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INTERVENTIONAL GLAUCOMA: SLT AND MIGS

A roundtable discussion of nondestructive interventional treatments for open-angle glaucoma.

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To watch videos of this roundtable, go to **eyetube.net/collection/ellex/jrfal/**

INTERVENTIONAL GLAUCOMA: SLT AND MIGS

A roundtable discussion of nondestructive interventional treatments for open-angle glaucoma.

At ASCRS 2018 in Washington, DC, a group of surgeons experienced in interventional glaucoma therapies sat down to discuss the roles of selective laser trabeculoplasty (SLT) and microinvasive glaucoma surgery (MIGS) for treatment of open-angle glaucoma (OAG).

The term **interventional glaucoma** *refers to more than simply technology. It is a mindset that the available technologies bring to us as surgeons and clinicians. Instead of being passive and watchful, waiting for our patients to progress, interventional glaucoma allows us to be actively involved in their care by providing interventional therapies that change the course of the disease. I am very excited about interventional glaucoma and how it shapes the future of glaucoma care.*

In this roundtable, we will discuss a number of technologies used in the interventional glaucoma model. First, we want to hear about SLT and its relevance in glaucoma therapy today, including the interplay of SLT and MIGS options. We also will talk about our experiences with ab interno canaloplasty (ABiC) performed with the iTrack surgical system (Ellex), its role in rejuvenating the natural outflow system, and its place among MIGS procedures. **—Iqbal "Ike" K. Ahmed, MD, FRCSC, Moderator**

SLT AND MIGS: AN INTERVENTIONAL APPROACH

Dr. Ahmed: I want to keep it pretty open to start, just talking about your current treatment paradigms for OAG. Tell me your thoughts.

Inder Paul Singh, MD: I think it depends on your target pressure, of course, but maintaining the patient's quality of life is always key for me. How can I get pressure down, maintain the pressure long term, and maintain a high quality of life? To meet those goals, I try to minimize patients' reliance on drops, thereby avoiding all of the various compliance issues we face. I tend to use SLT as a first line, if possible, and now also offer MIGS procedures earlier than I would offer traditional glaucoma surgeries, in an effort to minimize the impact of compliance in this long-term disease. Drops are always there as an adjunct as needed.

Mark J. Gallardo, MD: I agree—minimizing medication reliance is critical. In fact, when I encounter a glaucoma patient with mild to moderate disease with a visually significant cataract, I use that as an opportunity to manage both the patient's cataract and glaucoma. Unlike in the past, when I would rarely couple a cataract surgery with our more invasive filtration procedures in such patients, I now almost always automatically couple the patient's cataract surgery with a glaucoma surgery—a MIGS procedure. I do this because of the proven safety and efficacy in both IOP and medication reduction, and minimal additional recovery compared to cataract surgery alone.

Dr. Ahmed: We can draw from a few categories of glaucoma therapy. We have medications, interventional therapies like SLT and MIGS, and more traditional surgeries such as trabeculectomy and tube shunt. Tell me about how you use SLT and MIGS in conjunction with each other in your practice.

Mahmoud A. Khaimi, MD: My treatment paradigm is to go to SLT as primary therapy, and then use a MIGS procedure like ABiC with the iTrack microcatheter after that. If the disease progresses, my next steps would be perhaps SLT again, and then maybe some other MIGS, pushing back filtering and tube surgeries to later stages. In this paradigm, medication has actually fallen to kind of an adjunct in between those treatment stages. I think that's the way we're heading.

David D. Richardson, MD: I agree with that. I think that, at least here in the United States, it has always been an issue with medical/legal acceptability to go straight to a procedure instead of starting with medication. The safety profile of SLT is so great, I would argue that it's actually a safer first option than many of the medications. We talk about, for example, the beta-blockers as being a potential problem because they can have an impact on older patients. I actually had a younger, athletic patient end up in the emergency room because of his reaction to beta-blockers. So medications not only carry issues of adherence and cost, even with generics, but also health risks. I've never had a patient go to the emergency room after SLT. Never.

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Dr. Singh: You're right. And I'd add that there is the medications' toxicity to consider as well. Also, most of our medications also divert fluid away from the natural outflow. The ability of SLT to maintain the flow through the trabecular meshwork (TM) as well as the canal and distal channels means we can maximize the flow through the natural outflow systems as early as possible. That not only lowers pressure but also has the potential to prime the area for use of MIGS at a later time. Using SLT and MIGS earlier is very important to increase compliance, minimize toxicity, and improve the flow for long-term effect.

