Pleural Ultrasound Applications

Aplicaciones de la ecografía pleural

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The study of the pleural cavity with imaging methods made important advances some years ago with the development of computed tomography (CT), the important improvements made in its resolution capacity\textsuperscript{1,2} and more recently the advent of positron emission tomography, which can be especially useful in the staging and prognosis of pleural mesothelioma or for detecting pleural metastases.\textsuperscript{3,4} The evaluation of the pleural cavity with ultrasound has been part of the clinical assessment of these patients for more than 40 years as a complementary method to other radiological techniques available. In the last 10 years, however, ultrasound has presented a substantial change in its clinical use. It has gone from its almost exclusive use by specialists in radiology to being widely used by different clinical specialists, such as cardiologists, digestive tract specialists, orthopedic surgeons and pulmonologists or gynecologists, where its iconographic information has become better integrated into the clinical decision-making process,\textsuperscript{5} without significantly reducing the thoracic ultrasound activity in radiology units.\textsuperscript{7} In addition, in thoracic studies, there has been a considerable increase in the number of publications related with the recommended characteristics of ultrasound devices or transducers and with the characterization of the pleural space, including the presence of pleural masses or septa, or with the possible usefulness of this technique in the diagnosis of other pleural pathologies, such as pneumothorax.\textsuperscript{6–11}

In order to study the pleural cavity, it is recommended to use a small-sized vector or convex ultrasound probe, with frequencies between 3.5 and 5 MHz; meanwhile, for the exploration of the chest wall, high-frequency linear probes are used. The information provided by the pleural ultrasound is complementary to other imaging methods; it can be superior to them for the resolution of some clinical problems (such as detecting the existence of septa and their location), and inferior in other instances. Nevertheless, ultrasound has 2 characteristics that definitively set it apart from the other methods: the lack of radiation of the patient and its portability. These characteristics mean that it can be used in different places without having to move the patient—such as in intensive care units, the OR, post-op reanimation, patient hospital rooms or in the ER\textsuperscript{12–14}—and it may be repeatedly used as many times as necessary in order to evaluate the disease. It is, in addition, a less expensive technique than the other methods mentioned.

The main indications for ultrasound for studying pleural pathologies include:

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\item To detect the existence of pleural effusion. Ultrasound is able to detect up to 5 ml of pleural liquid, and its sensitivity increases when there are accumulations of more than 30 ml. Chest radiography usually requires an accumulation of at least 150 ml in order for it to be detected, and even greater quantities when done in supine decubitus. The ability of the ultrasound for distinguishing between pleural effusion and pleural thickening is high and comparable or superior to CT.
\item To locate the existence of pleural masses or thickening.
\item To guide thoracocentesis, transparietal pleural biopsy or the entry of the thoracoscope towards the best possible region with a greater quantity of pleural liquid or pleural masses, avoiding areas with walls, as it is most advisable.\textsuperscript{15–17}
\item To define the characteristics of the pleural liquid. The pleural effusion may present with established ultrasound characteristics, such as an anechoic, homogeneously echogenic and complex septated or non-septated patterns.\textsuperscript{8}
\item To direct the etiology of the pleural effusion. Although ultrasound is not able to establish a diagnosis, on most occasions the transudates have an anechoic pattern. Characteristics suggestive of malignant pleural effusion have also been described, such as pleural thickening of more than 1 cm, nodularity of the diaphragmatic pleura and thickening of the visceral pleura\textsuperscript{18} or the existence of detritus whirlpools floating in the pleural liquid.
\item To differentiate subpulmonary effusion from phrenic paralysis or ascites in the radiological elevation of the hemidiaphragm.
\item To diagnose pneumothorax. Its efficacy is similar to chest radiography, although it is not able to quantify size. Its main application could center around severe patients whose radiographies should be done in decubitus, those with subcutaneous emphysema (which makes for difficult radiological interpretation), or in situations with a greater difficulty for doing thoracic radiography.\textsuperscript{14}
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All the characteristics and potentialities of ultrasound for studying the pleura make it an essential technique for optimizing the evaluation and treatment of patients with pleural effusion. The
need for immediate results and the need to repeat the technique in many patients make it essential for the technique to be learnt by all pulmonologists involved in the evaluation of this type of patients. Other specialties have been equipped with ultrasound devices and pulmonology should be no different, especially considering that even the most inexpensive devices are sufficient for studying pleural pathologies. In times like these of economic crisis, being flexible and sharing equipment with other specialists, or even recycling older ultrasound models, are just 2 possibilities for those departments that do not have the option of obtaining new equipment.

**Conflict of Interest**

The author declares having no conflict of interest.

**References**