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THE FIRST-LINE ADVANTAGES OF SLT

SLT can lower IOP, reduce medication use, and provide key diagnostic information.

BY INDER PAUL SINGH, MD



For over 15 years, we have performed selective laser trabeculoplasty (SLT) as a safe, effective primary and adjunct treatment to lower IOP for patients with glaucoma.^{1,2} Now, we are beginning to learn that when we use SLT as a first-line therapy, we not only

reduce IOP, but we might also gain diagnostic information about the source of a patient's outflow resistance. This is an exciting concept, as our perception of this trusted method for reducing patients' burden of medications evolves to include a key role in glaucoma management, particularly in the age of microinvasive glaucoma surgeries (MIGS).

The shift from ocular hypertensive medications to other early interventions has followed disturbing data about medication use. Adherence in the first year is 51% to 56%, according to one study,³ but other reports say the reality is even lower.⁴ Patients might simply forget to take drops, but discomfort is a factor as well. Toxicity is a risk for virtually all topical glaucoma medications,⁵ including newer prostaglandins.⁶⁻⁸ Local side effects such as burning, dryness, conjunctival hyperemia, watering, and foreign body sensation grow worse with use over time.⁹ Systemically, these medications can exacerbate existing airway pathology¹⁰ and may impact patients with high blood pressure or diabetes.¹¹ Procedures such as SLT offer the option to help control IOP safely while minimizing issues of compliance and side effects long term.

SLT AS FIRST-LINE THERAPY

Prostaglandins have been the first-line therapy for glaucoma for many years. It is only recently, with abundant data about noncompliance and the advent

of new MIGS options, that we have taken a step back from standard therapy to consider surgical solutions as first-line tools.

Several key studies have assessed SLT as a first-line therapy. One prospective study showed that SLT reduced IOP 30% when used as a first treatment,¹² and a long-term study found that SLT patients' IOP was reduced 24.3%, 27.8%, 24.5%, and 29.3% at years 1, 2, 3, and 4.¹³ Studies comparing SLT to prostaglandin found it to be a safe alternative for primary glaucoma therapy, with similar outcomes and far less need for additional therapies in the first year.^{14,15} In one study, SLT lowered IOP by 6.6 mm Hg (29.9%), compared to 5.58 (25.4%) with prostaglandin.¹⁶ Studied side by side with latanoprost, SLT reduced IOP at least 20% in 75% of eyes, compared to 73% of eyes for latanoprost.¹⁷

Clearly, evidence shows that SLT lowers IOP similarly to topical medication. Patients can have the same benefits of medication without the uncomfortable side effects or, most importantly, the compliance issues that threaten their safe management of glaucoma.¹⁸ The procedure is even more cost-effective than long-term medication use.¹⁹

In my experience, SLT and MIGS are attempting to achieve the same outcomes: decrease drop burden, help bring IOP down to a target range, and maintain or help improve quality of life. In fact, SLT is a "non-invasive glaucoma procedure." It has a very good risk/benefit profile and targets the trabecular meshwork, which is targeted by some MIGS devices as well.

SLT'S DIAGNOSTIC VALUE

When we use SLT as a first-line therapy, IOP-lowering effect is equivalent to medication, but we also may gain a secondary benefit of diagnostic

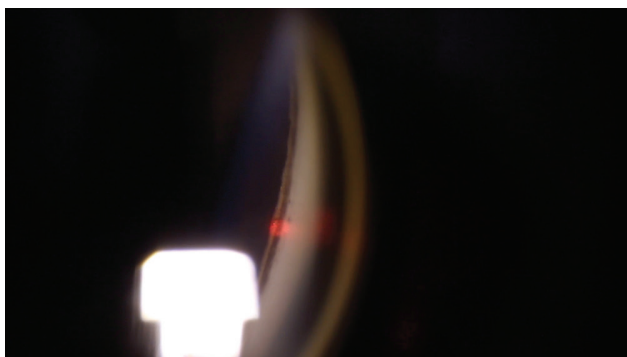


Figure. A patient after SLT.

information. Unfortunately, there are no preoperative noninvasive diagnostic tools to provide us the exact location of outflow resistance, but SLT might be a way to at least point us in the right direction.

