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GLAUCOMA DEBATE CLUB 2022

Cases in Sustained IOP Control

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Activity Description and Purpose

The successful treatment of glaucoma is challenged by many factors, including patient nonadherence to topical therapies, waning efficacy of topical therapies as disease progresses, and risks associated with traditional glaucoma surgery. As a result, several new approaches for managing glaucoma have been introduced that can help address some of the challenges posed by traditional medical therapy. These include sustained drug-eluting devices and minimally invasive surgical procedures. The choice of intervention is not straightforward, and a nuanced, patient-centered approach to selection is needed. In this educational activity, experts explore different treatment options for various patient scenarios through cases in a debate-style format. The desired result of this educational activity is to enable glaucoma specialists and other ophthalmologists to confidently incorporate a variety of new treatments beyond topical drugs to improve visual outcomes for patients with glaucoma.

Target Audience

This educational activity is intended for glaucoma specialists and other ophthalmologists caring for patients with glaucoma.

Learning Objectives

After completing this activity, participants will be better able to:

- Review safety and efficacy data for approved and emerging sustained-release drug delivery devices for glaucoma
- Identify patients with glaucoma who are most likely to benefit from sustained-release drug delivery treatment
- Choose appropriate MIGS procedures for a variety of patient scenarios

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GLAUCOMA DEBATE CLUB 2022

Cases in Sustained IOP Control

INTRODUCTION

Topical medical therapy has been the standard first-line approach to glaucoma management for more than 150 years. This drops-first glaucoma treatment paradigm is being revisited as nontopical treatment options expand. Sustained-release formulations of glaucoma medications offer novel routes of administration and longer duration of effectiveness between doses. Selective laser trabeculoplasty (SLT) has been shown in a recent landmark clinical trial to provide intraocular pressure (IOP) reduction at least as effectively and safely as topical medical therapy, without the hassles and adverse effects of daily eye drop administration. In addition, the advent of minimally invasive glaucoma surgery (MIGS)—consisting of a family of safer alternatives to traditional glaucoma surgical procedures—has expanded the indications for glaucoma surgery to patients with less-severe disease and to those earlier in their disease course. This activity is called the Glaucoma Debate Club because it will use a series of common clinical case scenarios to encourage discussion and debate among our panelists regarding the pros and cons of opposing treatment options for each patient. The selected cases feature treatment options, including sustained-release drug formulations, SLT, and MIGS procedures, that were considered to be reasonable next-step interventions in each case (although certainly not the only options), and these debates reveal rationales for each treatment option.

CASE 1: GLAUCOMA ASSOCIATED WITH UVEITIS AND STEROID USE

From the Files of Marlene R. Moster, MD

A 47-year-old woman who was a medical internist presented to her ophthalmologist for sudden onset of blurred vision in both eyes. She was found to have significant anterior chamber inflammation but without keratic precipitates. An extensive workup by a uveitis specialist revealed no identifiable underlying cause. Aside from high myopia (-8 D) corrected with contact lenses, she had no significant ocular history. Treatment with topical prednisolone acetate was started, which was initially dosed every 2 hours in both eyes and tapered over time to twice daily in both eyes.

This was supplemented with oral corticosteroids for several months before transitioning to oral adalimumab. Efforts to taper off steroids led to worsening inflammation. Over time, the patient's IOP began to rise, and she was referred for a glaucoma consultation. At that time, her visual acuity (VA) was 20/20 OD and 20/40 OS with her contact lenses. Her IOP was 53 mm Hg OD and 51 mm Hg OS. Both eyes had rare to 1+ cell and 1+ flare in the anterior chamber and no keratic precipitates. She was phakic, with very mild posterior subcapsular cataract formation in both eyes. Her optic nerve examination results, visual fields, and optical coherence tomography (OCT) images were all normal, with no signs of glaucomatous optic neuropathy. She was treated with a regimen of 4 topical glaucoma medications, an oral carbonic anhydrase inhibitor, and topical steroids twice daily, but her IOP decreased only to the mid-30–mm Hg range in both eyes. The patient stated that the medication regimen was unsustainable because of the adverse effects of the treatment burden on both her work and life.

Among the drop-less treatment options, the faculty debated if a gel stent or a gonioscopy-assisted transluminal trabeculotomy (GATT) procedure was the best treatment option for this patient.

