Value of lung ultrasound in diagnosis of acute respiratory failure by BLUE protocol.

This is submitted for partial fulfillment of the master degree in Chest Diseases

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The candidate

Samar Helmy Abd Elrahman

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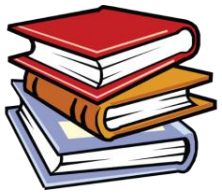
2D	**Two-dimensional**
B-mode	**Brightness mode**
CAP	**Community-acquired pneumonia**
Cc	**Cubic centimeter**
Cm	**Centimeter**



Introduction

Introduction

The chest ultrasound has become an attractive new tool for assessing lung status in ICU patients. There is a growing trend to be performed by physicians practicing in chest, intensive care .The aim of this study was to evaluate that chest ultrasound can be used easily at the bedside to assess lung morphology in hypoxemic patients and can be easily repeated to monitor progress and effect to therapy in critical care practice. **[Moghekar A, Mehta A., et,al. 2014].**

In critically ill ICU patients. there is a major problem of transportation so we have to use the bedside imaging modalities to diagnose the case as we can, however the X-ray provides limited information with exposure to radiation and on the other hand CT may be time consuming and cost more than other imaging modalite mainly in patient transportation. **[Moghekar A, Mehta A.,et, al. 2014].**

Ultrasound examination of the chest is a non- invasive imaging technique which gives information about the lungs, pleura and mediastinum &the chest wall without exposure to radiation and can be used safely in follow up**.** **[Demi L, Demi M, et, al. 2014].**

Ultrasonography in lung pathologies: appearance of the normal lung by ultrasound can be detected by lung sliding in association with multible horizontal A-lines and vertical B-lines. A-lines are lines parallel to the pleural line while B-lines are one or more vertical lines originate at the pleural interface. B-lines effacing the A lines and move with the pleural lines**.** **[Refaat R, Abdurrahman LA., et , al. 2013]**.

The pleural line defined as hyper-echoic line moving forward and backward with ventilation and about 0.5 cm below the rib line. By (M-mode) there is motionless parietal tissue above the pleural line and homogenous pattern below the pleural line, this known as seashore sign (Fig. 1). **[Refaat R, Abdurrahman LA., et, al. 2013].**

Chest ultrasound plays an important role in diagnosis of different pathologies:

Pleural effusion:

An aechoic space present between the two layers of pleura. Different u/s signs can be detected with pleural effusion such a sinusoid sign, thoracic spine sign and, V-line sign . The amount of pleural fluid volume can be estimated with the simplified formula: V (ml) = 20 _ Sep (mm) where V is the volume of pleural fluid, and Sep is the maximal distance between parietal and visceral pleura in end expiration, the amount of fluid collection is considered an important factor in indications of thoraco-centesis]. **[Volpicelli G, Elbarba , et, al. 2012].**

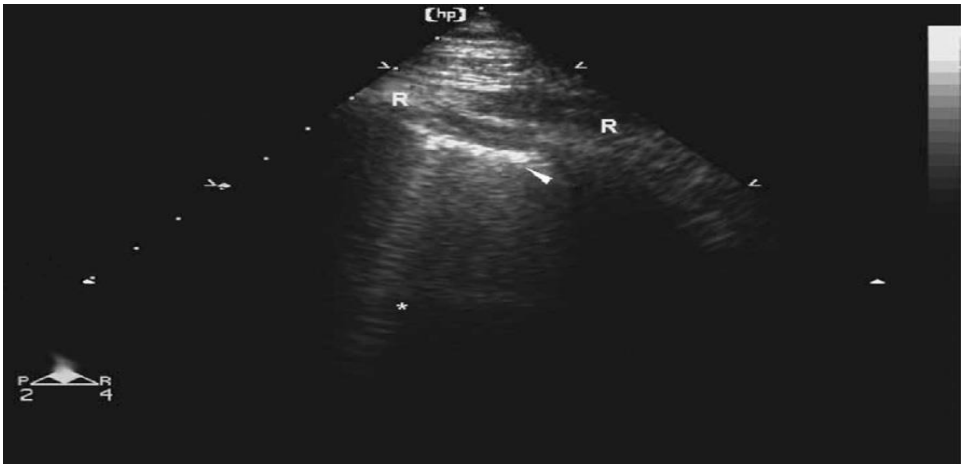


Fig 1.[U/S of NORMAL LUNG].

U/s of normal lung. The pleural line is a roughly horizontal hyper echoic line 0.5 cm below the upper and lower ribs identified by acoustic shadow (R) . It can be seen in dependent regions in normally aerated lung. **[Refaat R, Abdurrahman LA., et, al. 2013].**

