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Thoracic Ultrasound Technique – From Physics to Morphopathology

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Abstract: ***Introduction:*** Pulmonary pathologies are among the most common diseases in both children and adults, representing the leading cause of death in children under the age of 5. Over the years, the applicability of thoracic ultrasound has evolved, becoming a routine investigation, and its indications for use in evaluating both pediatric and adult populations have expanded. The classic diagnostic methods for pulmonary pathology in the general population include chest X-ray and CT scans, which expose the patient to ionizing radiation. ***Methods:*** Thoracic ultrasound is a non-invasive, painless technique that does not cause discomfort to the patient. A linear probe is preferred, and the examination begins with the transducer in a longitudinal position for a general assessment of the thorax. The examiner can then focus on an area of interest with the transducer in a transverse position. Each hemithorax is divided into anterior, lateral, and posterior zones by the anterior and posterior axillary lines. Each zone is then subdivided into upper and lower regions by an imaginary line passing through the nipple line. ***Results:*** Physiologically, A-lines can be visualized, which are horizontal, hyperechoic, equidistant lines parallel to the pleura, representing multiple reflections of the pleural line. B-lines, on the other hand, are long, well-defined vertical lines originating from the pleural line. B-lines may be considered physiological in newborns but can also appear in pathological conditions (more than 3 B-lines in one examined space). The main indications for thoracic ultrasound include respiratory distress syndrome, transient tachypnea of the newborn, meconium aspiration syndrome, pulmonary hemorrhage, neonatal atelectasis, pneumothorax, pneumonia, viral infections, and pleural pathology (such as pleurisy). ***Conclusions:*** Pulmonary ultrasound has the significant advantage of being a non-radiative investigation, making it an extremely important diagnostic tool, especially for this patient population, as it helps reduce the risk associated with repeated radiation exposure.

Keywords: thoracic ultrasound; biophysics; morphopathology of lung ultrasound; pathophysiology of lung ultrasound.