Dr. Ahmed: It sounds like most of you are using SLT early in the treatment paradigm, and in your experiences, patients are receiving that option quite well. Other than thinking about it as a primary therapeutic response, how do you feel about using SLT as an indicator of response to MIGS?

Dr. Singh: This is something that my colleagues and I have studied. Recently, we conducted a retrospective analysis of our first iStent Trabecular Micro-Bypass Stent (Glaukos) cases with at least a 1-year follow-up. We found that patients had done well overall. When we analyzed the subset of patients who had previous SLT, we found those with historically a good response to SLT had better IOP reduction and were on less postoperative medications than the patients who historically did not have a response to SLT.

These outcomes made us reexamine SLT as a possible diagnostic tool and provided our first inkling that we needed to examine the location of future MIGS treatment. SLT works at the TM, right? So, if it works well, we can conclude that the flow is probably good in the canal and distal channels. If it does not work well, then there might be some downstream resistance.

Now a positive SLT outcome leads me to think a trabecular bypass might be sufficient as well as ABiC with iTrack, while a poor effect of SLT leads me to conclude that the patient might have better results if we focused not just on the TM, but rather on the entire outflow pathway, including the distal channels, which would lead me to rely on a procedure like ABiC with iTrack. We are still studying the outcomes to determine if this is an accurate predictor.

David D. Richardson, MD

Dr. Khaimi: Whether SLT works or it doesn't, I still do ABiC with iTrack afterward because I think it's a little bit more powerful than other MIGS options and it comprehensively treats everything. So, perhaps we weren't able to open up the TM very well with SLT, but with ABiC viscodilating so much of the canal, I think it opens up the TM well. To me, SLT is a good indicator of whether ABiC will be effective afterward, but if SLT doesn't work, that doesn't keep me from doing ABiC.

Dr. Singh: I agree with you. I think that's one of the most important points. I probably wouldn't do a TM bypass-only device after unsuccessful SLT. That's where I think ABiC with iTrack can really help out in those patients.

Nathan M. Radcliffe, MD: We're moving toward standalone MIGS procedures, and SLT is sort of the grandfather of standalone glaucoma interventions. A patient who did well with that SLT intervention is sort of psychologically primed to think, "I trusted Dr. Radcliffe. He told me there would be a

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I don't think that we can do ALT anymore because we're doing MIGS as a first-line surgical treatment now. There's a big theme of rejuvenation in glaucoma now. SLT achieves that, and then we're rejuvenating the TM a little bit more with ABiC with iTrack. So, unlike ALT, SLT's nondestructive nature does not preclude future MIGS treatment options.

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laser, that I would recover very nicely, and that it could work. It worked. That was 4 years ago. Now things have changed with my glaucoma, and he's recommending ABiC. I'll do it." Our patients are buying into this paradigm. As we gain experience and confidence with SLT, we'll feel more confident in offering these safe, standalone MIGS procedures. The end result is that we're changing the overall paradigm to what Dr. Ahmed has called interventional glaucoma.

MISCONCEPTIONS ABOUT SLT

Dr. Ahmed: SLT has been around for some time, but I think there are still some misconceptions floating around about the procedure. Could you talk about some of the misconceptions you encounter with SLT and how you clarify them for people?

Dr. Radcliffe: Yes, there are many misconceptions (see *Six Misconceptions About SLT* sidebar). At a conference like this one, I'm overwhelmed with a flood of questions from our colleagues and friends. "Can you do SLT on someone who's never been on medication?" Yes. "And insurance will pay for that?" Yes. "But doesn't it cost the insurance company more?" No. It saves the insurance company money over medication. "But not if they're on generics." Yes, even if the patient is taking generics—and particularly if the patient is taking price-gouging generics, which we see more and more. As a bonus, while medications like dorzolamide (Trusopt, Santen) can be taken away, SLT treatment cannot.