THE CASE FOR A GEL STENT

Arsham Sheybani, MD

The key considerations in this case are that the patient is young and phakic, so the risk of long-term corneal endothelial or lens injury should be minimized. Because the patient is a physician, a procedure with a rapid postoperative visual recovery time is preferred. Furthermore, a procedure with evidence of efficacy in steroid-induced glaucoma should be selected. To address these considerations, I would implant a gel stent.

Glaucoma is common in eyes with uveitis and can be difficult to control with medications alone. In a prospective study in 24 patients with medically uncontrolled uveitic glaucoma, mean IOP was reduced from 30.5 to 12.2 mm Hg (a 60% reduction) and mean medication use was reduced from 3.3 to 0.4 medications per eye at month 12 following gel stent implantation.[1] In a retrospective analysis of 37 eyes with uveitis and medically uncontrolled glaucoma, all patients were using ≥ 3 medications, including 76% who were using an oral carbonic anhydrase inhibitor before gel stent implantation.[2] After a mean follow-up period of 17 months, mean IOP decreased from 36.1 to 12.6 mm Hg and medication use decreased from 3.7 to 0.6 medications.

Steroids are well known to cause IOP elevation even in eyes without uveitis. The safety and efficacy of the gel stent has been described in eyes with refractory steroid-induced glaucoma. In a series of 3 eyes of 3 patients using topical corticosteroids postoperatively following lamellar keratoplasty, preoperative IOP ranged from 30 to 45 mm Hg on 5 to 6 medications per eye; at 12 months postoperatively, IOP ranged from 10 to 17 mm Hg using only 1 to 2 medications per eye.[3] Complications included transient hyphema, suture-related fungal corneal ulcer, and the need for a needling procedure. In another report, 2 eyes with steroid-induced glaucoma following intravitreal steroid administration for posterior segment conditions underwent gel stent implantation, with IOP decreasing from 32 to 33 mm Hg on 4 to 5 medications to 9 to 12 mm Hg on no medications 4 months postoperatively.[4]

From a safety standpoint, gel stent implantation has a favorable safety profile. In a cross-study comparison of safety with MIGS, gel stent surgery has a low rate of hyphema (2.4%), stent malposition or obstruction (0.8% each), and inflammation (1.1%), with an approximately 40% rate of postoperative needling and a 10% rate of secondary surgery **(Table)** (G. Durr, MD, S. Samet, MD, I. K. Ahmed, MD, unpublished data, 2020).[5] With regard to endothelial cell loss (ECL), a retrospective analysis in 32 eyes demonstrated comparable ECL rates (~14.5%) in eyes undergoing combined phacoemulsification and gel stent surgery (n = 17) and those undergoing standalone phacoemulsification (n = 15), suggesting no additional ECL attributable to the gel stent.[6] In contrast, ECL following tube shunt implantation is generally greater than that following phacoemulsification and continues over time at a rate of approximately 2.7% per year.[7,8]

THE CASE FOR GATT

Marlene R. Moster, MD

The rationale for selecting GATT for this patient is the nature of her glaucoma. Steroid-induced glaucoma is known to arise owing to

Table. Cross-Study Comparison of Safety Profiles of Commonly Performed Minimally Invasive Glaucoma Surgeries (G. Durr, MD, S. Samet, MD, I. K. Ahmed, MD, unpublished data, 2020)[5]

Adverse Event	Percentage of Eyes						
	ABiC	Hydrus Microstent*	iStent*	KDB*	Trabectome*	GATT	Gel Stent
Hyphema	29.1	19	19	7.5	9.1-40	32.8	2.4
Secondary surgery	1-25	3.5-19	2.6	1.3	15.9	18.6	10.3
Stent malposition	NA	0.2	2.7-35.3	NA	NA	NA	0.8
Stent obstruction	NA	12.2-18.7	3.6-13.2	NA	NA	NA	0.8
IOP spike	12.5	0.5-4.8	0.8-5.2	1-6.7	7.3-50	6	NA
Inflammation	–	11.4	2.4	1.1	20	1.4	1.1
Other	–	PAS, 13.3-18.8	PCO, 8.3-66.7	PCO, 25	PAS, 100; Reflux bleeding, 100	3-line loss, 5.6	Needling, 38.8

Abbreviations: ABiC, ab interno canaloplasty; GATT, gonioscopy-assisted transluminal trabeculotomy; IOP, intraocular pressure; KDB, Kahook Dual Blade; NA, not applicable; PAS, peripheral anterior synechiae; PCO, posterior capsular opacification.

