Long-term control of intraocular pressure (IOP) is key to minimizing the ocular damage that eventually occurs in glaucoma patients. The effects of traditional anti-glaucoma eyedrops are short-lived and therefore require diligent, long-term use. Even argon laser trabeculoplasty (ALT), which is known to deliver effective results, starts to lose efficacy within several years. In contrast, selective laser trabeculoplasty (SLT) delivers effective IOP reduction that lasts far longer than any other treatment.
Previously, argon laser trabeculoplasty (ALT) was the laser procedure of choice for open-angle glaucoma for over 30 years. Studies such as the Glaucoma Laser Trial, published in the Archives of Ophthalmology in 1989, have long confirmed that laser trabeculoplasty (LT) effectively lowers intraocular pressure (IOP). However, as a procedure that involves the use of a hot, high-energy laser, ALT must be performed with a degree of caution. The 2001 approval of selective laser trabeculoplasty (SLT) by the US Food and Drug Administration (FDA) marked the dawn of a safer type of LT. As the cold laser used in SLT works by targeting pigmented cells only (selective photothermolysis), the thermal or coagulative damage to surrounding tissue seen with ALT is avoided. But, this does not compromise the efficacy of SLT. Clinical studies, such as that by McIlraith, et al, published in the Journal of Glaucoma in 2006, have shown that SLT lowers IOP as effectively as prostaglandin drugs. And Bovell, et al, have illustrated equally efficacious 5-year IOP lowering results with SLT and ALT, among a study group of 176 eyes with open-angle glaucoma. Despite this overwhelming evidence in favor of SLT in open-angle glaucoma patients, the longevity of the results it provides remains a point of concern among some ophthalmologists.

SLT is Not “ALT Lite”

Anecdotal evidence suggests that this concern stems, at least in part, from the common misconception that SLT is simply a weaker version of ALT. As ALT tends to lose efficacy over time, it is often assumed that this is also the case for SLT. The rule of thumb with ALT is that 30% of treated patients will fail at three years and 10% will fail each year thereafter. That means that at five years, 50% of people treated with ALT will no longer benefit from it. I have performed more than 4,300 SLT procedures since 2001 and have found a significantly higher five-year efficacy rate with SLT compared with ALT.

“I have performed more than 4300 SLT procedures since 2001 and have found a significantly higher five-year efficacy rate with SLT compared with ALT.”

Specifically, when my colleagues and I used a Kaplan Meier analysis to measure the cumulative probability of success of SLT as primary therapy based on our 4,000 patient data set we found a cumulative probability of success of over 90% at ten years post-treatment when SLT was used as a primary treatment (Refer to Figure 1). Indeed, a non-trivial number of patients whom I treated with SLT as far back as 2001/2002 still have an IOP within goal, are not on medication, have not needed surgery or repeat SLT treatment.

But there are some situations in which a second SLT treatment is required to maintain a normal IOP (namely in heavily or weakly pigmented eyes, where surgeons are often overly cautious with SLT application and give insufficient treatment on the first application). Fortunately, a key benefit of the cold laser SLT technique over the hot laser ALT is that it can be repeated multiple times, as required, without risk of damage.

“A key benefit of SLT over ALT is that it can be repeated multiple times, as required, without risk of damage.”

SLT Works as Primary, Secondary and Repeat Treatment

The long-term efficacy of SLT demonstrated by the results of my own database, which is one of the largest databases of SLT patients worldwide, applies to SLT as a primary, secondary or repeat treatment. I most commonly use SLT as a primary treatment on medication-naïve open-angle glaucoma patients. In fact, I prefer to perform SLT before starting a patient on any other treatment because previous studies have shown that pharmacological agents, such as prostaglandins decrease the IOP-lowering effect of SLT. SLT as a primary therapy has also been shown to stabilize diurnal IOP variation after treatment. I have performed primary SLT with successful outcomes in patients with primary open-angle, pigmentary and exfoliative glaucoma. Patients for whom SLT is contraindicated include those with uveitic, inflammatory or neovascular glaucoma. This is because the inflammation-triggering mechanism of SLT is ineffective in these types of glaucoma that already feature a large degree of inflammation and / or compromised meshwork function.