Dr. Singh: One misconception I hear from some doctors is that they don't believe that SLT even works. In a study that compared SLT to a prostaglandin analog, researchers found similar efficacy without the toxicity, costs, and compliance challenges.[1] Years ago, a lot of us used to use trabeculoplasty, especially argon laser trabeculoplasty (ALT), when glaucoma was more advanced. After trying three or four medications, we thought, "OK, fine, I'll do trabeculoplasty." But in contrast, SLT works much better earlier in the disease progression because we have a healthier outflow system. Perhaps that contributes to this big misconception.

Dr. Ahmed: What's your experience with repeatability of SLT?

Dr. Khaimi: If a patient has good results for a year, I'll usually try to repeat SLT. It's not destructive. Maybe that's another misconception we should mention as well. Some folks might confuse ALT and SLT, as Dr. Singh mentioned. I don't think that we can do ALT anymore because we're doing MIGS as a first-line surgical treatment now. There's a big theme of rejuvenation in glaucoma now. SLT achieves that, and then we're rejuvenating the TM a little bit more with ABiC with iTrack. So, unlike ALT, SLT's nondestructive nature does not preclude future MIGS treatment options.

Dr. Radcliffe: I would just add that just because we can repeat SLT, that doesn't mean that we will have to do so. Again, this gets back to some people thinking that SLT doesn't work, or patients believing, "It's only going to work for a year or two, so what's the point?" I've seen it work for 9 years. It seems to patients like a cure at that point, and if I have to repeat SLT every 9 years, I think I'm doing great.

Dr. Khaimi: Are those the patients you treat early on?

Dr. Radcliffe: Yes. A patient might be on a prostaglandin analog for 6 weeks, does not like the side effects, so we decide to go for SLT. Patients like this have had known glaucoma for only a period of weeks to months. Anyone who seizes those cases early and treats with SLT will never question whether it works. People who use SLT too late, maybe to try to get out of surgery, aren't positioned to get the best

results. Those are the ones who question the efficacy. But if they use SLT early, they will see the results.

Dr. Gallardo: You have to question why SLT doesn't work in those patients who have been on medications for years. One reason that we don't really discuss: we've known for 10 or 15 years that the preservative in the drops actually damages the TM. We're using drops to help a patient's pressure, but at the same time, we're damaging the system that naturally relieves the pressure. If we can minimize or even eliminate the patient's need for medications, we will actually help reduce the deleterious effects that the benzalkonium chloride is causing to the conventional outflow system.

Can you imagine if there were a cholesterol medication that helped oxygenate the heart, but at the same time closed off the coronary arteries? No one would ever use it, but we do something similar to that every day with eye drops. We prescribe medications that we know, over time, damage the eyes' primary outflow system. We also know that chronic medication use will adversely affect the viability of filtration procedures by inducing cytokine and interleukin infiltration into the conjunctiva, but we prescribe them routinely. I've always wanted to minimize the need for medications as much as I can.

MIGS IN DAILY PRACTICE

Dr. Ahmed: Let's switch gears to MIGS. MIGS procedures have exploded on the scene. There are lots of options out there. What MIGS are you using? Where do they fit into your approach?

Dr. Gallardo: I'm a proponent of the idea that every device and procedure has its place. In any one routine OR day, I perform several MIGS procedures. I evaluate each patient and try to find the procedure that I feel best fits the patient's pathology by assessing the drainage angle via gonioscopy, stage of glaucoma, and looking at the patient's pressure and number of medications. As a result, I use various MIGS devices and procedures for patients whose glaucoma is anywhere from mild to severe, and I try to utilize MIGS prior to doing any filtering procedure.

Mark J. Gallardo, MD

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Dr. Singh: It's a similar principle to selecting premium lenses. Which patient needs which MIGS? We never had that ability in the past, but now we can select the right MIGS for each situation. We are now able to tailor our treatment for each patient. It's great to have options.

Dr. Ahmed: What percentage of your practice is combination cataract-MIGS surgery, versus standalone MIGS? How do you use MIGS for those situations?

Dr. Khaimi: I'm doing more combined surgery, about 60/40 or 70/30. I want to take advantage of the opportunity for patients with vision impaired by cataracts, who are on multiple drops, to be treated with a MIGS procedure that brings down their ocular pressure. I think that's a great time to capture them. Of course, it also dramatically improves their quality of life.

