Editorial

Is the Angle Truly Open or Closed?
Lance Liu, MBBS, FRANZCO - Melbourne, Australia

Although primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG) coexist in all countries worldwide, PACG is more prevalent than POAG in some Asian nations. Assessing the angle is important given that the subsequent glaucoma management decisions (whether they be medical, laser, or surgical) are based on its appearance. Currently, gonioscopy is the gold standard in assessing the angle based on the visualization of the trabecular meshwork (TM) and should be performed to look for angle closure.1,2 The rationale is that angle closure is an anatomic problem that can cause the intraocular pressure (IOP) to fluctuate because of a combination of TM closure and damage,3 can lead to PACG (which is a more devastating and blinding disease compared with POAG4), and is amenable to intervention (especially if detected early). However, gonioscopy findings are subjective because the appearance of the TM can change in different lighting conditions or can appear open with inadvertent corneal compression from, or tilting of, the goniolens. In clinical practice, gonioscopy usually is not part of the ophthalmic examination of all patients and is performed in only 56% of glaucoma patients, and repeated on the same patient in 13%.5 However, ultrasound biomicroscopy6 and, more recently, optical coherence tomography (OCT), represent other ways to image the anatomic features of the angle directly to determine its status.

In this issue, Baskaran et al7 report a prospective, longitudinal study (see http://aoajournal.org/article/S0161-6420(15)00768-X/fulltext) showing that approximately 17% of patients with gonioscopically open angles, but who had OCT-confirmed iridotrabecular contact (ITC) at baseline, demonstrated progressive angle closure after 4 years, with 45.5% of patients with 1 quadrant of ITC becoming occludable with gonioscopy or OCT (defined as 2 quadrants or more of closure). Both gonioscopy and OCT were performed in a dark room with minimal light shone through the pupil because angle closure is found more commonly in physiologically dilated pupils.8 In comparison, those with open angles at baseline did not demonstrate angle closure with gonioscopy, whereas 12.7% of patients with no ITC shown on OCT demonstrated occludable angles after 4 years.

This study objectively confirms what we already know clinically: that angles can close over time. 

This study objectively confirms what we already know clinically: that angles can close over time.

In light of the above, is OCT better than gonioscopy in detecting angle closure? Part of the answer may lie in the differences between the gonioscopic and OCT definitions of angle closure. Pathologically, there are 2 types of angle closure, synechial and appositional. Synechial closure, defined as the presence of peripheral anterior synechiae (PAS), is pathognomonic of PACG; appositional closure (angle closure without scarring) often is missed because it occurs most commonly when the pupil is physiologically dilated in the dark.9 When performing gonioscopy in dark lighting conditions with a small slit-lamp beam, nonvisualization of the TM implies the angle is closed. Given that an occludable angle currently is defined as the presence of angle closure in 2 quadrants or more,12 the angle is deemed open gonioscopically, although there may be 1 quadrant of angle closure in the absence of PAS. In contrast, OCT-defined angle closure is the presence of ITC in 1 quadrant or more.10 Consensus is needed from the glaucoma community to address this discrepancy.

Other factors contributing to the poor detection of primary angle-closure disease include the reliance on screening tests (Van Herick is only 61.8% sensitive8,9), instead of gonioscopy being performed routinely.11 Gonioscopy also has a number of interpretation problems,14 compounded recently by a paradigm shift in assessing the angle; an open angle now is a diagnosis of exclusion.1,2 Therefore, gonioscopy needs to be performed to exclude angle closure by looking for synechial closure (such as high or low PAS15) and appositional closure (pigment changes,16 the height of the iris plane,17 and assessing the appearance of the TM in a completely dark room with a small slit-lamp beam). Yet, appositional angle closure still can be missed, because the light needed during the initial assessment, tilting the goniolens from the primary position, or inadvertent corneal pressure may open an angle that is closed in the dark. Gonioscopy may be the gold standard in assessing the angle, but it may not be for detecting angle closure.

However, OCT is a noncontact means of imaging ITC directly and is easier to acquire in a completely dark...
environment. It is more sensitive in detecting appositional angle closure compared with gonioscopy (44.6% of gonioscopically open angles had ITC with OCT), but not PAS (only 93.3% of gonioscopic PAS was seen with OCT).\textsuperscript{17} In a screening population, angle closure was detected in 59% of patients using OCT and 33% of patients using gonioscopy.\textsuperscript{18} The agreement between the gonioscopy and OCT is fair,\textsuperscript{18,19} but angle closure still can be missed because the time-domain and spectral-domain OCT devices provide only 1 to 2 cross-sectional images of the anterior segment at a time, and there are problems in identifying the scleral spur\textsuperscript{19,20} and in imaging the superior angle (because of the eyelid), where angle closure most commonly is found.\textsuperscript{18} We await further studies using swept-source OCT where the entire 360° of the angle can be imaged, which may improve PAS detection.

How can we improve our detection rate of glaucoma disease in clinical practice? We know that patients usually are asymptomatic throughout most of the glaucoma spectrum (risk, suspected glaucoma, or early disease) and usually seek treatment late in the disease process when there is visual field loss or extremely high IOP. Given that up to 50% of patients are undiagnosed in glaucoma epidemiologic studies, with 50% having seen an eye care professional in the last 6 months before diagnosis,\textsuperscript{21} all patients (regardless of their presenting symptom) should undergo opportunistic screening looking for either glaucomatous damage or for any risk factors for glaucoma development. These risk factors include those for open-angle and angle-closure glaucoma, which require an assessment of the angle to exclude angle closure or ITC.

Optical coherence tomography has become an integral part of our diagnostic skills in ophthalmology, and it eventually may be used routinely to assess the angle. Given the problems with gonioscopy, OCT is better in detecting angle closure by imaging in the dark, but not all ophthalmologists have ready access to this technology. Until future studies determine which method is the gold standard, gonioscopy should be performed. To quote Thomas McCrae (1870–1935), “More is missed by not looking than not knowing,” so if the angle looks open, ask yourself whether it also can be closed, because early detection can lead to better patient outcomes.

References


Footnotes and Financial Disclosures

Financial Disclosure(s): The authors have no proprietary or commercial interests in any materials discussed in this article.

Correspondence:
Lance Liu, MBBS, FRANZCO, GIRU, Royal Victorian Eye and Ear Hospital, 32 Gisborne Street, East Melbourne VIC 3002, Australia. E-mail: drlifu@hotmail.com.