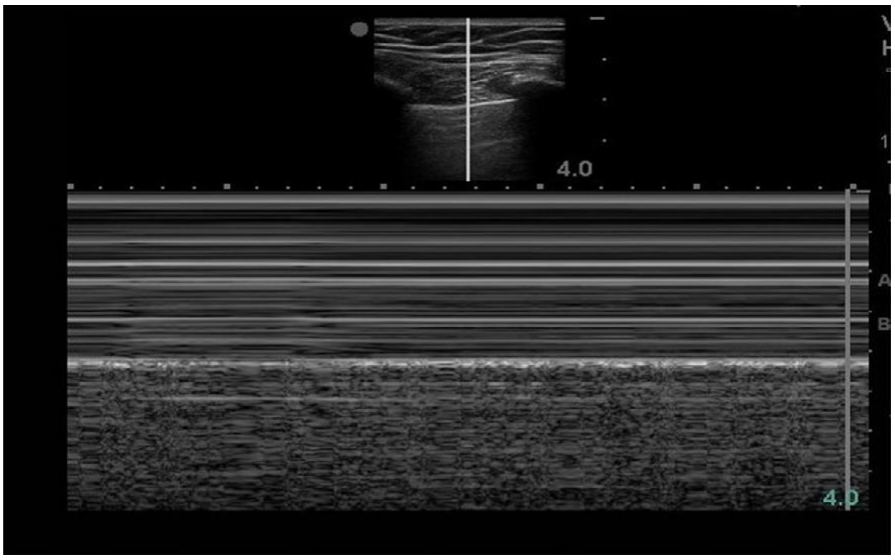
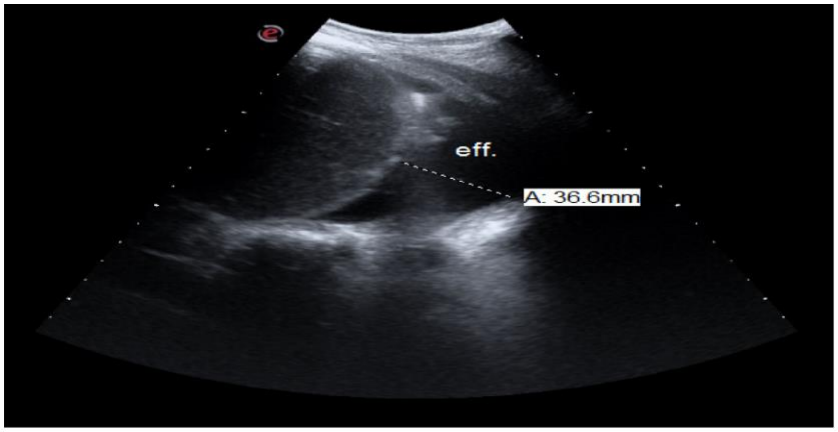


Fig 2[seashore sign] .

Fig. 2. Normal lung ultrasound and characteristic seashore sign**. [Adhikari S, Amini R,et,al.2014].**



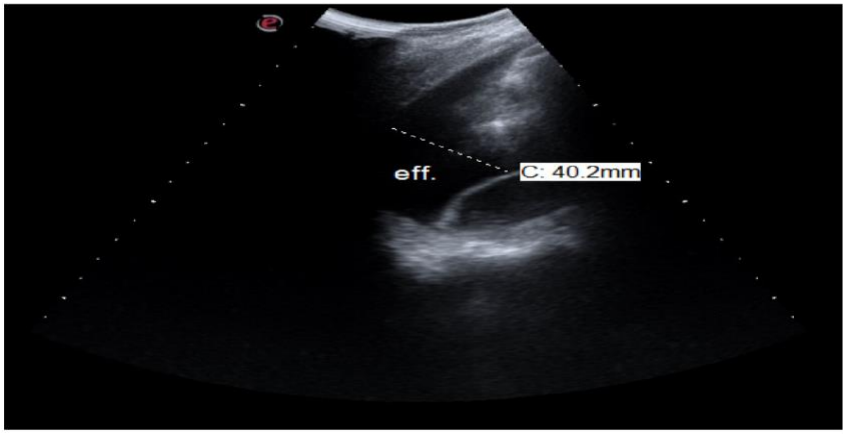


Fig 3 . (a ,b & c)

Fig. 3.(A case in radiological department), 23-years-old female patient with systemic lupus erythematous and chronic

kidney disease admitted to the intensive care unit and on mechanical ventilation. Large pleural collections with pleural separation equal to 37 mm ‘‘Sep measurement = 740 ml” on the right side (a), and equal to 40 mm ‘‘Sep measurement = 800 ml” on the left side (b). Ultrasound image using time motion mode (M-mode) demonstrating the sinusoid sign (c). This sign illustrates an undulation of the collapsed lung tissue within the pleural fluid. associated with multi A-lines of interstitial disease.

Lung consolidation:

diagnosed by ultrasound as an echo-poor or tissue like image. hypo echoic area of exudate. [Liu X-lei, Lian R, et, al, 2014].

Interstitial syndrome:

the A-lines play an important in diagnosis of diffuse interstitial pathology with thickened interlobular septa as well as areas of ground-glass opacity. [Volpicelli G, Melniker LA, et, al. 2013].

Pneumothorax:

by ultrasound pneumothorax can be diagnosed by absent lung sliding, as presence of lung sliding and/or B lines rule out diagnosis of pneumothorax. [Volpicelli G, Boero E, et,al. 2013].

Fig 4 . Pneumothorax

Pulmonary embolism (PE):

The following criteria can help in diagnosis of PE by ultrasound:

1) PE was considered if there was two or more triangular or rounded pleura-based lesions can demonstrated.
2) probable PE: one typical lesion with a corresponding low-grade pleural effusion.
3) possible PE: nonspecific sub-pleural lesions <5 mm in size or a single pleural effusion alone.
4) PE not established: if there is normal chest ultrasound. [Squizzato A, Rancan E,et, al. 2013].

Neoplasms:

tumors in relation to the pleura can be assessed with ultrasound, lung tumors appear as predominantly hypo echoic masses. [Vollmer I, Gayete A., et ,al. 2010].

Chest wall masses:

different soft-tissue lesions arising from the chest wall can be easily detected by high-frequency US. Masses generally have variable echogenicity and US findings are too non-specific to differentiate between various etiologies. [Lichtenstein DA. ,et ,al. 2014].