Dr. Singh: For me, the numbers have changed. A few years ago, I did about 90% cataract-MIGS procedures and 10% standalone MIGS. With all of the new MIGS products available to us, including ABiC with iTrack and others, the current ability to do standalone procedures has allowed me to treat more patients earlier, especially pseudophakic patients who are not tolerating medications. Nowadays, even if the fields and nerves are stable, but the patients can't afford the medications, can't remember to take them, or are just not happy, I offer a MIGS procedure. Now I can tell those patients, "I'd like to discuss a procedure that is safe and efficient overall and could get rid of some of your drops." That threshold has changed, and now I'm probably

SIX MISCONCEPTIONS ABOUT SLT

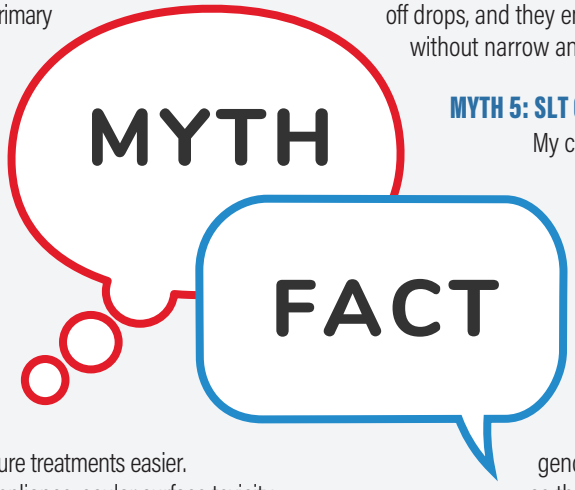
By Nathan M. Radcliffe, MD

Colleagues often ask me questions about selective laser trabeculoplasty (SLT), and I hear a lot of myths. I'm happy to debunk them and share the facts about SLT.

MYTH 1: SLT IS NOT AN EFFECTIVE FIRST-LINE THERAPY

"Does SLT really work?" It's a common question. The quick answer is "Yes," but I would add that SLT is both effective and a wise choice as a first-line therapy for the following reasons:

- SLT works as well or better than topical medications.[1] One study of SLT as primary therapy showed that mean IOP reduction was 7.3 to 8.3 mm Hg at 1 year.[2]
- In another study that compared SLT to prostaglandin as primary therapy, IOP reduction was similar at 9 to 12-month follow-up (6.3 mm Hg for SLT, versus 7.0 mm Hg for medication).[3]
- SLT opens up the trabecular meshwork, helping restore natural flow through the canal and distal channels, which should help sustain outflow and make future treatments easier.
- SLT alleviates the problems of compliance, ocular surface toxicity, meibomian gland dysfunction, and high costs related to taking one or more medications long term.



MYTH 2: SLT CANNOT BE REPEATED (OR SLT MUST BE REPEATED)

Some surgeons fear that they only have one chance to do SLT, and others who believe in repeating it think that this must happen every 2 years on the clock. However, the truth is that SLT is repeatable but does not always require repeating. IOP reduction from the second SLT is typically comparable to the first, and the results last longer.[4] Some patients, more than 10 years out, have never needed the second treatment. If I perform SLT and fall short of the goal I know that repeat therapy may achieve it. I find that patients understand the idea of repeat SLT treatment, and because the experience is comfortable for them, they do not hesitate about having a second SLT.

MYTH 3: SLT IS NOT EFFECTIVE OVER THE LONG TERM

SLT causes remodeling and healing of the trabecular meshwork. By utilizing SLT as a primary therapy or treatment early in the disease process, we increase the likelihood of long-term effect. In a long-term study that included 88 eyes with SLT, IOP was lowered -6.7 ± 7.1 at 3 years, -7.0 ± 7.7 at 4 years and -7.4 ± 7.3 at 5 years, with some patients requiring additional interventions during the follow-up period.[5]

MYTH 4: SLT CANNOT BE PERFORMED AFTER ALT OR LPI

In my experience, the outcomes for SLT after argon laser trabeculoplasty (ALT) are the same as we see for patients who have never had laser treatment. SLT is an excellent choice, in fact, because it does not cause thermal damage or scarring to the trabecular meshwork.

In patients with narrow angles who have had previous laser peripheral iridotomy (LPI), I consider the angle to be "primed" by the trabecular acquisition. SLT works just as well here as in primary open-angle glaucoma.[6] If the angle is freshly opened, then we know where the disease is located. I treat them with SLT, get them off drops, and they end up with outcomes similar to patients without narrow angles.