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<th>Time Interval (Years)</th>
<th>Cumulative Probability of Success (%)</th>
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Lawrence F. Jindra, MD
An analysis of 1,393 eyes treated with SLT in my private practice revealed a mean IOP reduction of 31% (from a mean of 18.9 mmHg to 13.0 mmHg) over an average follow-up of 757 days. These findings echo those seen in the Glaucoma Laser Trial and Ocular Hypertensive Treatment Study, which showed that primary LTP effectively lowers IOP in treatment-naive patients, which in turn minimizes long-term vision loss.\(^2\)\(^9\)

Although I prefer to use SLT as a primary treatment, in many cases it is patients who remain uncontrolled despite multiple medications or those who are in IOP control but suffer from the significant side effects seen with such topical hypotensive agents, who seek out SLT. In such cases, SLT can only be used as a secondary treatment and here the aim is to reduce IOP, medication dependency and side effects.

A review of 1,016 eyes treated with secondary SLT at my practice revealed a mean IOP decrease of 22% (from a mean of 19.8 mmHg to 15.5 mmHg) over a follow-up period of 520 days. Mean medication use decreased by 57% from a mean of 2.3 to 1.0 medication types.

Overall review of outcomes from my practice’s dataset so far has shown that 57% of all patients referred for SLT while taking anti-glaucoma medications end up taking no medication after SLT. In other words, if someone comes to me on one medication, I have more than an 80% chance of resolving their raised IOP and getting them off the medication with SLT. This probability falls to over 60% for patients on two medications, over 40% for those taking three medications and over 30% for those on four medications.

Studies, such as that of Hong et al, published in the Journal of Glaucoma in 2009, have shown a high success rate when SLT is used as a repeat treatment a few weeks or months after initial SLT.\(^10\)\(^11\) Indeed, in 2006, Shah et al presented results at the annual European Society of Cataract and Refractive Surgery (ESCRS) meeting, which showed that in 70% of cases, repeat SLT reduced IOP by at least 20% at post-treatment year one.\(^10\) Fifty-three percent of cases still had this level of IOP reduction at two years post-treatment. Hong et al’s study identified additional IOP decreases of 5.0 and 2.9 mmHg between first and second SLT treatments, respectively.\(^11\) Our results have also been inline with these findings. Interestingly, we also found that the period of time between consecutive SLT treatments does not significantly affect the size of IOP reduction achieved.\(^12\)

How SLT Works on Traditionally Complicated Patients

A notable strength of SLT is its suitability and efficacy in multiple scenarios. I have personally had success when using SLT on patients of different ethnicities and ocular conditions. A common concern relates to treating patients of Asian origin because such individuals have narrower angles and shorter eyes. When the argon laser of ALT is used in eyes with narrow angles there is a risk of synechia, which can trigger a severe pressure spike. Unsurprisingly, surgeons have become reluctant to treat Asian patients with narrow angles with ALT. But as SLT is based on the use of nanosecond laser technology, the damage required to produce the peripheral synchiae that give rise to pressure spikes simply does not occur. Furthermore, my colleagues and I have analyzed our 4,000 patient database to identify the effect of race on SLT efficacy and have found almost no differences in outcomes.

Glaucoma patients with cataracts are a specific group of patients with much to benefit from SLT. Research has shown that SLT used prior to cataract surgery can pre-emptively blunt the IOP spike that can occur after cataract removal and also minimize the need for postoperative anti-glaucoma medications.\(^14\)

Long-Term Control, Long-Term Freedom

The benefits of SLT extend beyond the obvious clinical efficacy discussed in this article. The financial and emotional burden of being dependent on medications...
can take a huge toll on patients. A pensioner on a fixed income in the USA has to pay in the region of $100 for a bottle of eye drops every month. This amounts to $1200 per eye drop per year.

When a patient is treated with SLT the IOP reduction is achieved quickly and maintained over the long-term. And in many cases, this reduction in IOP is achieved with no dependency on eye drops – and with none of the systemic and local side effects of these drugs. And perhaps more importantly, the long-term efficacy provided by SLT means that patients gain a new lease of life as they no longer feel chained to a never-ending supply of medications.

“When a patient is treated with SLT the IOP reduction is achieved quickly and maintained over the long-term. And in many cases, this reduction in IOP is achieved with no dependency on eye drops – and with none of the systemic and local side effects of these drugs.”

Lawrence F. Jindra, MD

Dr. Jindra is currently in private practice and is the Director, Emeritus of the Glaucoma Service and Chief, Emeritus of the Division of Ophthalmology, Winthrop University Hospital; and, Assistant Clinical Professor of Ophthalmology at Columbia University. Having pioneered the clinical implementation of SLT, he has performed more than 4000 procedures since 2001 and has presented over eighty presentations on SLT and its role in the treatment of glaucoma at international scientific meetings.

Click here to watch an interview with Dr. Jindra

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To learn more about SLT visit: slt-ellex.com