Efficacy, Compliance & Cost-Effectiveness in the Treatment of Glaucoma

SELECTIVE LASER TRABECULOPLASTY (SLT)

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Executive Summary

A major cause of vision loss worldwide, glaucoma is a long-term optic neuropathy characterized by structural abnormalities of the optic disc and retinal nerve fibre and visual-field defects. (1, 2) Although great progress has been made in defining the spectrum of diseases known as glaucoma, its pathogenesis is still poorly understood. Altered biological activity in the trabecular meshwork (TM), and the resultant rise in intraocular pressure (IOP) beyond physiologic limits has been ascertained as a predisposing factor in glaucoma. (3, 4)

Glaucoma treatments are in effect, aimed at reducing IOP to an acceptable target range, thereby preventing further optic disc damage. Currently available treatments to lower IOP are accomplished through medication, surgery and laser therapy. These work either to decrease the production of aqueous humor, or increase the aqueous humor outflow facility. (1) As practitioners incorporate drug and laser therapy to lower IOP, either as first-line or secondary treatments, important attributes like efficacy, patient compliance and overall cost-effectiveness need to be taken in account prior to considering treatment options for glaucoma.

Selective laser trabeculoplasty (SLT) is being increasingly demonstrated as safe, well tolerated, and effective at IOP reduction in several forms of glaucoma. It has proven to be equally efficacious as a primary and adjunct therapy, in relation to medication and other laser treatments, and delivers greater cost-effectiveness and compliance over topical glaucoma medications. (5-7)

Yet, despite the substantial benefits and clinical experience, the use of SLT is not widespread. (7) Ophthalmologists and healthcare decision-makers must overcome the lack of understanding behind SLT's IOP reducing mechanism, and its inherent advantages over medication and other laser treatments, in order to fully maximize the potential of SLT's therapeutic approach in the management of glaucoma.

Background

In recent years the efficacy and affordability of glaucoma treatments has improved, and includes a range of medication options. Statistical data indicates that the addition of new drugs as glaucoma therapy is a more common practice in comparison to switching to a new therapy. (12) Yet, it is a well known fact that the costs of managing and treating glaucoma are considerably high.

SLT treatment for glaucoma and ocular hypertension involves the use of a Nd:YAG laser energy to selectively target pigmented trabecular meshwork cells with low threshold radiation exposures, without producing collateral thermal damage to adjacent non-pigmented cells and structures. While SLT has gained favour in recent years with glaucoma specialists, the use of medication is generally considered a first line treatment to address glaucoma because of its perceived ease of use and effectiveness. As a result, SLT has been relegated to a niche therapy status, even though it is an equally effective and more cost-efficient treatment.

While the mechanism behind SLT in lowering intraocular pressure (IOP) is still not fully understood, its role in enhancing the biological activity within the trabecular meshwork (TM) has been suggested. (19-21) A few studies have been conducted to prove the effectiveness of SLT in IOP reduction for various types of glaucoma including primary open angle glaucoma, (POAG) pseudoexfoliative glaucoma, pseudophakic secondary glaucoma, and in patients treated previously with ALT. (11, 26) These studies individually demonstrate that SLT is a superior and more cost-effective treatment compared to medication and other glaucoma therapies, not merely from the cost perspective, but also from the several relative advantages that can be gained by patients who opt for SLT.

SLT Efficacy, Compliance and Cost-Savings in Comparison to Drug Therapy

Commonly used classes of IOP-lowering medications to treat glaucoma include prostaglandin analogues, beta-adrenergic receptor antagonists (beta-blockers), alpha adrenergic receptor agonists (alpha agonists), and carbonic anhydrase inhibitors (CAIs). Various studies have shown SLT to be comparable in its efficacy to various topical medications including latanoprost (0.005%), at reducing IOP. (17)

Efficacy and Compliance

Like most medications, glaucoma medication too has its share of side effects. The presence of preservatives used in glaucoma eye drops have reportedly adverse reactions in patients. (14) Bilateral deepening of the upper lid sulcus is an adverse outcome of Bimatoprost, a topical glaucoma medication. (15) Bilateral granulomatous uveitis was also observed with topical brimonidine application in patients. (16) Topical Travoprost, a prostaglandin analogue results in several known side effects, including a darkening of the eyelid and eyelash hypertrichosis, and a deepening of the eyelid superior sulcus. (18) By contrast, SLT has a consistent safety profile and reduces IOP in a single surgical procedure without the possible side effects and complications. SLT's safety profile includes mild and transient inflammation, ocular pain, and a small risk of moderate IOP elevations after the procedure.