In SLT, we apply selective photothermolysis to pigmented cells in the trabecular meshwork, which releases inflammatory mediators, such as macrophages and cytokines. This increases aqueous outflow through the trabecular meshwork and the inner wall of Schlemm canal. When SLT has a significant effect, we assume the trabecular meshwork could be the main area of resistance. When it is not effective, this might tell us that resistance is in the canal or in the distal collector channels.

We are only beginning to explore the potential diagnostic benefit of SLT as a first-line therapy. It is intriguing to think that if it does help us understand a patient's pathology, we possibly can use that information to select the best MIGS intervention for a given patient.

I began to suspect that SLT had diagnostic value when I noted that patients who responded to SLT historically (Figure) also did well with subsequent implantation of the iStent Trabecular Micro-Bypass Stent (Glaukos) during cataract surgery, whereas those who did not respond to SLT tended to demonstrate less response to the iStent. My thought is if SLT works well, then the trabecular meshwork might be the major cause of resistance in the natural outflow pathway. If SLT does not demonstrate a significant response, I assume the major site of resistance is likely to be in the canal or distal. For cases where SLT works well, a trabecular bypass procedure like iStent would be a good choice. If SLT does not have an effect, a canal-based procedure such as ab interno canaloplasty (ABiC; Ellex) using the iTrack device (Ellex) may be a better option to open up all of the natural outflow pathways, such as Schlemm canal and collector channels as well as the trabecular meshwork.

Although I have seen these trends in our patient population, larger, longitudinal, comparative studies are needed to help fully understand the potential diagnostic role of SLT. At this time, considering the lack of alternative diagnostic tools to help guide our decisions for the “right MIGS device” for each patient, I do think there is potential value in using SLT as another piece of information to help us make the best decisions for our patients.

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Inder Paul Singh, MD

- glaucoma specialist, president of The Eye Centers of Racine and Kenosha, Racine, Wisconsin
- ipsingh@amazingeye.com
- financial disclosure: serves on the speakers' bureau for Ellex and Glaukos

COMBINING SLT AND MIGS

Two surgeons discuss how to gain the maximum IOP-lowering effect from complementary procedures.

BY MARK J. GALLARDO, MD, AND SAVAK "SEV" TEYMOORIAN, MD, MBA



Selective laser trabeculoplasty (SLT) is as effective as medication in controlling IOP,¹ which is why many physicians have adopted it as a first-line treatment to manage

glaucoma without the compliance problems associated with medications. SLT is also a valuable adjunct to microinvasive glaucoma surgeries (MIGS) in reducing IOP enough to reduce or eliminate medications.

What are the advantages of combining SLT and MIGS?

Mark J. Gallardo, MD: SLT alone can reduce IOP by about 20% to 30% in most patients,²⁻⁴ with efficacy comparable to prostaglandin analogues.¹ If we reduce IOP by 25%, that might be enough to move a patient from two medications to one, but may not eliminate medications completely. Likewise, various MIGS devices can reduce IOP and medication use, but they do not always lower IOP enough for patients to be medication-free. If the goal is to get a patient off medications—to avoid compliance problems, address intolerance, or reduce expenses, for example—then we may be able to achieve that with the cumulative effects of both MIGS and SLT.

Savak "Sev" Teymoorian, MD, MBA: Many of us have seen the benefits of using SLT before a MIGS intervention, from SLT's value over medications as a first-line therapy to its diagnostic advantage in helping to identify which mechanism is creating the greatest outflow resistance. SLT also has the advantage of reducing IOP after MIGS if we need to take it down an extra few points. In my experience, using SLT after MIGS can be a better approach than returning patients to a medication after MIGS.

Like MIGS, SLT is a step in the treatment paradigm between medications. MIGS and SLT are natural partners in reducing IOP without the risk of traditional glaucoma surgeries, such as trabeculectomy or tube shunts, or the compliance issues of medications. When

we are already discussing MIGS surgery for glaucoma, possibly in addition to cataract surgery, the idea of augmenting the IOP-lowering effects of those surgeries with a laser treatment makes sense to patients as well. My patients tend to do well with the combination.

