

Chest in children: what to do and when to do it

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Introduction

The pediatric chest radiograph remains the most frequently requested imaging study worldwide. However, pediatricians, neonatologists and pediatric radiologists appreciate the increased diagnostic yield provided by new radiological technology. The evolution of imaging technology has led to an unprecedented ability to evaluate chest anatomy and abnormalities. The advances in equipment and innovative imaging techniques include rapid imaging, three-dimensional capability, high-resolution and angiographic techniques in computed tomography (CT) and magnetic resonance imaging (MRI), and improved transducer technology, pulsed Doppler and color Doppler imaging in ultrasound (US). Many novel image-guided interventional procedures have also been developed.

These and other refinements have enabled recognition of more subtle pathological changes and have led to a greater understanding of cardiopulmonary disease processes. Clinical and therapeutic advances have altered our perspective of many diseases and clarified how and when imaging can be useful. This presentation will focus on the areas of pediatric chest imaging in which progress has been made, and in which imaging and management approaches have changed as a result of these technical achievements.

Radiography remains the primary imaging technique in the evaluation of most chest diseases, as it has the capability to confirm or exclude numerous conditions. It is the first step in chest evaluation and guides further investigation with other radiological techniques, such as US, CT and MRI. The applications of chest US have expanded over time. This technique has several advantages that are beneficial in children: it does not use ionizing radiation; color and power Doppler abilities permit study of vascular structures without the use of intravenous contrast, the examination does not require sedation in most cases and it can be performed bedside. US is useful for evaluating the lung, pleura and mediastinum, and is especially helpful for rapid assessment of patients with complete opacification of a hemithorax at chest radiography. It is the method of choice for characterizing pleural fluid collections, to determine whether the thymus is normal and for distinguishing solid from cystic masses in equivocal cases.

Recent major advances in CT technology, with meticulous attention to the technique, have improved the sensitivity and specificity of pediatric CT imaging and resulted in improved diagnostic accuracy. The benefits of helical CT include speed, improved image quality, possibility for optimized use of intravenous contrast and reduced sedation rates. The main applications are evaluation of pulmonary nodules and masses, vascular anatomy (CT angiography), central airways and critically ill patients. High-resolution CT techniques enable imaging of the lung and its interstitium with excellent spatial resolution.

Most patients younger than 6 years undergoing MR study will require sedation or general anesthesia. The main clinical indications for MR are evaluation of masses and chest wall lesions, and investigation of vascular or cardiac abnormalities.

Disclaimer Dr. Garcia-Peña has no financial interests, investigational or off-label uses to disclose.

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