MYTH 5: SLT ONLY WORKS IN PIGMENTED ANGLES

My colleague, Paul Harasymowycz, MD, reviewed 70 of his patients and analyzed what baseline factors correlated with good IOP lowering.[7] He found that having a higher baseline IOP was related to getting a better pressure reduction, and that patients on a prostaglandin analog didn't get quite as much lowering. However, age, angle pigmentation, phakic status, gender, or diagnosis did not impact efficacy, so these patients may all be treated without concern of baseline factors throwing off laser success.

MYTH 6: SLT IS NOT RELEVANT IN THE ERA OF MIGS

Eyes with a high baseline pressure tend to respond to many procedures. A factor called corneal hysteresis predicts who will have good IOP reduction from SLT.[8] Successful SLT tells us that resistance to outflow was located in the trabecular meshwork, while SLT that does not meet goals tells us that a microinvasive glaucoma surgery (MIGS) procedure or other intervention should target another mechanism.

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about 60/40 with more stand-alone MIGS than before.

ABiC IN THE SPOTLIGHT

Dr. Ahmed: Let's focus on one of the MIGS: ABiC with iTrack. We've all used this system, and I think there is increasing interest in the procedure. Could a few of you describe how ABiC works, in terms of its mechanism of action and how it lowers pressure?

Left to right: Inder Paul Singh, MD; Nathan M. Radcliffe, MD; David D. Richardson, MD; Mark J. Gallardo, MD; Mahmoud A. Khaimi, MD; and Iqbal "Ike" K. Ahmed, MD, FRCSC.

Dr. Richardson: I describe ABiC to my patients as essentially angioplasty for the eye. We take a drainage system that has been stopped up and we expand it, rejuvenating the natural outflow. Patients get that, because they all understand what angioplasty is.

One of the things that I like about ABiC with iTrack is how we approach it. I take a step-wise approach with MIGS. First I want to use SLT to get the TM working better. If the improvement is not enough, then I want to make sure that the outflow system is truly open by using ABiC with iTrack. The next step, in my opinion, is placing a stent, so we're creating a communication pathway. So that's the step-wise approach that I take, and patients understand that. You've got an obstruction, you've got a drainage system behind that, and then sometimes you have to open it up. It's nice, because it's a very simple, straightforward, easily understood discussion to have.

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Dr. Khaimi: That's truly the epitome of interventional glaucoma therapy. The mechanism with ABiC is viscodilation of Schlemm canal, which might be collapsed or have herniated TM in it. We're also creating intratrabecular fractures and beams that allow aqueous to flow through diseased TM and out through the conventional outflow pathway.

There are a lot of pretty revolutionary MIGS options, but I like to start off with ABiC first. There is a misconception that it only works on the canal distally. I think that ABiC comprehensively treats all outflow channels, which is why it is my first go-to MIGS procedure. I don't have the diagnostic capability to know where the obstruction is located or what level of resistance exists, so I like to start off with a MIGS that addresses everything. The other advantage is that ABiC doesn't burn any bridges. I can do any other procedure afterwards because it isn't destructive, and I don't have to worry about a device.

Dr. Richardson: We were talking earlier about SLT being a diagnostic tool. ABiC with iTrack has the same potential. If it doesn't work, then there's no point in going in later and putting in a stent or a scaffold. A failed ABiC is telling you this system is not capable of being reopened. Fortunately, that's quite rare, but if we're looking at a step-wise approach, I would not place a stent in a patient who does not respond to ABiC. Instead, I would look at a suprachoroidal shunt or another approach.

Dr. Radcliffe: Dr. Khaimi, could you explain the phrase "trabecular herniation?" I just learned about this.

Dr. Khaimi: When pressures increase, we see trabecular meshwork herniating into Schlemm canal. Haiyan Gong, MD, PhD, in Boston has assembled a lot of beautiful pathology slides showing POAG compared to normal eyes. POAG eyes tend to have a lot more herniations, especially complete herniations.[2] I tell my patients, "Your canal looks like this when it's working normally. But if it has become clogged or collapsed, we need to balloon it open." We need to alleviate the trabecular herniation.

