Editorial

Standardized Orbital Echography: A Valuable but Underused Technique

Attempts to improve the detection and characterization of orbital abnormalities over and above that obtained with CT have centered recently on MR imaging [1–4]. The hope has been that with improved surface coils, high-field-strength magnets, thinner sections, and techniques used to suppress the signal from orbital fat, abnormalities poorly characterized or undetected by CT could be identified and greater specificity in diagnosis could be achieved. The standard ophthalmologic examination combined with ocular sonography adequately shows and characterizes abnormalities within the globe, so it is in the extraocular regions that improved diagnostic imaging would be most helpful. Unfortunately, MR has been of limited value in this regard. Its only possible advantages over CT have been in visualizing the intracanalicular and prechiasmal optic nerve, detecting globe ischemia, identifying subacute and chronic intraorbital hemorrhages, and imaging in more than one plane. Although some authors have proposed that MR may have use in differential diagnoses, for most orbital masses CT remains superior to MR. In routine practice with CT, thinner sections are obtained, contrast is given, cortical bone and calcifications are shown, chemical shift artifacts are not present, and changes in the patient's gaze is not a significant problem. Despite its advantages, CT still may fail to distinguish between different types of masses and may fail to show convincingly the subtle differences in size between abnormal and normal muscles and nerves. Orbital sonography, however, in the proper hands, can serve as an inexpensive and valuable complement to CT.

Although sonography in ophthalmologic diagnosis was first reported in 1956 [5], it has been the relatively recent improvements in instrumentation and techniques that have allowed the experienced sonographer to have a significant impact on orbital diagnoses. The technique, properly termed *standardized echography* [6, 7], involves having a well-trained examiner perform specific techniques with standardized A-mode, contact B-mode, and Doppler instrumentation. This system allows not only the dynamic evaluation of globe abnormalities but also the accurate localization, differentiation, and measurement of intra- and extraconal masses. This is achieved through the systematic analysis of multiple acoustic properties, such as structure, reflectivity, sound attenuation, compressibility, and vascularity. By means of this special echographic method, various tumors and inflammatory lesions can be distinguished on the basis of their different acoustic properties. Of paramount importance in this tissue characterization is the strong correlation of standardized A-mode reflectivity with histologic structure. Such information, when supplemented by CT images, routinely may allow more accurate differential diagnoses [8–10].

Subtle enlargement of the extraocular muscles—for example, in Grave's disease, myositis, or carcinoma—or slight enlargement or atrophy of the optic nerve sheath complex is detected accurately with sonography. Accumulation of perioptic nerve fluid can be difficult to diagnose with CT and MR, particularly when the amount of fluid is small. With standardized A-mode echography, precise measurements of the diameter of the optic nerve sheath complex can be determined at different parts of the nerve and compared with normal values. In addition, when fluid is present, abduction of the eye in question results in a diminution in the width of the sheaths, as the fluid is squeezed out of the perioptic space [7]. Establishing the presence of such fluid is important in the diagnosis and follow-up of a number of conditions, including optic neuritis and compressive optic neuropathies.

In this issue of *AJNR*, the article on acquired hyperopia with choroidal folds [11] would have been strengthened and the authors' points shown more convincingly if optic nerve echography had been available. The fact that echography was attempted in one patient, with equivocal results, points out the need for well-trained and experienced diagnostic echographers if orbital echography is ever to be offered as a routine, reliable diagnostic service. The amount of fluid that, according to Stimac et al. [11], widens the optic nerve sheath complex could have been identified with standardized echography.

A review of a number of articles on orbital imaging in *Radiology* and the *AJNR* over the past 2 years shows that echography received virtually no attention, despite the contribution it could have made. Use of MR to add more specificity to the CT findings in orbital pseudotumor has been proposed [2]; specifically, the presence of an isointense or minimally hyperintense mass on T2-weighted images suggested to the authors the presence of an orbital pseudotumor. In another study [12], MR failed to reveal distinguishing intensity characteristics in lymphomas vs lacrimal carcinomas. In the patients described in these papers [2, 12], standardized A-mode echography would have distinguished masses of low reflectivity consistent with pseudotumor or lymphoma from masses of high reflectivity, such as carcinoma. Similar signal characteristics were reported [1] for noncalcified, non-fat-containing extraocular masses of different etiologies. These findings point out the nonspecificity of MR in most extraocular orbital masses and, hence, the potential usefulness of orbital echography.

In two other studies, demonstration of an optic neurogram [13] or an optic syrinx [14] required the instillation of water-soluble myelographic contrast material into the lumbar subarachnoid space. In both situations, echography could have shown either cystic degeneration of the nerve or the manifestation of late optic nerve compression without incurring the potential problems of intrathecal injection of contrast. Additionally, echography could have quantitated more accurately the degree of involvement of the optic nerve.

Despite these advantages, it must be recognized that orbital echography allows good delineation of just the anterior two-thirds of the orbit and optic nerve. In addition, because this is not a simple technique to master, considerable experience and detailed knowledge of orbital anatomy and pathology are required. The United States has only a handful of trained diagnostic echographers. Moreover, the number of training programs available in this field are limited (University of Miami, University of Iowa, University of Southern California, University of Texas at San Antonio) and the training itself is informal. A recently incorporated society, the American Association of Ophthalmic Standardized Echography, may help focus attention on this important area of diagnostic sonography. As we look toward improving orbital imaging and offering a cost-effective supplement to CT, consideration should be given to standardized echography, which is a valuable but currently underused technique.

Robert M. Quencer
University of Miami School of Medicine
Miami, FL 33101

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