Goniotomy—long considered a leading surgical option for pediatric glaucoma—has re-emerged as a treatment for adult glaucoma, driven primarily by advances in minimally invasive glaucoma surgery (MIGS).1

“MIGS has exploded on the glaucoma scene,” said Shivani S. Kamat, MD, at UT Southwestern Medical Center in Dallas. “Traditional surgeries for glaucoma, like trabeculectomy, work well but have a lot of risks associated with them. MIGS has allowed us to offer surgical options that aren’t as risky and can be performed earlier in the disease process, which has been proven helpful in slowing the disease.”

“We know from historical data that goniotomy works,” said Frini A. Makadia, MD, at the Wheaton Eye Clinic in Wheaton, Ill. “These new minimally invasive procedures can be used for patients who have gone beyond what drugs or laser can provide but who don’t need a full-blown excisional surgery like a trabeculectomy or tube shunt, which we know come with complications.”

What counts as goniotomy success?
“Goniotomy treats the trabecular meshwork [TM], the portion of the drainage system where the majority of pathology with glaucoma exists,” said Dr. Kamat. “I consider the procedure a success if I get a 20% to 30% decrease of pressure and I’m able to stop a [glaucoma] drop or two.” Dr. Makadia noted, “I usually get about a 20% pressure reduction, and patients can usually stop at least one medication.”

Indications, Contraindications
Sahar Bedrood, MD, PhD, at Advanced Vision Care in Los Angeles, performs goniotomies in patients with moderate or severe open-angle glaucoma (OAG), either as a standalone procedure “or in conjunction with cataract surgery for those intolerant of [glaucoma] drops or needing extra IOP lowering surgically.”

“The beauty of goniotomy is that it’s very versatile for patients with OAG and even for some with narrow angles who require an IOP-lowering procedure and cataract surgery at the same time,” said Dr. Kamat (see “Goniotomy Plus Phacoemulsification,” next page). “It’s very low risk and user-friendly, and it tends to work well—and if it doesn’t, it won’t preclude you from doing other procedures down the line.”

And even though the procedure can be performed with cataract surgery, Dr. Makadia said, “It’s worthwhile to try a standalone goniotomy regardless of cataract status if patients have uncontrolled glaucoma or a secondary mechanism like pigment dispersion, pseudoexfoliation, steroid-induced glaucoma, or uveitic glaucoma.” Other indications include cases when “glaucoma is progressing but there’s time to attempt a goniotomy before proceeding to a tube shunt or trabeculectomy,” she said.

Contraindications. Potential contraindications include Sturge-Weber syndrome and thyroid eye disease, said Dr. Bedrood. In both instances, pressure creates resistance beyond the Schlemm canal, because the goniotomy may not

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lower pressure enough.
If someone has a mild peripheral anterior synechia, you can remove it intraoperatively before goniotomy, added Dr. Kamat, “but for wide areas of scarring, typically you would avoid goniotomy.”

Comparing Instrumentation
Devices to open the TM include the microvitreoretinal (MVR) blade; the Trabectome (MicroSurgical Technology), used to perform trabeculectomy; the iTrack (Nova Eye Medical) canaloplasty microcatheter, used to enlarge the Schlemm canal; and the OMNI trabeculotomy system (OMNI Surgical).

But as Drs. Makadia and Kamat noted, the Kahook Dual Blade (New World Medical) has become an increasingly popular MIGS device. “I mostly use the Kahook; it’s a small, curved-angle blade that’s easy to get into the angle and manipulate,” Dr. Makadia said. With parallel blades, a ramp, and a 230-µm-wide footplate that sits in the 250-µm-wide Schlemm canal, the Kahook can lift and cut the TM in a single pass.

“I typically use the Kahook to perform a goniotomy; it glides through the tissue very easily,” said Dr. Kamat. “The Trabectome has other features, like ablating the tissue as it’s cutting to help prevent bleeding, but that creates scar tissue, which isn’t always favorable.”

“Goniotomy has its own nuances but can be quickly learned,” added Dr. Makadia. “I’ve had a few comprehensive ophthalmologists ask about new procedures, and I’ve always encouraged them to try the Kahook. It’s something they felt comfortable with very quickly.”

Another option, known as BANG (for bent ab interno needle goniotomy), is also gaining traction. It is decidedly low tech by design: as with the original pediatric technique, the surgeon uses a simple bent hypodermic needle. (Of note, goniotomy can be variously—and confusingly—referred to as goniodoplasty, excisional goniotomy, or even trabeculectomy in some literature.)

Surgical Insights
Visualization and access. Dr. Kamat's No. 1 tip for any MIGS procedure: “Make sure you have a good view, using gonioscopy, to see the drainage angle.”