* Performed with phacoemulsification/intraocular lens

pathology within the trabecular meshwork—most notably the formation of cross-linked actin networks and increased myocilin expression—that increases aqueous outflow resistance.[9,10] Given the patient's young age, her distal collector channel system is likely intact and healthy, so if the obstructed trabecular meshwork can be bypassed, her IOP should come down.

Several publications support this expectation. In a retrospective analysis of 13 eyes undergoing GATT for steroid-induced glaucoma, mean IOP decreased by 55% to 63% and number of medications decreased by 74% through 24 months of follow-up despite the continued use of steroids by most patients.[11] Several case reports also describe success with GATT, such as a child with steroid-induced glaucoma[12] and an eye with a penetrating keratoplasty.[13]

This patient was also highly motivated to continue contact lens wear for her myopia postoperatively. For this reason, I wanted to avoid a bleb-based procedure because contact lens wear can be a risk factor for bleb-related complications.

CASE CONCLUSION

The patient's left eye was operated upon first. By week 1, IOP was 14 mm Hg and VA was 20/50; by month 3, IOP remained 14 mm Hg and VA had returned to her preoperative 20/40 level (likely attributable to the posterior subcapsular cataract). The right eye underwent surgery 3 weeks after the left, with similar outcomes. Seven years later, following bilateral cataract surgery, the patient's uncorrected VA was 20/20 in both eyes and her IOP was 13 mm Hg in both eyes using only the dorzolamide/timolol fixed combination and continuing her topical steroid once daily in both eyes.

PANEL DISCUSSION

Dr Moster: Would you have approached this case differently?

Dr Samuelson: I would have implanted an Ahmed glaucoma drainage device and likely removed the lens at the same time in each eye, given that her acuity was only 20/40 and ongoing steroid therapy is likely to worsen the posterior subcapsular cataract. This gives the best opportunity for IOP reduction and allows me to correct her refractive error so she will not need to use contact lenses for her -8 D myopia postoperatively.

Dr Ahmed: This was the perfect candidate for GATT—a young patient with uveitis and open-angle glaucoma who does not have synechia or sticky uveitis. Instead of the usual 360° treatment, I wonder if 180° would have been sufficient for this patient. This can reduce the risk of hyphema.

Dr Sheybani: I think the results of 180° and 360° GATT are likely similar in most cases. Given this patient's high IOP preoperatively, once we made the decision to operate, I would have done the full 360° treatment to give us the best chance for success.

CASE 2: ELEVATED INTRAOCULAR PRESSURE AFTER GEL STENT IMPLANTATION

From the Files of Arsham Sheybani, MD

An 84-year-old pseudophakic woman was referred with primary open-angle glaucoma (POAG) and persistent IOP elevation into the mid-20–mm Hg range despite the use of 3 topical medications. Recent visual fields demonstrated moderate progression. She had previously undergone SLT on 3 occasions. To achieve a new target IOP in the mid to low teens range, she underwent gel stent implantation via an open conjunctiva technique with adjunctive mitomycin C (MMC). Five weeks after surgery, the bleb required needling for elevated IOP; this was performed without additional MMC. Four months postoperatively, her IOP was 14 mm Hg on 1 medication. By the seventh postoperative month, her IOP rose to 20 mm Hg despite the use of 3 medications.

The faculty debated if a tube shunt or re-needling the bleb was the best treatment option for this patient.

THE CASE FOR A TUBE SHUNT

Thomas W. Samuelson, MD

This case underscores the double-edged sword that MIGS procedures represent. The gel stent is a useful tool in the right patient. The procedure is standardized. Visual recovery is rapid. There is less profound and less sustained hypotony compared with that seen with traditional procedures. There are also fewer postoperative visits, no need for suture lysis, and less need for ocular massage. Despite this, MIGS procedures are less titratable than are traditional procedures; there is little opportunity for the surgeon to customize the procedure in pursuit of an individualized IOP target goal. There is also limited opportunity for postoperative manipulations compared with trabeculectomy.