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>
> —Mahmoud A. Khaimi, MD

Dr. Gallardo: To add to Dr. Khaimi's comments, Dr. Gong found that in postmortem POAG eyes fixed at 0 mm Hg, 95% of collector channels were obstructed by these TM herniations, while in non-POAG or normal eyes, only 15% of collector channels were obstructed despite being fixated at 10 mm Hg.[1] The iTrack catheter itself lyses these herniations within the canal, in addition to viscodilating the distal system.

Robert Stegmann, MD, also showed that while viscodilating Schlemm canal using the iTrack catheter, microperforations within the inner wall of Schlemm canal are created.[3] The microperforations help counter the reduction in the inter- and intracellular micropore population exhibited in glaucoma patients. Given the endothelial cells of Schlemm canal are connected by tight-junctions, it is thought that these micropores help facilitate aqueous outflow through the inner wall and into Schlemm canal.

Dr. Ahmed: We know the nondestructive nature of ABiC with iTrack. We've heard about the multiple mechanisms of action, plus its proximal system and distal system. We've been using it. What about our colleagues? What are the barriers to adoption? Are they technical or knowledge related? What barriers have you seen, and how do you approach them?

Dr. Gallardo: The most challenging portion of the procedure is the initial intubation of the canal. Once the catheter is in the canal, it's very easy to thread the iTrack throughout the canal's entirety.

Surgeons who are not MIGS trained at this point face the same barriers as any new surgeon to the angle. They need to learn to obtain a clear view of the nasal angle with a direct surgical gonioprism as well as to manipulate surgical tools within the angle. However, if a surgeon is MIGS trained, I think the barriers to ABiC are minimal. They will have a limited learning curve because they're already in the angle, and it won't be difficult for them to achieve success with this procedure.

Dr. Radcliffe: I was performing MIGS already, but I was probably the last of this group to adopt ABiC, and I think you're right. Maybe it seemed a little bit intimidating, but actually not only was it fun to adopt, but it was enjoyable as well. I felt the thrill of actually doing surgery on the canal rather than just putting things in it in one simple shot.

What impressed me was the level of confidence I had during the procedure. I knew I was achieving the anatomical goal for the canal. I think surgeons commonly aren't quite sure that they're where they want to be in the canal, and this solves that problem 100 percent. Surprisingly for me, I think I felt more confident that I had achieved my surgical goal after my first ABiC procedure than I ever felt with a TM procedure. It was just so clear as the anatomy literally lit up, with the iTrack going around the circle, that I was certain it was right. It was fun, too. I said, "Why did I wait so long?"

My barriers to adoption were, first, some misconceptions. For example, I thought that I had to buy a big device that illuminates the iTrack microcatheter. I didn't realize that it was easily obtainable with the first case without a capital investment. The other barrier is that it can be very difficult to change practice patterns. We have to find out who our rep is, make a phone call, and talk to a colleague who's been doing it. If I operated in the same OR as an iTrack user, I would have adopted it a long time ago, but I had to start without any exposure. Once I got the ball rolling, it was easy. If there's a lesson learned for me, it's that there's no need to wait.

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>
> —Mark J. Gallardo, MD

Dr. Ahmed: How does ABiC with iTrack compare to the other MIGS out there, and where does it fit?

Dr. Khaimi: A lot of the other MIGS are stents that bypass the obstruction. For example, iStent bypasses a diseased TM. Cypass Micro-Stent (Alcon) is a suprachoroidal device. With ABiC, no device is implanted in the eye. We use the iTrack catheter to go around the canal, and as Dr. Radcliffe described, we can see exactly where we're going. There's no

Inder Paul Singh, MD

guessing game. That's a big thing for me. I'm a belt-and-suspenders kind of guy, so if I think that the disease process is somewhere along the line from the TM to the distal region, it's nice to be certain that I'm in the area I want to treat.

Dr. Richardson: In a comparison of trabeculectomy to all of the available alternative procedures, the only two that came close were glaucoma drainage devices and ab externo canaloplasty.[4] The work that Dr. Gallardo and Dr. Khaimi have done has indicated that ABiC with iTrack produces results that are quite close to what we can expect from ab externo canaloplasty.[5] So, while we don't have a direct comparison among all of the players, the results certainly suggest that ABiC with iTrack may be a bit more effective than other MIGS options that we have, without a destructive ab externo procedure.

