Addressing Barriers to Wider Use of Gonioscopy

Automated gonioscopy provides a streamlined and efficient way to perform this vital examination technique.

BY ANTON B. HOMMER, MD

Gonioscopy is most commonly thought of as a test performed to assess open- versus closed-angle glaucoma. Indeed, in addition to that essential purpose, there are a number of applications for this important examination technique. For example, a review of the angle is necessary in an eye with suspected inflammatory activity to look for synechia. In cases of trauma, gonioscopy would be helpful for identifying recesses of the peripheral iris or other posttraumatic signs. After identifying vascular occlusion in a diabetic patient, other uses might include looking for neovascularization, which affects the health of the eye and could indirectly impact IOP.

Even in the eye with suspected or diagnosed glaucoma, gonioscopic examination serves a larger role than differentiating between open- and closed-angle etiology. As the patient is followed over time, for example, the exam is repeated periodically to review and monitor any changes to the anatomy. As well, there is a growing appreciation that the angle should be thoroughly reviewed to help determine patients' suitability for a MIGS procedure. Postoperatively, gonioscopy is used to review placement of the device, ideally with an image capture for documentation purposes (Figure 1).

In its practice guidelines for glaucoma, the European Glaucoma Society recognizes gonioscopy as an essential part of the eye examination for any adult suspected or diagnosed with glaucoma, noting that the clinician should evaluate at least five parameters:

1. level of iris insertion, both true and apparent
2. shape of the peripheral iris profile
3. width of the angle approach, (ie angular separation between the corneal endothelium and the anterior surface of the peripheral iris)
4. degree of trabecular pigmentation
5. areas of iridotrabecular apposition or synechia.[1]

It is also suggested that clinicians use a grading system when possible, principally so that findings can be evaluated and compared over time. The Spaeth gonioscopy grading system is perhaps the most well-known, but other systems, including Shaffer and Kanski, have also been described.

Figure 1. GS-1 image in an eye with pigment dispersion apparent in the angle. In this patient, successful placement of a CyPass Micro-Stent (Alcon) is confirmed.

Figure 2. Linear layout of a 360° photograph captured with the GS-1. This image is notable for showing both closed and open angle in different portions of the angle, as well as synechia.

CHALLENGES IN GONIOSCOPY

Despite the recognized importance of gonioscopy in evaluating glaucoma, it is estimated that it is performed in fewer than 50% of patients.[2,3] This may be a consequential oversight for many patients. Although angle-closure glaucoma is present in only about 10 to 40% of glaucoma cases, depending on which part of the world is reviewed, it accounts for the majority of cases of bilateral amaurosis.[4,5]

One prominent reason that has been offered for the underutilization of conventional gonioscopy is that the examination is perceived as technically challenging. The choice of goniolens may be important in this regard; some models that are placed directly on the eye naturally depress the globe, thereby compromising the assessment of the angle in its natural anatomic position. In other situations, use of the incorrect size or diameter might distort the shape of the eye during the exam. These factors are compounded by the requirement for a compliant patient, especially if images are being captured. With a traditional set-up, the lens must be repositioned several times around the eye to capture images for 360°. However, the actual examination can be uncomfortable for patients, especially if the angle is anatomically small or narrow. As a result, even if conventional gonioscopy

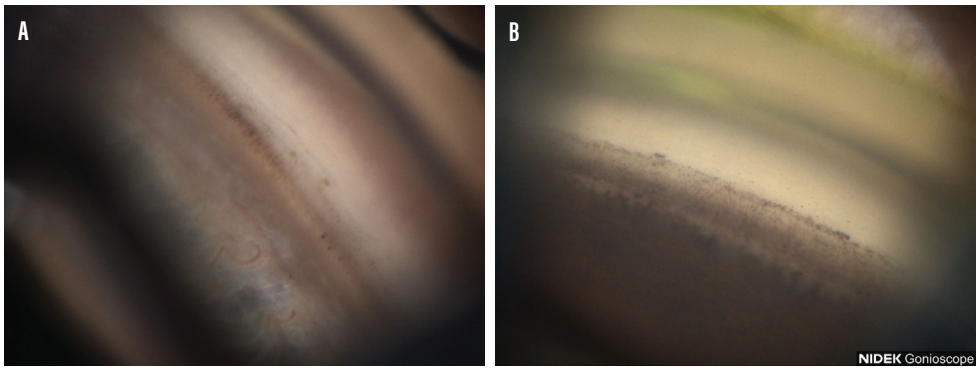

Figure 3. The automatically acquired, high-resolution color photographs from the GS-1 may be useful for differentiating low pigmentation (A) from moderate pigmentation (B).

is successfully performed, findings may be unreliable.