It is worth noting that the first glaucoma surgery for this patient was a bleb-based procedure and not an angle surgery. This is typically done because either the glaucoma severity calls for a bleb-based procedure or because the distal outflow system is thought to be impaired by the glaucoma process. Now, she has failed the first procedure despite an initially successful needling at week 5. There are several considerations when selecting the next procedure: the severity of the glaucoma, the likelihood and rapidity of progression, and the patient's level of tolerance for failure of the next step. Many patients become frustrated with a sequential approach, whereas others are more patient with a stepped approach and prefer the "next safest" option. Such patients may prefer a procedure with a lower success rate over one with greater efficacy if the former is significantly safer than the latter. Conversely, after a failure, many patients will prefer a more definitive procedure, even if the complication rate may be higher.

With these considerations in mind, I would not opt to re-needle the gel stent bleb. Although it worked the first time, the success was short lived and may predict short-lived success with repeat needling. Instead, I would implant a tube shunt. At the same time, I would inspect and attempt to revise the gel stent concurrently. Even if revision of the gel stent works for only a short while, it may provide the necessary IOP control postoperatively while we wait for the tube plate to encapsulate so we can pull the ripcord to open the tube. I fenestrate tubes routinely for early postoperative IOP control, but if the gel stent is already there, it makes sense to attempt to use it for at least short-term control while operating.

THE CASE FOR RE-NEEDLING THE BLEB

Arsham Sheybani, MD

When appropriate, I will undertake a second bleb needling after gel stent surgery. The procedure is minimally invasive relative to alterative options. The patient is already familiar with the procedure and knows

what to expect. It does not preclude any subsequent options that might be needed. Also, I will generally know immediately if the procedure worked or not, so not much time is lost. As for the use of additional MMC at the time of re-needling, I consider 2 key factors: How long has it been since the first MMC application, and how does the conjunctiva look from a vascularity/ischemia standpoint? I do not typically reapply MMC soon after a first exposure, and I use it cautiously in avascular or ischemic-looking conjunctival beds.

Data support the value of repeat needling after gel stent implantation. In various studies, the needling rate after gel stent surgery was typically in the 20% to 40% range.[14-18] In a series of 51 eyes undergoing gel stent surgery alone or in combination with cataract surgery that underwent ≥ 1 needling procedure, an average of 1.5 needling revisions were required postoperatively; approximately 60% of eyes required a single needling revision, approximately 25% received 2, and 10% to 15% received 3.[19] The first needling typically occurred within 5 to 7 months of surgery, and the second needling—if needed—occurred approximately 6 months after the first. Needling revision (however many were needed) lowered the mean IOP in these eyes from approximately 24 to 25 mm Hg to approximately 13 to 14 mm Hg at last follow-up, demonstrating that this postoperative procedure can salvage a failing gel stent.

CASE CONCLUSION

An anterior segment OCT revealed an obstruction in the proximal lumen of the gel stent. Needling the bleb was not going to address this issue. Instead, YAG (yttrium aluminum garnet) laser was applied to the proximal tube opening using a gonioscopy lens—which may have been fibrin—to dislodge it, and the bleb rose immediately.

PANEL DISCUSSION

Dr Moster: If you do not have access to an anterior segment OCT, would you consider YAG laser to the proximal tube lumen empirically before needling in eyes such as those of this case patient?

Dr Sheybani: Yes. Try the YAG laser first, and if that does not work, proceed to needling.

Dr Ahmed: These small lumen-filtering devices may reduce the incidence and severity of hypotony, but they are prone to blockage, as in this case. This is one of the Achilles heels of these microdevices. After relieving the obstruction with the laser, nonsteroidal or steroidal therapy may be necessary for a prolonged period to prevent that fibrin from recurring. As for the issue of repeat needling, for me, it is dependent on how the first one goes. If I do not get much of a result from the first one, I do not think it is valuable to do a second needling.

Dr Samuelson: What is the role of primary needling (ie, needling at the time of implantation)?

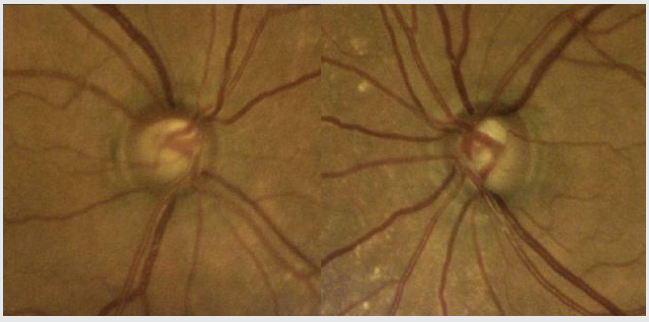
Dr Ahmed: This is an issue that arises with ab interno implantation, in which you do not have visualization and access to the subconjunctival space. You cannot ensure that the distal tip is free of obstruction with Tenon tissue. At the end of each ab interno gel stent implantation, I perform a primary needling. I swipe the subconjunctival space above and below the stent with the same 30g needle through which I inject the MMC. In ab externo implantation with open conjunctiva and Tenon, you have direct access and can perform this directly.

