PICTORIAL CME

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Lung Ultrasonography in the Critical Care Unit

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In the critical care setting, lung imaging is one of the most important diagnostic procedures[1]. This helps in making vital clinical decisions and fixing therapeutic targets (like the adequacy of intravenous fluids). Also, after invasive procedures like central venous catheter insertion and tracheostomy, lung imaging is essential to rule-out procedural complications. Earlier, chest X-ray and CT scan were the mainstay of lung imaging in the critical care setting. But these investigations have certain fallacies and more than one interpretation of one image is possible. In such a scenario, lung ultrasonography is now emerging as a useful alternative imaging technique. The present case demonstrates one such usefulness of lung ultrasonography.

A 52-year-old woman, reported to have rheumatic heart disease, presented with acute onset unconsciousness. On examination, she was found to have irregular pulse (rate = 80 - 120/min) and a Glasgow Coma Scale score of 5/15. CT scan of brain showed acute infarct in left middle cerebral artery territory and ECG demonstrated atrial fibrillation. The patient developed mild fever on the 4th day in the CCU. A chest X-ray was done (Fig. 1). However, in view of the pre-existing valvular heart disease, we could not be sure whether this X-ray represented heart failure or pulmonary infection. Serum procalcitonin was 0.7 ng/ml and total leucocyte count was 13,000/cmm. Both of these results were inconclusive. NT-pro BNP could not be done due to cost factor. A CT scan of the lung could not be done due to unstable clinical status of the patient. A bedside echocardiography showed tight mitral stenosis with spontaneous echo-contrast in the left atrium.

In such a background, a bedside lung ultrasonography was done, which showed (Fig. 2) features of hepatisation of the right lung. The consistency of liver and lung were almost same, with some amount of pleural effusion in between. This cheap imaging technique helped us in clinching the diagnosis of pneumonia without further costly investigations.

The patient was started on empirical antibiotics, later modified according to culture reports. The lung haziness on chest X-ray diminished over the next ten days. Fever disappeared and the Glasgow Coma Scale improved to 7/15.

Lung ultrasonography (USG) helps in the diagnosis of many emergency conditions like interstitial oedema, lung abscess, lobar collapse and pneumothorax[1]. In pneumonia there are

Fig. 1: *Day 1 chest X-ray (AP view) of the patient showing bilateral lower zone haziness.*

Fig. 2: *Day 1 lung USG showing hepatisation of lower lobe (white arrow) with pleural effusion (asterisk).*

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various USG patterns which can help in bedside diagnosis. These include absence of A-lines, presence of B-lines, sonographic air-bronchograms and liver-like hepatisation of the lung (as in the present case)[2]. Absence of A-lines and presence of B-lines are non-specific sonographic findings which may occur in many diseases like interstitial syndrome[2]. Thus, their diagnostic sensitivity is low. But air-bronchograms and hepatisations are more sensitive for detecting pneumonia[2]. In our case, with the protean features in chest X-ray, liver-like consistency of the lower lobe in USG helped in the diagnosis. Sometimes, air-bronchograms can also be seen inside areas of consolidation and this is even more specific for pneumonia (Fig. 3)[2]. In many cases, some amount of pleural effusion of the same side is also detected sonographically, especially in bacterial pneumonia[2]. In our case also, pleural effusion was found adjacent to the areas of consolidation.

Although lung USG is a relatively new technique, its reliability is reasonably established. In a recent meta-analysis, the sensitivity and specificity of lung USG were both more than 90%, when compared to a combined standard of radiography, clinical features and laboratory tests[3]. In some cases, USG can even detect hidden consolidations which are missed in conventional chest X-rays (like retrocardiac ones)[4]. This can, thus, be sometimes useful in diagnosing the cause of recurrent fever in the CCU/ICU.

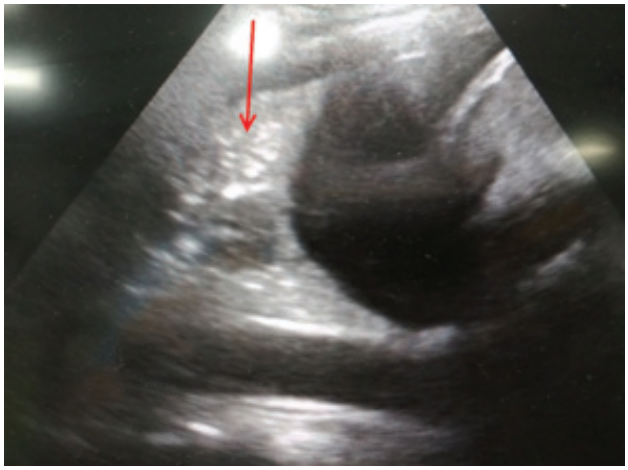

Fig. 3: *Representative image showing air bronchogram (red arrow) inside areas of consolidation.*

Besides its diagnostic utility, lung USG has other advantages. USG can help in image-guided biopsy in a non-resolving pneumonia or a pleural-based mass[5]. This can be an alternative to CT guided biopsy, which involves more radiation exposure. One more advantage of lung USG is the ability to do frequent follow-up studies without the risk of radiation exposure. The changes in character of consolidation after treatment are seen earlier in lung USG, compared to X-rays.

We present this pictorial essay to sensitise clinicians to the utility of point of care lung USG, not only in the critical care unit but also in the general medicine wards. This can help in earlier detection of various lung pathologies and also can help in resolving confusion when other laboratory tests or imaging studies are inconclusive.

References

1. Bouhemad B, Zhang M, Lu Q *et al*. Clinical review: Bedside lung ultrasound in critical care practice. *Crit Care* 2007; 11: 205.
2. Stadler JAM, Andronikou S, Zar HJ. Lung ultrasound for the diagnosis of community-acquired pneumonia in children. *Pediatr Radiol* 2017; 47: 1412-9.
3. Pereda MA, Chavez MA, Hooper-Miele CC *et al*. Lung ultrasound for the diagnosis of pneumonia in children: a meta-analysis. *Pediatrics* 2015; 135: 714-22.
4. Guerra M, Crichiutti G, Pecile P *et al*. Ultrasound detection of pneumonia in febrile children with respiratory distress: a prospective study. *Eur J Pediatr* 2016; 175: 163-70.
5. Yang PC, Luh KT, Chang DB *et al*. Ultra-sonographic evaluation of pulmonary consolidation. *Am Rev Respir Dis* 1992; 146: 757-62.