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# Benefits of UBM in Phacomorphic Glaucoma

BY MARIO DE LA TORRE ESTREMADOYRO, MD

As an ophthalmologist specializing in imaging technologies, I have discovered ultrasound biomicroscopy (UBM) to be an essential tool in the overall treatment of angle-closure and secondary open-angle glaucoma. UBM is a noninvasive, in vivo imaging tool that emits a high-frequency, short, acoustic pulse generating echoes. As it propagates throughout the various anatomic tissue structures, it records each specific acoustic density. These echo densities are then translated into voltages; they are amplified and converted into pixel intensity resulting in multi-dimensional cross-section images and videos.[1] UBM is a brilliant tool to evaluate the structural competency of the anterior chamber by providing a valuable diagnostic and quantitative imaging assessment.

When studying a patient's particular angle closure, it is useful to utilize as many images as possible to help you move forward with a proper treatment plan. UBM adds an essential level of imaging to this evaluative and diagnostic process. There are many imaging tools used today, such as OCT, slit-lamp, gonioscopy, and biomicroscopy. OCT is a non-contact method that provides an excellent horizontal photograph of the anterior segment but doesn't provide much vertical information. Gonioscopy is a contact method that has been previously considered the gold standard. UBM, also a contact method, is performed relatively the same, but again, offering an increased depth of field with an exceptional level of detail.

As these tools provide an exceptional visualization of the anterior segment, they do not offer a complete picture. The lack of visualization posterior to the iris and ciliary body hinders an accurate diagnosis, as indicators to underlying pathologies responsible for secondary open-angle glaucoma such as tumors, cysts, or suprachoroidal effusions may be missed. In addition to the discovery and diagnosis of the pathologies mentioned above, UBM can further examine anomalies with unprecedented precision and microscopic resolution. What sets UBM apart is its use of sonic transduction (instead of light) which safely penetrates the epithelium and is not absorbed or distorted by the pigmentation. Used in conjunction with OCT, UBM provides a full representation of the eye's anterior and intermediate segments.

In the market today, there are several ultrasound imaging systems to fit your particular clinical environment. Among the recent technological breakthroughs in ophthalmic ultrasound is the use of annular technology for B probes and especially for high-frequency ones. Quantel Medical has recently introduced a 20-MHz probe with five-ring annular technology that offers outstanding depth of field and produces simultaneous, high-resolution visualization from the vitreous to the wall. This new probe is available on the ABSolu ultrasound platform which can also be equipped with a 15-MHz B probe and a 50-MHz UBM probe. The ABSolu's S mode allows for the diagnosis of tumor lesions, retinal/vitreous membrane detachments, and Graves' disease.

## PHACOMORPHIC GLAUCOMA

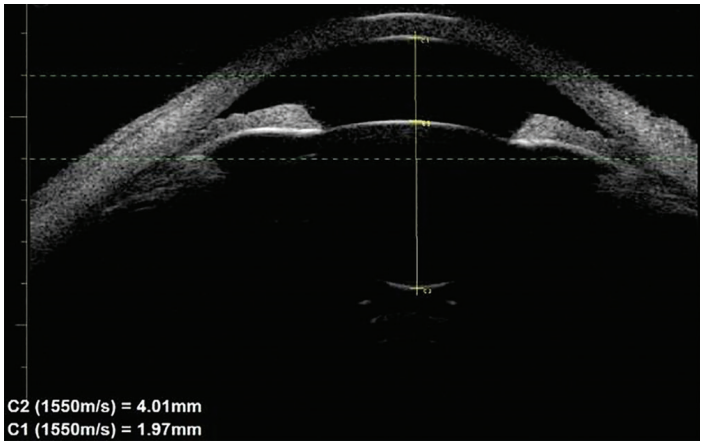


Figure 1. Phacomorphic glaucoma.

Phacomorphic glaucoma is an acute, secondary glaucoma with closure related to changes in shape, thickness, growth, and maturity of an intumescent cataract (Figure 1). These traumatic cataracts can lead to pupillary block and cause the angle closure. The clinical signs of phacomorphic glaucoma include a rise in IOP of 50 to 60 mm Hg, pain, corneal edema, mydriasis, moderate lens opacification, red eyes, or a shallow central anterior chamber. This is a complex condition that requires not just OCT or gonioscopy, but UBM as well. The patient will most likely complain of vision loss in a dark or low light situation and will experience deterioration in the visual field. The symptoms may resemble primary open-angle glaucoma but will require the UBM examination to understand the complex nature of the problem accurately. Using UBM, the defining characteristics of typical phacomorphic glaucoma are evidently clear. These include a shallow anterior chamber, the iris profile (anterior contact with the lens), and angle closure, along with an observation of a large lens and inner lens pocket.