CASE 3: ROLE OF SUSTAINED-RELEASE GLAUCOMA DRUG DELIVERY

From the Files of Iqbal Ike K. Ahmed, MD, FRCSC

A 64-year-old Black woman was referred for glaucoma evaluation. Her mother had moderate open-angle glaucoma that was controlled with medical therapy. She was using a calcium channel blocker for systemic hypertension. On examination, she was noted to have significant ocular surface disease (OSD) with epitheliopathy. Her IOP was 22 mm Hg OD and 25 mm Hg OS. Her central corneal thickness was average at 541 µm OD and 546 µm OS. She had a 1+ relative afferent pupillary defect in the left eye. Her angles were open with 1+ pigment. **Figure 1** shows her optic nerve photographs, visual fields, and OCT images of the retinal nerve fiber layer and macular ganglion cell layer.

A



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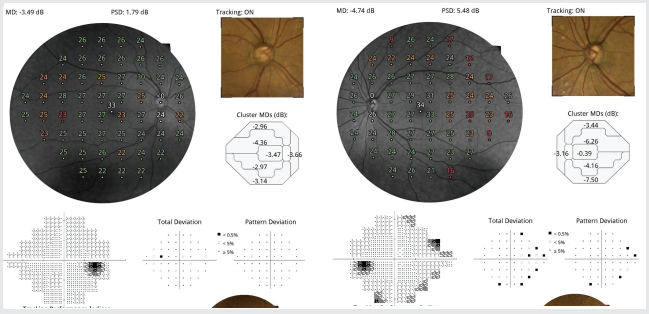

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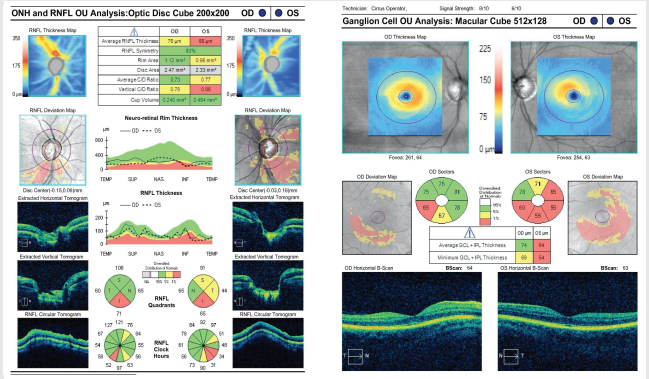

Figure 1. Glaucoma testing results for the patient presented in Case 3: (A) optic disc photographs; (B) visual fields; (C) retinal nerve fiber layer (left) and macular ganglion cell layer (right) optical tomography images

This patient was diagnosed with early POAG. After a discussion of therapy options, with a focus on the effects of various treatments on her OSD, she underwent bilateral 360° SLT, which lowered her IOP to the high-teens range until returning nearly to pretreatment levels 1 year later.

The faculty debated if a sustained-release (SR) drug implant or repeat SLT was the best treatment option for this patient.

THE CASE FOR A SUSTAINED-RELEASE DRUG IMPLANT

Marlene R. Moster, MD

Topical medical therapy for glaucoma has been associated with the onset or worsening of OSD—affecting 30% to 70% of treated patients[20-26]—and is likely attributable to the cytotoxic effects of the preservative benzalkonium chloride.[27,28] Sustained-release intraocular drug delivery can overcome this adverse effect. An SR formulation of bimatoprost has been approved for use[29]; an SR formulation of travoprost is in late-stage clinical development.[30]

Bimatoprost SR is a small biodegradable implant placed in the anterior chamber that contains 10 µg of active drug that is released in steady-state fashion over 3 to 4 months.[31] It can be implanted in the office using a preloaded applicator **(Figure 2)**. In patients with OSD, the bimatoprost SR implant has many attributes: it is preservative free, allowing the ocular surface to heal; it is effective and well tolerated with few adverse events; and it is covered by most insurance plans.

