Comparison of the 20-MHz Ultrasound Probe With Ultrasound Biomicroscopy in Glaucoma

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Abstract. The 20-MHz ultrasound probe was compared with ultrasound biomicroscopy to determine its usefulness in imaging various glaucomatous conditions. Ten patients with glaucoma underwent anterior segment imaging with both the 20-MHz probe, which attaches to the B-scan (Innovative Imaging Inc., Sacramento, CA), and the Ultrasonic BioMicroscope (UBM; Paradigm Medical Industries, Salt Lake City, UT). All pathology was easily demonstrable using the 20-MHz probe, in one case showing a retinal detachment not seen with the UBM. However, anterior findings such as fluid in the suprachoroidal space and sclerostomy sites in postoperative trabeculectomy cases were more difficult to view with the 20-MHz probe. The use of coupling enhanced the quality of the latter images. The 20-MHz ultrasound probe may be a viable aid in diagnosis and follow-up of certain glaucomatous conditions, and the use of a coupling device enhances its images. [Ophthalmic Surg Lasers Imaging 2004;35:347-349.]

INTRODUCTION

During the past decade, a relatively new anterior segment imaging technique, ultrasound biomicroscopy, has enabled clinicians and researchers alike to visualize and better understand certain anatomic–pathologic relationships regarding the diagnosis and treatment of glaucoma. Recently, the clinical need for a single combined anterior and posterior segment ultrasonography unit has furthered advances in ultrasound development. The Ultrasonic BioMicroscope (UBM; Paradigm Medical Industries, Salt Lake City, UT) uses a 50-MHz transducer, whereas newer probes such as the 20-MHz B-scan (Innovative Imaging Inc., Sacramento, CA) exchange less resolution for a greater depth of penetration, with
the additional advantage of being attached to a B-scan unit. A pilot study was undertaken to assess the usefulness of the 20-MHz ultrasound probe in imaging various glaucomatous conditions compared with the UBM.

METHOD

The current study was a prospective, nonrandomized clinical series of 10 patients with glaucoma who underwent anterior segment imaging with both the UBM and the 20-MHz probe. Patients were recruited from the William and Ana Goldberg Glaucoma Service of Wills Eye Hospital, and verbal consent was obtained. Clinical diagnoses included plateau iris (4 patients), uveitis (1 patient), chronic angle-closure glaucoma (1 patient), neovascular glaucoma with hyphema (1 patient), postoperative shallow anterior chamber (2 patients), and secondary hemorrhagic angle closure (1 patient).

The same ultrasonographer (ELA) performed the ultrasonography in a masked and standardized fashion. Earlier subjects underwent UBM evaluation first, whereas later subjects started with 13 probe evaluation. Some patients also had 20-MHz probe ultrasonography with a coupling device to enhance the images. Acquired images were then interpreted and compared in all clock hours by two investigators (ELA, PJH).

PROBE DESCRIPTION AND TECHNIQUE

The 20-MHz probe is the same size as the traditional B-scan probe, and attaches to the same unit (Fig. 1). Whereas the 10-MHz probe (B-scan) has a penetration depth of 50 mm and the 50- to 60-MHz probe (UBM) has a penetration depth of 5 mm, the interim range of frequency of the 20-MHz 13 probe produces a scan of 10 mm wide by 12 mm deep. A fluid-filled latex tonometer tip is placed over the probe tip, and a film of gel tears is applied to the latex to
enhance coupling (Fig. 2). The probe is then gently placed directly onto the anesthetized cornea and sclera of the seated or supine patient (Fig. 3) and images are acquired. Alternatively, the probe may be used in a supine patient with a fluid bath technique, during which a plastic cylinder is placed on the sclera and filled with saline or 1% methylcellulose, as during UBM imaging.

RESULTS
Ten patients underwent anterior segment imaging using both devices. All pathology, such as anterior rotation of the ciliary body and plateau iris configuration (Figs. 4 and 5), ciliary body cysts, hyphema, and Elshnig pearls (Figs. 6 and 7), was easily demonstrable using the 20-MHz probe, in one case showing a retinal detachment not seen with the UBM. However, anterior findings such as fluid in the suprachoroidal space and sclerectomy sites in postoperative trabeculectomy cases were more difficult to see with the 20-MHz probe. The use of coupling enhanced the quality of the latter images. The resolution of the UBM images was superior to those obtained by the 20-MHz probe, but coupling enhanced the images acquired by the 20-MHz probe.

CONCLUSION
The 20-MHz I^3 ultrasound probe may prove to be a viable aid in diagnosis and follow-up of certain glaucomatous conditions, and the use of a coupling device enhances its images. The UBM has better resolution and remains the gold standard in anterior segment imaging.

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REFERENCES