Automated gonioscopy would seem to address several of these issues. An examination with the GS-1 (NIDEK CO., LTD., Japan) takes about a minute to perform on each eye, with the complete examination, including entering patients' information, taking about 5 minutes. Many practices have a technician perform the exam, with results handed to the clinician before he or she enters the room with the patient. The various features of the device add up to provide clinicians a streamlined and efficient way to perform gonioscopy, one which seems to eliminate many of the barriers to performing this vital examination technique.

THE ADDED VALUE OF IMAGING

One of the biggest advantages of the GS-1 is the possibility to acquire high-resolution color images for 360° and combine them in a single photograph, eliminating the need to either reposition the lens or stitch together images based on anatomic landmarks (Figure 2). As well, with high-resolution color photos, the clinician can identify and differentiate pigmentation (Figure 3). For instance, a black pepper-like appearance is suspicious for pigment dispersion, whereas a salt-and-pepper-like appearance suggests pseudoexfoliation. These same points can be determined with a goniolens, yet there is additional value in having documentation for evaluating intervisit variability in the appearance of such clinical findings.

Other examination techniques, such as anterior-segment OCT, have inherent limitations when imaging the angle. Prominently, the lack of color limits the ability to identify important pathology, including vessels, pigment, and color. As well, these images are not real but actually reconstructions of data collected and processed according to a mathematical algorithm. Thus, even when image quality is sufficient to view the anatomy and structural features of interest, the image rendering process introduces opportunities for inaccuracies and errors.

The high-resolution color images automatically captured with the GS-1 are an invaluable teaching tool. In teaching facilities, photos can be used to help trainees identify landmarks and distinguish anatomy. Even in private clinics, though, the ability to show a patient what is going on at the angle is helpful for education and counseling. In my practice, I have used GS-1 images to demonstrate to patients the positioning of a MIGS device postoperatively, and patients are impressed with the details we are able to highlight even when discussing micro-sized devices. Overall, some patients simply learn better by seeing rather than hearing a clinician explain things.

Another crucial aspect of having access to reliable color images of the iridocorneal angle anatomy is that they can be used for grading purposes. When performing grading with standard gonioscopy, the interpretations must be performed either during the exam, which needlessly extends the duration, or later, based on notes when the patient is not present. Being able to carefully examine a photograph, on the other hand, permits a much more meticulous and measured assessment and grading of the angle features, regardless of what system is used.

IMPLICATIONS FOR PRIVATE PRACTICE

One current limitation of the GS-1 is that it is not possible to perform dynamic gonioscopy with the device, although this is a feature the company is investigating. Indentation gonioscopy is most typically used in differentiating appositional from synechial closure. It has other uses, but overall, these clinical situations constitute a set of specialized examination circumstances that warrant the use of additional techniques, even if automated gonioscopy is part of the evaluation.

Outside of the need to occasionally use a small diameter lens for dynamic gonioscopy, the GS-1 performs all the same functions as a gonioscopic examination in a much more efficient manner, with the bonus of having findings documented with a photograph of the actual anatomy. Furthermore, it is possible to have the photograph captured by a technician or other designated staff member. Therefore, in settings where this kind of arrangement is possible, incorporating automated gonioscopy improves clinical workflow and focuses efforts on delivering high-quality care. ■

1. European Glaucoma Society Terminology and Guidelines for Glaucoma, 4th Edition - Chapter 2: Classification and terminology. Supported by the EGS Foundation: Part 1: Foreword; Introduction; Glossary; Chapter 2 Classification and Terminology. *Br J Ophthalmol*. 2017;101(5):73-127.
2. Coleman AL, Yu F, Evans SJ. Use of gonioscopy in medicare beneficiaries before glaucoma surgery. *J Glaucoma*. 2006;15(6):486-493.
3. Varma DK, Simpson SM, Rai AS, et al. Undetected angle closure in patients with a diagnosis of open-angle glaucoma. *Can J Ophthalmol*. 2017;52(4):373-378.
4. Tham YC, Li X, Wong TY, et al. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. *Ophthalmology*. 2014;121(11):2081-2990.
5. Jonas JB, Aung T, Bourne RR, et al. *Glaucoma. Lancet.* 2017;390(10108):2183-2193.

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