Diagnosing Angle-Closure Glaucoma

Don't miss the sleeping giant.

BY SHAN C. LIN, MD

Glaucoma is the second leading cause of blindness worldwide and the leading irreversible etiology.[1] Among whites, open-angle glaucoma (OAG) accounts for approximately 85% to 90% of glaucoma cases, according to large prevalence studies. Research from East Asia, however, particularly studies involving the ethnic Chinese population, suggest that angle-closure glaucoma (ACG) is more prevalent worldwide than Western sources have assumed. ACG will account for an estimated 26% of all glaucoma by the year 2010.[1] Moreover, ACG accounts for almost half of the blindness caused by glaucoma today, despite the lower estimated prevalence compared with OAG. Because ACG can evolve rapidly and damage vision to a much greater extent than OAG, the former is a more severe form of the disease overall. Diagnosing ACG early is therefore critical to preserving affected patients' vision.

THE DIFFERENT PRESENTATIONS OF ACG

A common misconception is that ACG usually presents as an acute angle-closure attack. Studies from Singapore and other countries in Eastern Asia, however, have shown that most cases of ACG are subacute or chronic.[2,3] In such cases, patients normally do not complain of pain or a headache. Instead, the presentation is similar to that of OAG and is thus insidious. In other words, clinicians not looking for ACG may fail to detect it. A missed diagnosis is especially likely with subacute ACG, in which the patient's IOP may be normal while he is in the office during daylight hours. In the evening or at night, however, his pupil will dilate, and the angle may become occluded. The IOP rises gradually but not high enough to cause pain or other symptoms, although the increase can be sufficient to damage the optic nerve.

Because the ethnic and racial diversity of many countries' populations is growing, it is increasingly important that clinicians be aware of the different forms of ACG.

DIAGNOSING A CLOSED OR OCCLUDABLE ANGLE

Clinical Overview

The simplest way to grade the angle is using the van Herick technique at the slit lamp. Usually, the clinician offsets the slit illumination 60° from the paraxial viewing scope. The grading system for the angle is 0 (no space between the iris and cornea at the peripheral limbus), 1 (between zero and one-quarter the corneal thickness), 2 (equal to one-quarter the corneal thickness), 3 (between one-quarter and one-half the corneal thickness),

Figure 1. Viewed with ultrasound biomicroscopy (UBM), these iridociliary cysts are causing the angle to close.

and 4 (greater than one-half the corneal thickness).

Gonioscopy, however, remains the so-called gold standard for evaluating the anterior chamber angle and for assessing a patient's risk for ACG. The method's advantages include its speed, simplicity, and low cost (it requires a relatively inexpensive instrument, the goniolens). Its disadvantages include the subjective nature of the assessment, the need to contact the patient's ocular surface, and the associated discomfort.

Because ACG may be more prevalent—and more subtle—than many clinicians realize, they should perform gonioscopy on all likely candidates for ACG, including patients whose angles appear narrow with the van Herick technique. Additional risk factors are an age greater than 55 years, a family history of glaucoma, diagnosed or suspected glaucoma, and Asian descent.

Tips for Successful Gonioscopy

I offer three suggestions for ensuring the effectiveness of gonioscopy using a Zeiss-style goniolens (my preference is model OPDSG [Ocular Instruments, Inc., Bellevue, WA]).

Minimize Pupillary Constriction

During gonioscopy, the room's lights should be off, and illumination at the slit lamp should be minimal. Light within the pupil will constrict it, thereby opening the angle and possibly masking a potentially occludable angle.

Be Careful Not to Indent the Eye

The increased pressure in the anterior chamber may open a narrow or occludable angle, thus leading to an incorrect diagnosis.

Perform Dynamic Gonioscopy

After detecting a narrow or closed angle, the clinician should push gently on the eye to see whether the angle opens. The presence of peripheral anterior synechiae in some parts of the angle usually indicates a certain degree of chronic angle closure.

The most conclusive way to confirm the existence of an occludable angle is to perform the dark room prone provocative test. The patient stays in a dark room for approximately 45 minutes with his head down and his body in a prone position. The test maximizes the conditions that close the angle in the eyes of patients at risk for ACG. Darkness allows the iris to dilate. Orienting the head with the face downward allows the lens/iris diaphragm to move anteriorly and increases the chance for pupillary contact with the lens. The prone positioning increases episcleral venous pressure, which further contributes to elevated IOP. A patient who is not at risk for ACG will show minimal change in IOP, whereas an individual at risk will likely experience a significant increase in IOP (usually 6 mm Hg or more). Because the dark room prone provocative test is time-consuming and cumbersome, however, it is impractical for most clinicians to use.

Figure 2. Seen on UBM, pupillary block causes the angle to narrow. Note the lens/iris touch at the pupillary margin and the anterior bowing of the iris.