Dr. Ahmed: What does your the typical ABiC with iTrack patient look like?

Dr. Singh: I think the beauty of ABiC with iTrack is that a large population of patients can benefit from the procedure. It's not just for a patient who is pseudophakic at the time of cataract surgery. Another nice feature is that it can be used for mild to moderate glaucoma as well as advanced disease. I've performed it on postoperative trabeculectomy and tube patients, in cases where there was good visualization and access to the TM. I find that the selection of patients is very broad, so when I want to manage the natural outflow system for any patient, this is a very universal choice.

In Dr. Khaimi and Dr. Gallardo's respective data, ABiC worked very well used both as a standalone and in combination with cataract surgery, as well as in different types of patient populations.[4] For those who had starting pressures

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What percentage of the MIGS you perform is shunt/canal-based procedures versus supraciliary/subconjunctival procedures?

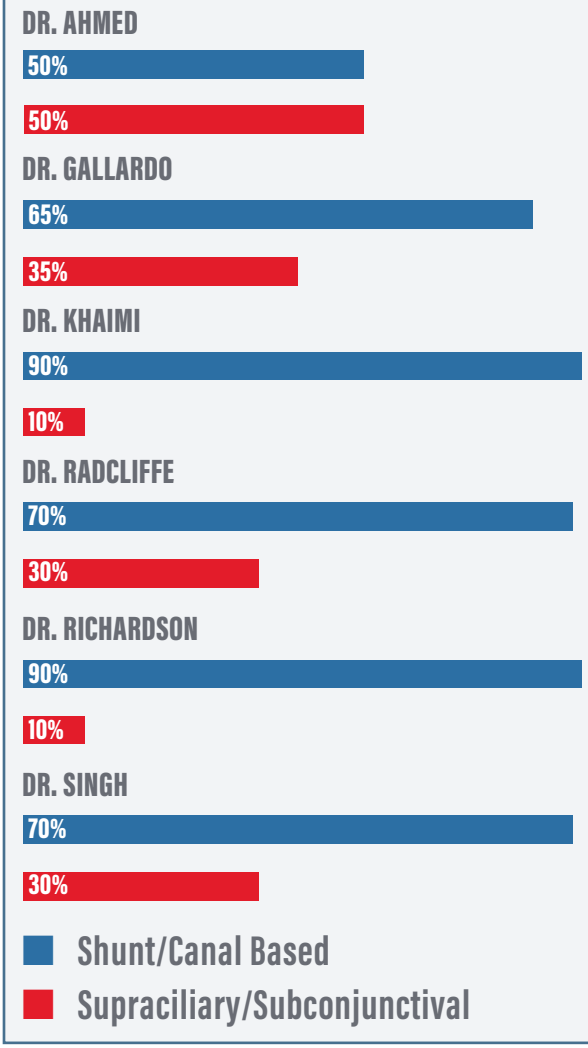

Figure 1. Shunt/canal-based versus supraciliary/subconjunctival procedures.

that were high or in the middle to upper teens, you saw a significant reduction that was maintained. For those who had lower, more controlled IOPs, ABiC with iTrack kept the IOPs low but reduced the drop burden significantly. That responder rate is what excites me. We don't know where the resistance to outflow is preoperatively. Is it the TM, Schlemm canal, or distal? While various MIGS procedures may work on specific sections of the outflow system, ABiC's multiple mechanisms let us hedge our bets and, in my opinion, have a better chance of getting that reduction of pressure in the right type of patient population. As long as I have a good angle and can see it very well, I think the patient is a very good candidate for ABiC.

HOW HAS MIGS CHANGED YOUR PRACTICE?

Dr. Ahmed: What percentage of the MIGS you perform is shunt/canal-based versus supraciliary or subconjunctival (Figure 1)?

Dr. Gallardo: I would say about 60 to 70% of my MIGS procedures are performed on the conventional outflow system. For me, it's the safest system to work with because there's virtually no risk for hypotony owing to the back wall of the episcleral venous system, and it has proven efficacy at reducing pressure and medication burden. After that, I prefer to use the suprachoroidal space, which has also been shown to be quite effective but has a tad bit higher risk for adverse events. Typically, my subconjunctival procedures are for patients who need a filter.

