential diagnosis.[2,3]

The BLUE protocol, the one we used in our case is a fast method to manage patients with acute respiratory disorders. This protocol helps to differentiate pneumonia; as in our case with fractal or shred sign; that seems to be a shredded fractal boundary between consolidated and aerated lung tissue that corresponds to nontranslobar consolidations. BLUE can also pursue the degree of pulmonary oedema as

Main Points

- Lung ultrasound in the critically ill (LUCI) is a practical and valuable bedside assessment tool.
- In trauma patients, bedside lung ultrasound can be more advantageous over computerised tomography to capture acute severe changes without transferring patients from the bed.
- LUCI can provide early recognition and diagnosis with high sensitivity and specificity.

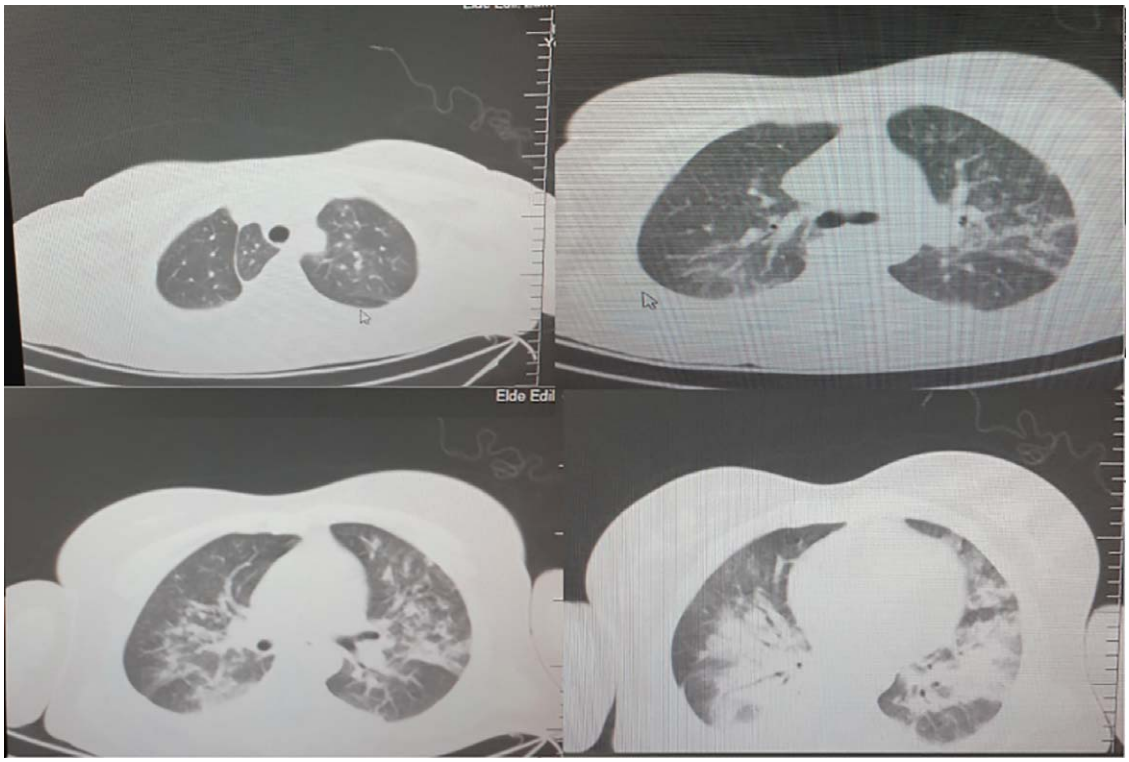

Figure 2. Computerised tomography of the lung.

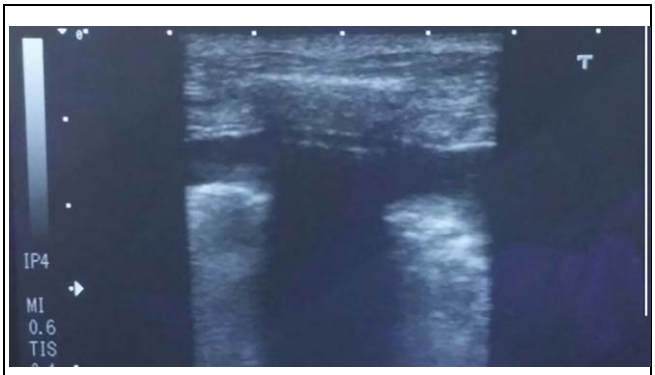

Figure 3. Lung ultrasound at right midaxillary middle zone quad sign.

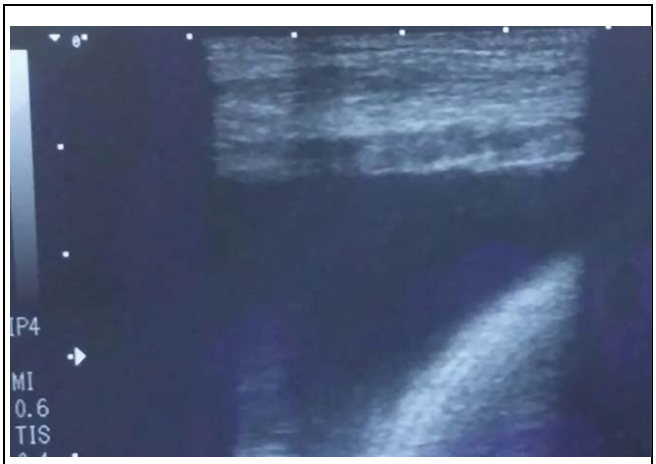

Figure 4. Lung ultrasound right midaxillary lower zone PLAPS point.

we were capable with our patient by evaluating the number of B lines day by day.[3,4]

Moreover, it enables us to make a rapid diagnosis and therapeutic interventions, a favour precious through trauma patients. In our case, the patient had series of chest X-rays starting from the first emergency admission, she also had a CT when her clinic deteriorated but none of them showed the severity of her situation and CT failed to identify the exact reason. The first LUCI of the patient showed no signs of pneumothorax (abolished lung sliding) or pleural effusion (quad sign). However, daily USG control as part of physical examination made it possible to evaluate clinical changes by BLUE.

Even though not everyone could use LUCI or not accustomed to consult before CT as presented in our case. It would be precious for every physician to get used to it especially in cases of possible thoracic injuries.

According to Leblanc et al.,[5] the diagnostic accuracy of lung USG was higher than that of combined clinical examination and chest radiography, when compared for pneumothorax, lung contusion and haemothorax.

What is instructive in our case is the sensitivity of lung USG in comparison with CXR and CT by monitoring the clinical progress by serial reproducibility. Furthermore, it reminds us of a different perspective that CT is not that definite.

Ojaghi Haghighi et al.[6] showed that the sensitivity for USG in the diagnosis of haemothorax was 82.97% with a specificity of 98.05%. Portable CXR for pneumothorax detection had a sensitivity of 34.61% and a specificity of 97.95%. In the detection of haemothorax, CXR had a sensitivity of 25.53% and a specificity of 95.14%. USG sensitivity and specificity for the diagnosis of haemopneumothorax were high. The sensitivity of portable CXR was low despite its high specificity for the detection of haemothorax and pneumothorax.

Conclusion

Due to its easy availability, absence of radiation and cost-effectivity, it would be wise to use LUCI in a routine clinical practice as a bedside examination tool since its value is well proved by many cases like ours. These advantages are of even greater value in trauma patients, as immediate decision making can be life-saving.

Informed Consent: Verbal informed consent was obtained from all participants who participated in this study.

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Conflict of Interest: The authors have no conflicts of interest to declare.

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