IMAGING THE ANGLE

Additional methods of evaluating the condition of the angle include UBM (from manufacturers such as Sonomed, Inc. [Lake Success, NY], Paradigm Medical Industries, Inc. [Salt Lake City, UT], and iScience Interventional [Menlo Park, CA]), slit-lamp photography (Pentacam Comprehensive Eye Scanner; Oculus, Inc., Lynnwood, WA), wide-field camera imaging (RetCam; Clarity Medical Systems, Inc., Pleasanton, CA), and, more recently, anterior segment optical coherence tomography (AS-OCT) (Visante OCT [Carl Zeiss Meditec, Inc., Dublin, CA], SL-OCT [Heidelberg Engineering GmbH, Heidelberg, Germany]). A distinct advantage of UBM technology is the ability to delineate structures behind the posterior, pigmented layer of the iris, including the ciliary body, lens, and zonules. As a result, UBM can uncover important features of plateau iris or iridociliary cysts—both causes of ACG.

For example, one family treated in my practice has iridociliary cyst syndrome, which could not be detected by their prior ophthalmologist without the UBM. Several members of the family had developed glaucomatous damage to their optic nerves, and some had suffered

extensive visual field loss. Their original ophthalmologists had performed laser peripheral iridotomies to treat what appeared to be simple pupillary block, but UBM revealed that the angles remained narrow or closed (Figure 1) due to the iris cysts that were pushing the iris forward.

The use of UBM technology has been largely avoided, partly due to the requisite placement of an eyecup and water bath. Recent advances have allowed UBM imaging without the setup of an eyecup and water bath. Instead, the clinician places a soft-shelled probe directly on the ocular surface, with or without a gel interface. Alternatively, the Visante OCT is a quick, noncontact modality based on the reflectance of laser light that can image the anterior chamber angle. The machine can generate images in seconds. The scans look similar to the images produced by UBM, but they are of higher resolution. Again, a disadvantage is that the Visante OCT currently cannot image the ciliary body or other structures behind the iris. Future studies will shed light on the ability of the technology to detect patients at risk for ACG, as determined by gonioscopy, or even those missed by gonioscopy.

IT IS NOT ALL PUPILLARY BLOCK

Physicians often assume that pupillary block (Figure 2) is the causative mechanism in the vast majority of ACG cases. Patients who have a narrow angle usually receive a laser iridotomy, which is often considered adequate treatment.

How effective is laser iridotomy in the long run? In a study conducted in Singapore, the success rate in preventing a long-term rise in IOP in the fellow eyes of patients who suffered an acute attack of ACG was 89%, with an average follow-up of 4 years.[4] Although iridotomy appears to be very effective, a significant proportion of patients will still develop glaucoma. The reason may be related to the cause of the angle closure. If the etiology is iris cysts or plateau iris (Figure 3), an iridotomy may not be effective in preventing future glaucoma. For the patient who has a plateau iris, for example, additional treatments may include the use of pilocarpine and argon laser iridoplasty.

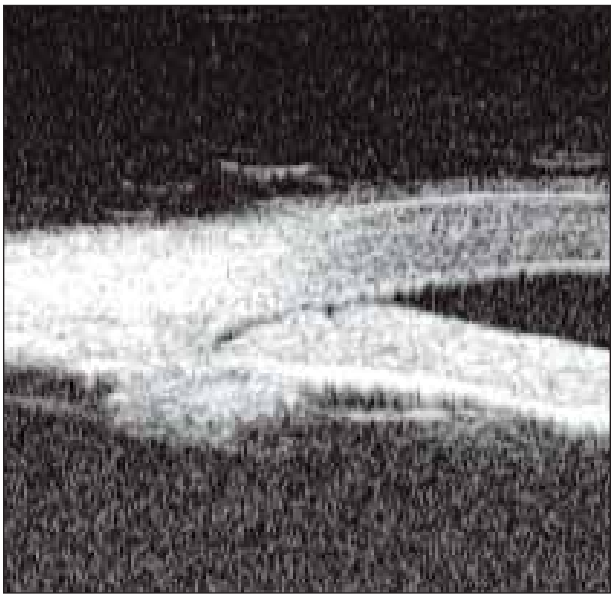

Figure 3. UBM shows that plateau iris anatomy is causing the angle to narrow. Note the anterior positioning of the ciliary process, which is causing an elevation of the peripheral iris.

Further evidence that pupillary block is not the overriding mechanism in most cases of occludable angles comes from a recent study in India,[5] in which investigators examined 55 patients at the slit lamp and with UBM after laser iridotomy and found that 60% still had a narrow angle. In a majority of these patients, UBM revealed a plateau iris. These results suggest that simply treating patients with a laser iridotomy may leave a lot of them at risk of glaucomatous damage.

For these reasons, after the laser iridotomy, postoperative management should involve a re-evaluation of the angle that includes gonioscopy and, possibly, imaging of the anterior segment.

SUMMARY

Although treatment and prevention are available for ACG, it remains a common cause of blindness worldwide. Vigilance in the detection of those at risk for the condition is paramount. Physicians should perform gonioscopy and consider imaging tests of the anterior segment in patients at increased risk for the disease. Even after the identification of narrow/occludable angles and treatment with laser iridotomy, clinicians must recognize that causes other than pupillary block may be contributing to the narrow angle. The re-evaluation of patients after treatment is therefore critical. ❑

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