In phase 3 ARTEMIS trials, bimatoprost SR was noninferior to timolol with regard to mean diurnal IOP reduction 12 weeks after treatment, with mean IOP reductions in the range of 6 to 7 mm Hg.[31,32] In a long-term extension study of 200 patients who received 3 implants 16 weeks apart (at baseline and at weeks 16 and 32), 54 required no additional treatment through ≥ 2 years of follow-up and 18 required no additional treatment through ≥ 3 years of follow-up.[33] In a 24-month phase 1/2 trial, bimatoprost SR lowered mean IOP by 7.3 mm Hg compared with a mean IOP reduction of 8.2 mm Hg with topical bimatoprost, 0.03%.[34] Progressive ECL was observed with repeated bimatoprost SR implantations in both phase 3 studies, with ECL rates of 8.1% to 10.2% at last follow-up in these studies in eyes receiving ≥ 3 implants.[31,32] For this reason, the US Food and Drug Administration's approval of the drug limits its use to a single administration.[29]

A

B

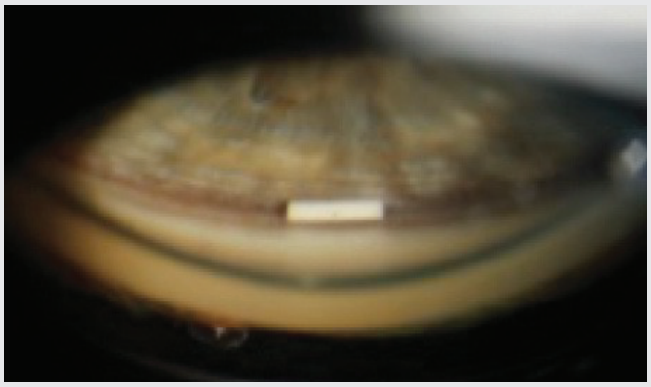

Figure 2. Bimatoprost sustained-release applicator (A) and the implant resting in the inferior angle of the anterior chamber (B)

This patient has had prior SLT. A recent study of repeat SLT demonstrated that repeat SLT confers only approximately half the IOP reduction of first SLT.[35] Importantly, bimatoprost SR effectively lowers IOP in eyes with prior SLT.[36] In a subgroup analysis of the pooled phase 3 ARTEMIS study data, eyes that had previously undergone SLT responded well to bimatoprost SR 10 µg, with mean IOP reduction over the first 12 weeks of 6.6 mm Hg comparable to that of eyes without prior SLT; 64% of these eyes required no rescue therapy in the year following the last implant.[36]

The ARTEMIS trial results support the use of the bimatoprost SR implant in many or most of our patients with POAG. I find it particularly helpful in patients who cannot adhere to topical therapy for whatever reason—eg, memory issues, cognitive issues such as early dementia, or physical limitations such as tremor—and in those who have OSD that might be aggravated by the preservatives in topical glaucoma medications. On the basis of all the preceding data, and particularly of this patient's OSD, my next step for her treatment would be the bimatoprost SR implant.

THE CASE FOR REPEAT SELECTIVE LASER TRABECULOPLASTY

Iqbal Ike K. Ahmed, MD, FRCSC

The recent LiGHT (Laser in Glaucoma and Ocular Hypertension Trial) demonstrated that primary SLT is at least as effective and safe as medical therapy in newly diagnosed and treatment-naïve patients with mild to moderate POAG or high-risk ocular hypertension.[37-39] In the LiGHT trial, nearly 80% of 536 eyes randomly assigned to receive primary SLT remained at target IOP without the need for medications at 3 years; 77% of these eyes required only a single SLT treatment.[39] At 6 years, 72% of SLT patients remained medication free, and more medication-treated eyes than SLT-treated eyes required trabeculectomy (31 vs 13, respectively).[40] Furthermore, visual field progression was less common and less rapid in patients receiving SLT than in those receiving medication.[37]

When its effect wanes, repeat SLT can be performed. Dr Moster rightly pointed out that the absolute IOP reduction with second SLT is less than that with first SLT, but this is only because we do not allow the effect of first SLT to wear off completely before re-treating; instead, we re-treat as soon as IOP rises above target IOP rather than when IOP returns to pretreatment levels.[41] In fact, in virtually every study that reports mean IOP values before and after initial and repeat SLT, repeat SLT lowers IOP to the same level achieved by first SLT, thus re-establishing the same level of control.[42-49] Interestingly, several of these studies suggest that repeat SLT may even last longer than first SLT.[45,48,50] In the LiGHT study, repeat SLT maintained medication-free IOP control in 67% of 115 eyes through at least 18 additional months; this was true even in eyes with a poor response to initial SLT that were re-treated within 2 months.[42]