## LENS VAULT

The most important aspect of utilizing UBM is to gain a greater perspective of the anterior chamber and the lens vault. Lens vault is defined as the perpendicular distance between the anterior pole of the crystalline lens and the horizontal line joining the

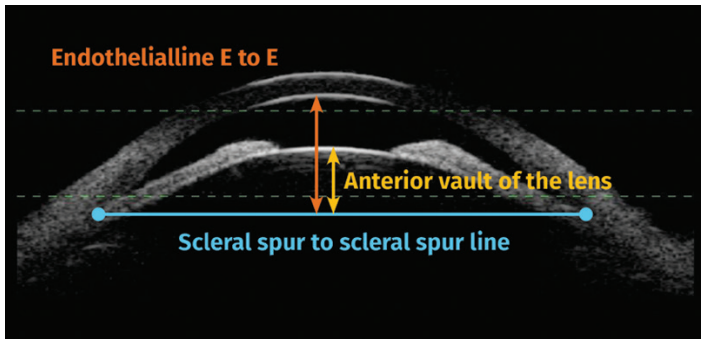


Figure 2. UBM representation of lens vault.

two scleral spurs; it has been recently associated with secondary glaucoma and angle closure. Using UBM can define how much the lens vault has moved or how much it is threatening the anterior chamber (Figure 2). If the anterior vault of the lens is more than one-third of the endothelial line (surface of the cornea) to the scleral spur line, then there is a phacomorphic mechanism. This should prompt you to scrutinize the angles and combine all observations to determine a phacomorphic glaucoma diagnosis.

In glaucoma, there are typically many factors and various forms of pathologies that need to be thoroughly examined and diagnosed. This is where UBM plays a critical role, along with OCT and other visual examinations, in reviewing the entire ocular anatomy. For example, if a patient presents with symptoms indicative of pupilar block glaucoma and you perform an iridectomy without performing a diagnostic UBM to look behind the iris, you may be addressing only part of the problem. This is true in cases of plateau iris syndrome as well. UBM can play an essential role in plateau iris assessment and is useful for examination of the mechanism of the syndrome. UBM can confirm any pupillary block or other causes of the angle closure, including phacomorphic glaucoma (Figure 3). UBM can also evaluate the therapeutic outcomes after laser iridotomy or iridoplasty.[2]

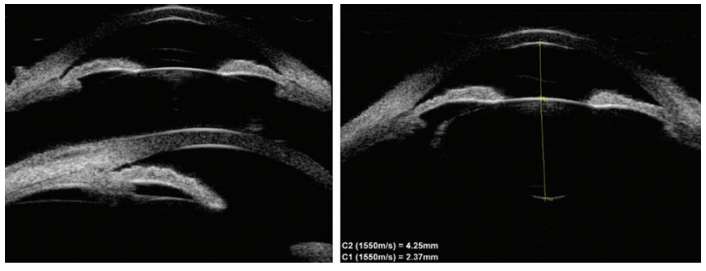


Figure 3. Block, plateau, and slight phacomorphic.

1. Ursea R, Silverman R. Anterior segment imaging for the assessment of glaucoma. *Expert Rev Ophthalmol*. 2010;5(1):59-74.
2. Stefan C, Iliescu DA, Batras M, et al. Plateau iris—diagnosis and treatment. *Rom J Ophthalmol*. 2015;59(1):14-18.

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## AN INSIDIOUS CASE


Figure 4. Insidious case. IOP of 50 mm Hg, 2 weeks evolution.

This case presented to me with acute phacomorphic glaucoma, which is a nightmare scenario from the treatment and surgical perspective. Diagnostic evaluations, including UBM, demonstrated evidence of a shallow anterior chamber, corneal decompensation, an IOP of 50 mm Hg, and a 2-week evolution. Furthermore, she has a goniosynechia (Figure 4). This case presented with many risks. The post-operative result still showed the synechia and continued angle closure. From that point, we were able to perform a lensectomy and IOL implantation to widen the anterior chamber and the angle, as well as address the synechia. We continued to use UBM post-operatively to monitor the surgical integrity and recovery of the eye. One month later, the anterior chamber was deeper, and the opening of the angle was not yet complete. She also still showed evidence of the synechia, which was much easier, and safer, to address (Figure 5).

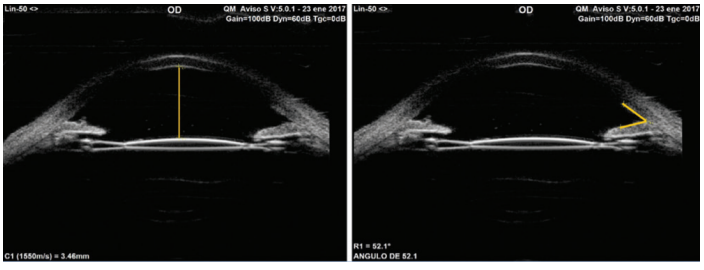

Figure 5. Post-surgical result.

## CONCLUSION

UBM is a simple, noninvasive investigation that can distinguish between primary angle-closure glaucoma and phacomorphic glaucoma that was not diagnosed appropriately. We live in a time of images and video, and UBM helps evaluate angle closure, lens-iris relationship, and lens diameter. Without it, we might miss the phacomorphic component and treat the disease as a regular primary angle-closure glaucoma, neglecting the most crucial factor that could help our patients preserve their vision. Ultrasound is an evaluative tool that general ophthalmologists can seamlessly implement in a clinical setting. The ABSolu is a great representation of how ocular ultrasound technology can serve as a comprehensive approach to diagnosing glaucoma patients at a significant cost-benefit ratio. ■