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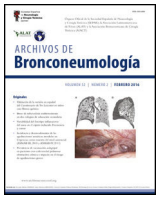

Editorial

# Thoracic Ultrasound: Present and Future☆

## La ecografía transtorácica: presente y futuro

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Thoracic ultrasound (TUS), also known as lung ultrasound, offers great benefits in the diagnosis of respiratory diseases that far exceed those imagined years ago, at a time when this technique was thought to be very limited in respiratory medicine, due to the incompatibility between air and ultrasound. We now know that interference with pulmonary air generates a series of artifacts that can help identify normal structures, detect different diseases, and guide various diagnostic and therapeutic procedures.[1]

TUS is now increasingly used in daily practice, although we are probably not taking advantage of all the possibilities it can offer. It is routinely used in pulmonology, primarily in the area of interventional medicine as a procedure for the study of pleural diseases. It is also used as a guide for chest wall and lung punctures, and is useful for guiding the placement of chest tubes, or before a thoracoscopy for locating the most appropriate access to the pleural cavity.[2]

However, TUS can contribute usefully in other respiratory areas, such as the daily monitoring of patients in hospital wards, in the emergency department, or even in outpatient clinics.[3,4] In this setting, the characteristics of pleural effusion (PE) together with different types of pleuropulmonary diseases can be evaluated, some of which are described below:

- In respiratory infections, such as pneumonia, that require daily monitoring in hospitalized patients, or less frequent monitoring in the case of patients followed up in outpatient clinics or at the time of presentation in the emergency department. In all these situations, PE can be seen as an image of pulmonary condensation with destructuring of the pleural line, containing air bronchogram. Monitoring with ultrasound is useful for assessing the progress of consolidations or the possible development of PE as a complication of pneumonia, obviating the need for chest X-rays.[5,6]
- Pneumothorax can appear spontaneously, due to trauma, or as a result of an invasive procedure. Thanks to the utilities of TUS and its greater yield in the detection of pneumothorax compared to chest X-ray, pneumothorax can be promptly diagnosed from the start. This diagnosis is based on the absence of pleural effusion and B lines in B mode, and the presence of the barcode sign in M mode. Clinicians can even use it to decide whether to take a conservative approach or place chest tubes, depending on the lung point sign: a conservative approach can be taken if it appears in the second intercostal (subclavicular) space; a chest tube may be required if it occurs at the axillary level.[7,8]
- Interstitial lung involvement is very common, not only due to diffuse interstitial lung diseases, but also because of other entities such as pulmonary edema or acute respiratory distress syndrome. All these entities are characterized by an increase in B lines, but an initial diagnosis can be made depending on their distribution, localization and behavior. TUS is also useful for assessing improvement during the course of these processes, except for diffuse interstitial lung diseases where the B lines persist when fibrosis is already established in the interlobular septa. Currently no ultrasound method is available that can assess the degree of severity.[9]
- Peripheral lung lesions abutting the chest wall are visible with TUS, so their morphology and behavior can be studied. Diagnosis with TUS-guided percutaneous transparietal biopsy has a high diagnostic yield and success rate, and avoids exposure to the ionizing radiation of computed tomography (CT) and hospitalization of the patient.[10]
- Another frequently studied entity is diaphragmatic paralysis. TUS can be used to evaluate the presence or absence of diaphragmatic movement with deep breathing methods, at rest or during sniff procedures, and monitor progress.[11,12]
- The BLUE protocol is used in emergency situations and can evaluate different causes of acute respiratory failure. This protocol is based on the assessment of different variables, such as the existence of lung sliding, and the presence or absence of A and/or B lines. When these variables are assessed at specific points in both hemithoraces, the cause of acute respiratory failure can be determined to be pneumonia, interstitial alveolar syndrome, or pneumothorax, among other causes.[13,14]
- Bone disease in the rib cage is usually assessed with chest CT. However, before disease at this level is suspected, TUS may be able to differentiate between a malignant or benign structure, as in the case of bruising due to injuries, fractures, or pulmonary hernias.[13,15]

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TUS in pulmonology can be used to evaluate different processes in different settings, and to assist in diagnosis and on-the-spot decision-making. It can help avoid delays in diagnosis and exposure to ionizing radiation, and benefits patient care. TUS is not a substitute for chest CT scans but it can be the first procedure in critical situations.[14] It has, like the stethoscope, become an indispensable complementary tool, suggesting that it should always be available in all clinical settings. In spite of its great advantages, TUS is still limited in cases when there is air interposition, so in the not too distant future methods must be developed to overcome this limitation and, above all, educational efforts must be implemented to promote better use of TUS.

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