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Ultrasound findings in pleural disorders

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Abstract **-** Ultrasonography of pleural space is playing an increasingly great role in the diagnosis of panoply of pleural disorders. In fact, ultrasonography is a reliable and simple procedure, free from side effects, non invasive and painless. Its reliability has been contradicted mainly because of the non-specific data gathered, but plain chest radiographies, so largely used, do not offer a higher specificity or sensitivity. It remains however valid the fact that ultrasonography of pleural space has to be made from a well trained imaging specialist, able of contouring and separating anatomical structures and changes found herein. A summary of other imaging procedures is discussed as well, with computerized tomography, magnetic resonance imaging and nuclear imaging procedures offering other possibilities, but lacking overall availability and immediate applicability.

Keywords – Climate Change, Tourism Development, Meta-Analysis, Turkey

Introduction

Imaging plays an important role toward the diagnostic workup and management of patients suffering from pleural disorders. Generally, the existence of a pleural involvement is routinely suggested after plain chest radiography (Figure 1). However, pleural sonography might be very helpful in detecting pleural effusions, and also toward directing interventional procedures, needle biopsies or catheter replacements.

Figure 1: Plain chest radiography: mesothelioma of the right pleural structure.

Progressing technology has challenged the role of pleural sonography (Donnelly, 2008). Although chest computerized tomography, magnetic resonance imaging and nuclear medicine are offering continuously pictures of higher resolution and accuracy, pleural ultrasonography still possesses some advantages, not only when compared with the older radiographic technologies. In fact, pleural ultrasonography is safe and free from side effects; it is a real-time procedure and relatively cheap, and it might be performed at the bedside due to existence of portable devices (Volpicelli, 2006).

Figure 2: Pleural empyema, ultrasonographic findings.

Apart from having a higher sensitivity when confronted with the conventional radiography, the sonography is able to differentiate solid from cystic lesions (Singh, 2005). Thus, sonography is able not only to detect a pleural effusion, but also it might be helpful in précising a point to perform aspiration. Lack of ionizing radiation during the performing a pleural sonography has been emphasized as another advantage of this diagnostic procedure (Stephens, 2007).

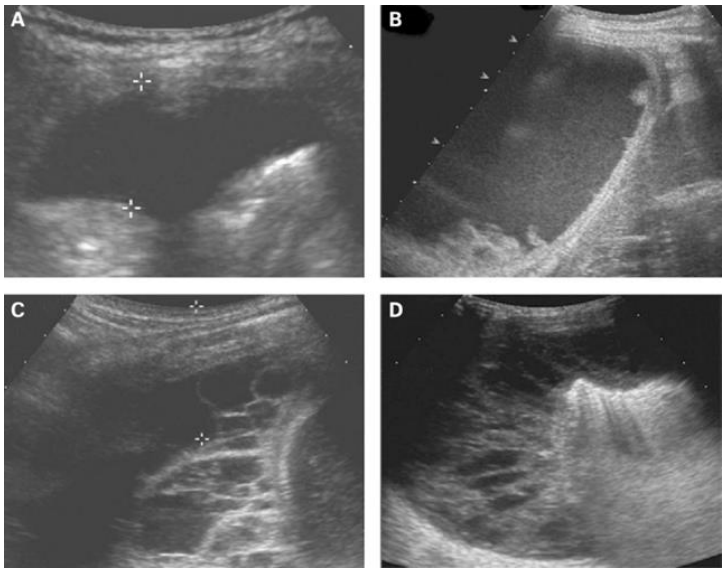
Another advantage of pleural sonography is the realization of a differential diagnosis between transudates and exudates (Chandra, 2010). Apart from diagnostic values, pleural sonography has therapeutic implications as well, for example when guiding the mechanical septal lysis in pleural effusions (Chandra, 2010).

Review

The detection of a pleural effusion is the first and most common outcome of a pleural ultrasonography, when clinical suspicion warrants the performing of the imaging procedure. Effusions might be anechoic and dark appearance; but complicated pleural effusions (fresh blood) will be hyperechoic in the appearance (Sikora, 2012).

Strict biochemical criteria are applied when a laboratory evaluation is made on the pleural aspirate (Light, 2002). These criteria are summarized at the Table 1.

Table 1: Light's criteria for distinguishing between pleural exudates and transudates



Fluid is an exudate if 1 or more of the following criteria are met

1. Ratio of pleural fluid level of lactate dehydrogenase (LDH) to serum level of LDH is greater than 0.6

2. Pleural fluid level of LDH is more than two-thirds the upper limit of the reference range for the serum level of LDH

3. Ratio of pleural fluid level of protein to serum level of protein is greater than 0.5

The list of causative factors of pleural effusions is relatively long; with cardiac, renal or liver impairment leading the list of transudative effusions; but numerous medications including amiodarone, methotrexade, phenytoin and nitrofurantoin have been imputed (McGrath, 2011). Abdominal surgery might be as well causative through non-specific mechanisms, of pleural effusions (Light, 1976).

Acute dyspnea, cough and pleuritic pain (pleurisy) are non specific clinical signs, but otherwise meaningful symptoms that should lead the diagnostic workup and adequate therapy, especially in emergency situations (Cibinel, 2012).

On the other hand exudates have been related to malignancies or parapneumonic effusions (Maskell, 2003). When the clinical picture of an empyema is suggested, pleural sonography might take the lead toward confirming the presence of the latter; some slight fibrinous transformations of pleural effusions might even escape to computerized tomography but suggested from the pleural sonography.

Usually plain chest radiography will miss a clear distinction between the parenchymal lesions and pleural processes. Generally pleural lesions form a wide angle vis-à-vis the thoracic wall; otherwise the sub-pleural lesions of the lung parenchyma form a narrow angle with the latter. The presence of pedicles (smooth margin) suggests a sub-pleural positioning; when angles are obtuse with the pleural line is tangentially seen, the lesion might be extra-thoracic (Molinari, 2011).

Another very important diagnostic field is the pleural tumors, with mesothelioma being probably the most frequent. In fact, in a case series we previously reported a clear majority of mesotheliomas as secondary lung cancer form, with nine mesotheliomas out of twenty four secondary lung cancers in total (Nikolla, 2013). Pleural sonography is helpful as well by in diagnosing peripheral lung tumors and other pleural abnormalities caused by pleural fibrosis and tumor metastasis (Rumende, 2012). Reviews regarding different imaging technologies, including positron-emission tomography (PET) in pleural diseases, are available (Laurent, 2006).

Figure 3: Mesothelioma of the pleura; sonography imaging.

Conclusion(s)

Pleural sonography is an easily performable, feasible and reliable diagnostic tool, very helpful toward diagnosing pleural disorders, thickening, effusions and tumoral processes. Sonography might be helpful even in other situations, such as pulmonary embolism (Comert, 2013) or when a pneumothorax is suspected (Shostak, 2013).

Although a simple, non-invasive, economic and easily performed procedure, paucity of studies have quantified the statistical value of sensitivity of pleural sonography, especially when confronted with other imaging techniques. Thus, a group of German authors, have clearly stated very high values of sensitivity and accuracy of lung ultrasound, with 95% of accuracy in the diagnosis of interstitial syndromes in favor of lung ultrasound, clearly higher than chest radiography with 72% and much better than mere and simple auscultation (Zechner, 2012). Even higher are sensitivity values of ultrasound-based diagnosis for pneumothorax, when compared with chest radiography (Zechner, 2012). It is therefore clear that pleural sonography is a method that should be widely applied, in the hands of a well-trained radiologist, with very good diagnostic and therapeutic outcome of the pleural diseases.

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