What synergistic effects can SLT and ABiC achieve together?

Dr. Gallardo: When you look at how each procedure manipulates the outflow system, it makes sense to combine the two procedures to fully treat the entire conventional outflow system. SLT is known to modify the architecture of the trabecular columns in an atraumatic fashion (unlike argon laser trabeculoplasty), which ultimately leads to an increase in the spaces between these columns and effectively reduces the outflow resistance. Ab interno canaloplasty (ABiC; Ellex) treats the outflow system as well, but addresses areas SLT is unable to reach. Upon circumnavigating the canal with the Ellex iTrack catheter, herniations of the trabecular meshwork-Schlemm canal inner wall complex, which obstruct collector channels, are lysed.

Viscodilation during the procedure also leads to other architectural changes of the conventional outflow system: the spaces between the trabecular columns are expanded, microperforations are created in the inner wall of Schlemm canal, and the canal itself and collector channels are dilated. By coupling both procedures, we are positively manipulating and modifying pathologic changes that occur in the conventional outflow system in glaucoma patients.

Dr. Teymoorian: The ABiC procedure works on all aspects of aqueous outflow, so it makes sense to combine it with SLT to further improve function of the trabecular meshwork, where most aqueous outflow occurs. The ideal result in any procedural intervention is to restore the anatomy back to its natural state. With glaucoma patients, this is achieved by improving the flow of aqueous from the anterior chamber to eventually the collector channels. Both SLT and ABiC aim to meet this goal; therefore, they complement each other very well by working in synergy.

The iTrack pulls trabecular meshwork herniations into the collector channels, breaks inner lumen adhesions, and opens the canal's stenotic segments. We slowly withdraw the iTrack after it navigates 360° of Schlemm canal, with the technician delivering one or two clicks of viscoelastic about every clock-hour. Herniated inner wall tissue is drawn from the collector channels, compressed tissue planes of the trabecular meshwork are separated, and the collector channels are flushed.

Dr. Gallardo: An important distinction of ABiC is that it restores the natural outflow process, whereas other MIGS procedures and traditional glaucoma surgeries physically alter or bypass the mechanisms of aqueous outflow. Unlike other MIGS procedures that treat only one aspect of aqueous outflow, ABiC works by enhancing function of the eye's outflow mechanisms—the collector channels, the trabecular meshwork, and Schlemm canal. This comprehensive approach ensures that we address the area of maximum outflow resistance for each patient, no matter where it resides.

SLT has a similarly restorative effect. SLT stimulates cellular regeneration in the trabecular meshwork to make it healthier and more porous, improving aqueous outflow. This effect is synergistic with ABiC's enhancement of the natural outflow channels. Neither technology damages tissue, alters the eye's mechanics, or involves implanting a device in the eye.

What patients are best suited for SLT after MIGS?

Dr. Teymoorian: A typical case where I might use SLT after MIGS is a patient who is on two or three drops, has uncontrolled glaucoma, and is intolerant to the medications or is having trouble paying for them. In this situation, a combination of procedures is needed to achieve the necessary IOP reduction. I would use SLT as both a therapeutic and also a diagnostic tool. If a session of SLT reduces IOP, then it also demonstrates the viability of the natural outflow channel. This supports the thought process that ABiC will deliver its expected efficacy. ABiC has been shown to have low complication rates like other MIGS procedures,⁵ and it reduces IOP about 30% while cutting patients' medication burden in half.⁶ ■

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Mark J. Gallardo, MD

- in private practice at El Paso Eye Surgeons in El Paso, Texas
- gallardomark@hotmail.com
- financial disclosure: consultant to Ellex; clinical investigator for the ABiC procedure

Savak "Sev" Teymoorian, MD, MBA

- in private practice at Harvard Eye Associates in Laguna Hills, California
- sevakteymoorian@hotmail.com
- financial disclosure: consultant to Ellex