

Head and Neck Ultrasound in the Pediatric Population

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KEYWORDS

- Pediatric • Head and neck ultrasound • Otolaryngology
- Office imaging

ADVANTAGES OF OFFICE IMAGING STUDIES OF THE HEAD AND NECK IN CHILDREN

Diagnostic imaging studies of the head and neck in children have three main challenges. First, pediatric conditions that require imaging are often dynamic and changing. Examples include lymphadenopathy, deep neck space infections, and vascular malformations. Although an initial imaging study can offer a great deal of information, it remains a snapshot in time and does not offer the physician insight beyond a narrow period. Many pediatric lesions quickly evolve over days or weeks, making remote imaging less relevant. Also, virtually all pediatric imaging is done outside the otolaryngology clinic. This not only requires additional logistics but also is accompanied by an interruption in care. In most major medical centers, imaging is scheduled hours, days, or weeks after the initial clinic visit. Once completed, the study must be conveyed back to the managing provider for review and decision making. Finally, many pediatric imaging studies require sedation or even general anesthesia for adequate information to be gained. This adds further logistical challenges to the health care team and poses additional risk to the patient.

In selected cases, directed ultrasound has the potential to solve all three of these major issues.

Ultrasound devices are now portable enough to be brought directly to the operating room, clinic examination room, or bedside and can be used by a radiologist or otolaryngologist with little preparation. Examinations are usually completed in minutes, can frequently be performed during the initial consultation, and are well tolerated in most children. With no need for radiation exposure, intravenous medication, or sedation, it can be repeated as often as needed rather than offering a single snap-shot of the lesion in question; ultrasound can be repeatedly used to track the evolution of lesions before, sometimes during, and after treatment.

Pediatric head and neck ultrasound uses the same hardware used in adult applications. No additional supplies are needed. Machines range in size from moderate-sized carts to laptop versions that are placed on wheeled stands. Each of the machines fit into a standard size examination room and, with battery backup, can be moved between treatment areas without interruption. Image storage varies between machines and ranges across the standard data formats and, depending on hospital archive systems, may or may not be available throughout the hospital. Although many probe types exist, a single high-frequency linear probe, 8 to 15 MHz, is adequate for most applications in otolaryngology.

This article was previously published in the December 2010 issue of *Otolaryngologic Clinics of North America*. The authors have no financial disclosures.

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Ultrasound Clin 7 (2012) 229–237

doi:10.1016/j.cult.2011.12.007

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Specific courses in pediatric ultrasound for otolaryngologists do not yet exist. Despite this lack, current course offerings dealing with adult ultrasound are offered to otolaryngologists through the American College of Surgeons. Techniques reviewed and evaluated at these training events are highly relevant to pediatric applications. Along with outside training, partnership with one's own radiology team is indispensable for advice and training as comfort is gained with the basic examination and techniques.

SPECIFIC APPLICATIONS OF ULTRASOUND IN THE OTOLARYNGOLOGY CLINIC

Lymphadenopathy

Evaluation of lymphadenopathy in children can quickly be accomplished with ultrasound. In the authors' clinic, ultrasound has evolved to become a natural extension of the physical examination. Although palpation of lymphadenopathy in most children is simple, accurate sizing of lymph nodes and diagnosis of multiple contiguous nodes is often

difficult. Overlying tissue frequently adds to the perceived size of the lymph nodes. Ultrasound offers solutions to both problems. With a brief imaging examination done to enhance palpation, the location of the lymphadenopathy is quickly determined. Precise sizing can be performed with digital calipers. Specific nodal architecture can often be visualized. Normal or reactive lymph nodes should typically be well defined and elliptical in shape. Their parenchyma should be homogeneously hypoechoic with a central linear-hyperechoic vascular hilum (**Fig. 1**). Although no ultrasound findings have been strongly correlated with neoplasm, concerns for malignancy arise with loss of the normal architecture, loss of the kidney bean shape to a more bulbous or round shape, absent hilum, irregular borders, cystic necrosis, and irregular capsular vasculature.¹ With baseline data established during initial consultation, children can be monitored with serial ultrasound examinations while undergoing medical evaluation and treatment. Any nodes that remain enlarged or demonstrate multiple abnormal

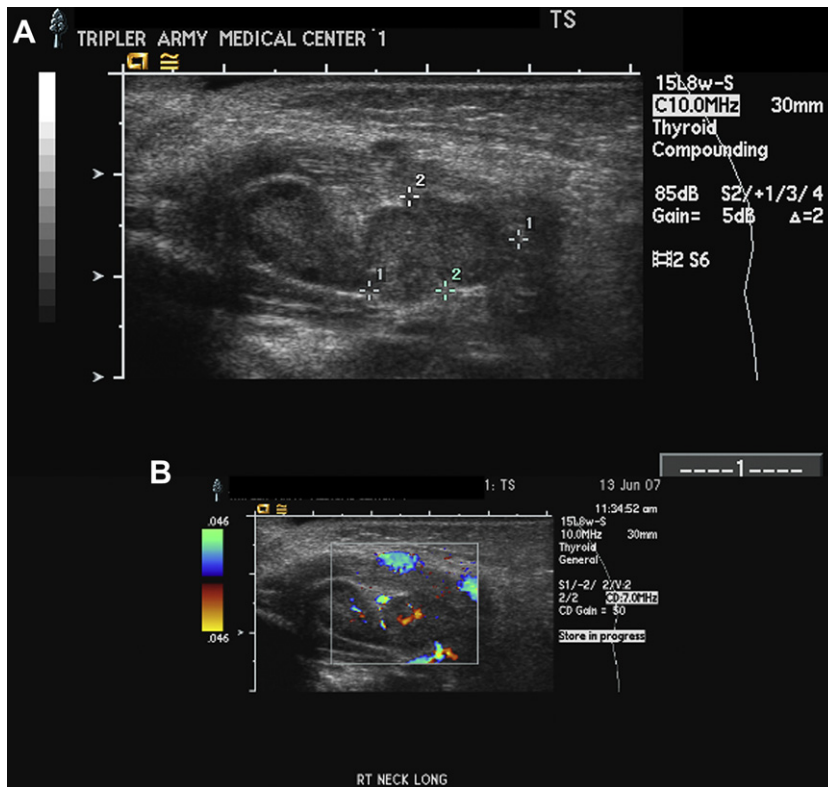


Fig. 1. (A) Five-month-old with fevers to 103°F for 36 hours with increased swelling of right neck. Screening ultrasound images demonstrate bilobed solid structures with hypoechoic peripheral parenchyma and central increased hilar echogenicity, consistent with a reactive lymph node. (B) Central color Doppler flow is noted, characteristic for a lymph node. Electronic calipers allow incremental follow-up to the scale of a millimeter.

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