Using the Kahook. With the Kahook, “I magnify down about five-fold compared to cataract surgery and turn the patient’s head 35 degrees and the microscope 30 degrees toward me for good access to the angle,” said Dr. Bedrood. As she’s cutting, she watches to confirm that the blade isn’t cutting inferiorly into the ciliary body or superiorly into the cornea, she said.

“The second you meet resistance, you’re too far into either the TM or the ciliary body space. Seeing the nice white sheen of Schlemm canal means I’ve taken off the right layer of TM.”

“Depending on how much pressure-lowering I’m hoping to achieve and what the pathology is,” said Dr. Makadia, “I can sometimes safely incise up to 30% to 40% of the angle with good visibility.”

Viscoelastic. “Make sure you use enough viscoelastic to keep the anterior chamber and IOP stable, because that will help tamponade any bleeding,” said Dr. Kamat. “You don’t want the eye to be very firm, which can close off Schlemm canal, but a ‘soft’ eye compromises the view with a lot of striae in the cornea.”

Using the BANG technique. Elizabeth A. Martin, MD, at the Indiana University School of Medicine in Indianapolis, said she prefers BANG. “I was doing some Kahooks and a lot of GATT [goniotomy-assisted transluminal trabeculotomies] with the iTrack and then OMNI,” Dr. Martin said. “The BANG is like a ‘poor man’s Kahook’ because it gives me very similar feedback [while cutting] and glides along very nicely.”

Needle plus viscoelastic. “I bend a short, 25-gauge needle and use a heavy viscoelastic,” Dr. Martin said. She uses .5-inch needles, because typical 1.5-inch, 25-gauge needles “can create unsafe torque in the eye, since the anterior chamber is only one centimeter.” While each single-use Kahook device costs about $250, she added, the needle costs a few dollars, so it’s cost-effective and more easily transported to the developing world.

A note on terminology. Even though BANG is often called a “goniectomy,” Dr. Martin considers it to be a goniotomy because she’s not taking a strip of tissue away.

More Thoughts on Patient Selection
Kahook versus BANG. Is BANG a better choice than the Kahook for certain cases? “They can be used interchangeably,” Dr. Martin said, “although certain angles have a bit more scarring, and because the [hypodermic] needle is sharper than the Kahook, it’s a little easier to get into the tissue.” Results of a recent study found that BANG was comparable to high-tech goniotomy in...
lowering IOP and reducing medication burden: 73% of participants had a drop of 20% or greater in IOP, and 73% were able to come off of one or more glaucoma medications.1

**Disease stage.** “In early and moderate glaucoma in adults, the drainage is still salvageable,” said Dr. Bedrood. “I typically don’t do goniotomy in early glaucoma when there’s still a chance to revive the TM with bypass stents, canaloplasty, or selective laser trabeculoplasty. There’s a lot we don’t know about glaucoma, so we don’t want to take functional tissue away.”

**Tissue-sparing considerations.** For her part, Dr. Martin said, “In mild glaucoma I’ve moved to [doing] more tissue-sparing angle-based surgery, such as stenting, where the TM still has some function. But in moderate and severe glaucoma, I’ve moved toward removing that TM because it’s dead weight.”

**Postoperative Expectations**

A micro-hyphema is the most common goniotomy complication, and it usually clears by week one, said Dr. Makadia. “If I expect a lot of postoperative bleeding, I put a sterile air bubble in the anterior chamber, which usually tampers the bleeding.”

Following surgery, Dr. Bedrood said that she puts patients on an antibiotic and prednisone four times a day, “which I taper up or down according to how much inflammation they have.”

“Patients may have [transient] blurry vision after post-op week one,” added Dr. Makadia, “but goniotomy is worthwhile from a glaucoma standpoint and generally won’t have a long-term impact on final vision.”

A post-op IOP spike is also common due to steroid exposure, Dr. Makadia said. “I keep my patients on their glaucoma medications until post-op month one, and if [they’re] below their goal pressure, I’ll put them on a trial of stopping one or two medications.”


Dr. Bedrood is a glaucoma and cataract specialist at Advanced Vision Care in Los Angeles. Relevant financial disclosures: None.

Dr. Kamat is a glaucoma specialist and assistant professor of ophthalmology at UT Southwestern Medical Center in Dallas. Relevant financial disclosures: New World Medical: L.

Dr. Makadia is a glaucoma specialist at the Wheaton Eye Clinic in Wheaton, Ill. Relevant financial disclosures: None.

Dr. Martin is a glaucoma specialist and assistant professor of clinical ophthalmology at the Indiana University School of Medicine in Indianapolis. Relevant financial disclosures: None.

See the disclosure key, page 8. For full disclosures, see this article at aao.org/eyenet.