Dr. Richardson: I do about 90%-plus conventional outflow.

Dr. Singh: I'd say I perform about 70% natural outflow MIGS and 30% other devices. I still try and maximize natural outflow if possible as a first choice for many patients.

Dr. Radcliffe: I've got a severe glaucoma practice. If I set aside my tube shunts and just look at MIGS procedures, then I do at least 60% conventional outflow—maybe as high as 75%. The rest are split between supraciliary and subconjunctival MIGS. The fact that ABiC has insurance coverage available to my standalone patients and to a full spectrum of health insurance companies helps me provide this option to more people.

Dr. Khaimi: I'm a canal-based guy, so I've always focused on conventional outflow. I've dabbled with a lot of other things, too, but when I go subconjunctival, it's usually to push that trabeculectomy farther downstream.

CONCLUSION

Dr. Ahmed: You guys have shared a lot of experience today. I thought we'd finish off the roundtable by talking about what excites you in the future of glaucoma therapy, whether it's something about diagnostics, your practice, MIGS, or other treatments. What are you excited to see in the next 5 years?

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>
> —Mark J. Gallardo, MD

Dr. Khaimi: Well, I wish we had MIGS a long time ago. I'm at a tertiary center, so I see many patients with severe glaucoma. We talk a lot about improving their quality of life with MIGS, but those options also dramatically improve the doctor's quality of life. There's a lot of less patient chair time. Patients are happy and doing well. It's an extremely exciting time. We can now rejuvenate and restore the outflow system—it doesn't get better than that. We were taught to bypass the natural outflow when we first started out, and now we can restore it.

Dr. Richardson: I love the idea that we're getting to the point where we can talk about doing multiple less risky procedures together, or in short step-wise approach, to potentially achieve the same outcome as trabeculectomy or glaucoma drainage devices with far less risk. If we can get to the point where we do multiple MIGS procedures at the same time for moderate and severe glaucoma patients, then we'll achieve the desired effect. For both patients and, as you mentioned, for the doctors as well, the low-risk outcomes are going to be wonderful.

Dr. Ahmed: Dr. Radcliffe, you always have something up your sleeve.

Dr. Radcliffe: Of course! Well, I look at myself 10 years ago using SLT only for severe glaucoma, and now it's my primary therapy of choice. I'm hoping that in the next 10 years, or maybe even sooner, I can make that same kind of transition to bring standalone, canal-based procedures into my mindset and into my practice. In order to make this reflexive and be more proactive, we all have to change our attitudes and our thoughts. We need to get consensus. It takes time to

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adjust, but I think I'm there conceptually, and I look forward to turning that acknowledgement into practice.

Dr. Singh: I think it's exciting that now we are pushing surgical intervention much earlier. Other technologies will help us. Diagnostic technologies will advance treatment, whether that's blood flow, cerebrospinal fluid pressure, or even 24-hour pressure monitoring. With MIGS and other glaucoma treatment technologies, I think we have a better understanding from a diagnostic perspective. It's funny, but MIGS procedures are making us realize how little we know about glaucoma. The more we learn, the more we have to do. For me, the exciting part is learning more about the pressure reduction that's possible when we can couple new diagnostic modalities with early intervention.

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> —Inder Paul Singh, MD

Dr. Ahmed: Well said. Dr. Gallardo, I'll give you last word on this topic.

Dr. Gallardo: Just looking at the number of people in all the MIGS sessions here at ASCRS, we can see how these new

Iqbal "Ike" K. Ahmed, MD, FRCSC

procedures have excited everybody in ophthalmology. When I finished my fellowship, I attended a symposium about an older canaloplasty procedure. It was exciting at the time, because it was one of our first truly blebless procedures. We've come a long way from that to where we are today, using the same technology in a microinvasive nature. I'm hoping that at some point, we will have diagnostic imaging in our clinics that allows us to actually evaluate the outflow system and determine whether we should go with conventional outflow or a supraciliary approach. We may even be able to use the iTrack microcatheter to determine if the distal system is intact, or it might highlight a specific area that we can target with a stent procedure to maximize outflow. There is more to look forward to, and it's kind of a cool time to be a glaucoma guy again.

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To watch videos of this roundtable, go to **eyetube.net/collection/ellex/jrfal/**