This patient's race is relevant to the choice of next treatment. In the Advanced Glaucoma Intervention Study, argon laser trabeculoplasty was more effective in Black patients than in White patients whose POAG was inadequately controlled with maximal medical therapy.[51] In the era of SLT, the WIGLS (West Indies Glaucoma Laser Trial) demonstrated the effectiveness of SLT in Afro-Caribbean patients with POAG. In a prospective analysis of 133 patients, SLT repeated as needed on the basis of prespecified criteria lowered IOP consistently by 6 to 9 mm Hg through 8 years of follow-up; the median time to re-treatment after initial SLT was 85 months, and the 8-year medication-free survival rate was > 70%.[50] The long-term, prospective WIGLS confirmed the findings of previous studies that SLT is highly effective in Black patients.[52-54]

According to these studies demonstrating the effectiveness of repeat SLT, including specifically in Black patients, I would repeat SLT as the next step in this patient's therapy.

PANEL DISCUSSION

Dr Sheybani: Many of us in clinical practice do not perform repeat SLT when the procedure does not work the first time, but the LiGHT study showed us that it is very reasonable to try it again if you did not get a great response the first time.[42]

Dr Samuelson: Did you consider a combined procedure with phacoemulsification and MIGS for this patient?

Dr Ahmed: No. She had 20/20 vision. I am not sure the benefits justify the risks.

Dr Samuelson: I agree. I prefer to use medicines and lasers until patients have a symptomatic cataract.

TAKE-HOME POINTS

- **The bimatoprost SR drug delivery implant provides significant IOP reduction through 4 to 6 months in most patients; some patients will demonstrate sustained IOP reductions for up to several years**
- **Sustained-release drug delivery is a reasonable alternative to topical therapy in patients at risk for poor adherence and in those with OSD, among others**
- **MIGS procedures alone or in combination with cataract surgery can effectively reduce both IOP and the need for IOP-lowering medical therapy; MIGS device selection should be based on patient factors, including the status of the distal aqueous outflow pathway and the risks of bleb formation**

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1. For most patients, the expected duration of IOP reduction following bimatoprost SR implantation is _____.
   a. 3 months
   b. 4 to 6 months
   c. 12 to 18 months
   d. 24 to 36 months

2. In the ARTEMIS phase 3 trials, prior SLT resulted in _____ for patients receiving the bimatoprost SR device?
   a. Reduced efficacy of the device
   b. Increased efficacy of the device
   c. No difference for device efficacy

3. Which patient characteristic might support the use of an SR drug delivery option over topical therapy?
   a. Presence of OSD
   b. Cognitive impairment due to dementia
   c. Tremor related to Parkinson's disease
   d. All the above

4. Which patient would likely be a good candidate for a bimatoprost SR implant?
   a. Patient with moderate to severe glaucoma who failed SLT once and is on maximal medical therapy
   b. Pseudophakic patient with mild to moderate glaucoma who failed SLT twice
   c. Patient with a narrow angle who has difficulty adhering to his/her topical medication
   d. Patient with progressing pseudoexfoliative glaucoma and ECL

5. In which scenario would a bleb-based MIGS procedure be favorable to a tube shunt implantation?
   a. Need for rapid visual recovery postoperatively
   b. Desire to wear contact lenses after surgery
   c. Low ECL preoperatively
   d. All the above

6. Which is a reason to consider alternatives to an angle-based procedure such as GATT?
   a. Need for a modest IOP reduction
   b. Mild glaucoma damage
   c. Evidence of distal aqueous outflow obstruction
   d. High myopia

7. Which of the following is true regarding needling procedures for gel stents?
   a. Most eyes with a gel stent will require needling eventually
   b. Most eyes will require > 1 needling procedure
   c. Needling is most often first required within the first month after surgery
   d. Needling can effectively salvage a failing gel stent

8. Which of the following is true regarding SLT?
   a. Most patients with mild to moderate POAG receiving primary SLT will remain well controlled without the need for medications for at least 6 years
   b. Repeat SLT restores IOP control to the same level as that achieved with initial SLT
   c. Median survival time of initial SLT in Black patients with POAG is approximately 7 years
   d. All the above