For many patients, a single glaucoma medication is insufficient to reduce IOP to the target pressure, and the treatment regimen includes 2, 3, or more medications from different classes. (8,9) The additional medication necessitates greater compliance and involves patient lifestyle changes resulting from regular and repeat eye drop medication. Medication compliance is an important concern in glaucoma treatment, as up to 80% of patients may not take their medication as prescribed. One of the primary reasons for non-compliance is the inconvenience associated with regular and repeat eye drop instillation. (9) Patients can also tend to forget to instil the eye drops. SLT on the other hand, has the benefit of being a one-time intervention, which does not require ongoing patient compliance.

Cost-Savings

The daily application of eye drops and the introduction of more than one medication in a glaucoma treatment regimen, effectively raises the cost of therapy. A study by Oostenbrink JB et al assessed the costs associated with the diagnosis and treatment of glaucoma and ocular hypertension over a one-year period: the mean cost of patients with glaucoma who had no changes in medication therapy was $347 and increased to $1,765 in patients with more than three adjustments in medication therapy. Outpatient visits to the ophthalmologist and medication contributed most to total costs. (10)

In terms of laser trabeculoplasty techniques including SLT, a study by Cantor et al demonstrated that SLT offered a potential cost saving of about $1,700 for patients who need two to four medications over 5 years. The study calculated that the 5-year cumulative costs of laser trabeculoplasty were approximately $4,838, compared to the $6,571 for medications and $6,363 for filtration surgery. (13)

SLT versus ALT

ALT (Argon Laser Trabeculoplasty) is a known treatment, in use for a long time, since the mid-nineties. ALT is as effective as SLT and has similar characteristics in terms of reducing pressure. SLT has proven to be equivalent to ALT in lowering IOP at 1 year in patients with open-angle glaucoma. (25) Since 1996, a 532 nm, Q switched, Nd: YAG laser, with pulse duration of 3 ns and a spot size of 400 µm has been used in SLT treatments.

Histological studies evaluating SLT have shown that unlike ALT, no scarring of the TM occurs following the procedure. SLT selectively targets pigmented TM cells without causing thermal damage to non-pigmented structures. Morphologic studies demonstrated minimal tissue alteration following treatment with SLT. (9, 23, 24) ALT uses a much higher power that causes tissue damage and cannot be used as a repeat treatment, only as an enhancement treatment in a different area of the same eye.

Also, the post-treatment visual recovery takes longer following ALT with much more post-operative inflammation, and the need for anti-inflammatory drops for around 1-2 weeks. While SLT can be used as a repeat treatment, no repeat treatment is required for a long time, as the IOP results after SLT generally remain stable. SLT is being increasingly accepted as an alternative treatment option to ALT for lowering IOP in glaucoma patients.

SLT as a Primary and Secondary Therapy

SLT has proven effective as a primary therapy for open angle glaucoma, and can hence serve as a viable adjunct in the early treatment of glaucoma. It can be used as a primary treatment in patients who cannot tolerate glaucoma medications or who are noncompliant, without interfering with the success of future surgery. (5) Clinical studies suggest that SLT is efficacious in lowering IOP, both as a primary treatment or when medical therapy is insufficient, as a secondary therapy with response rates after one year ranging from 59% to 96%. Average reduction in IOP has been reported from 18% to 40%. (7)

Research into the cost-effectiveness of glaucoma treatment algorithms has proven that using SLT as a first-line treatment, and drug therapy as a second-line option, increased its efficacy and saved large sums of money. SLT works very well in combination with beta blockers, as they have an impact on the production of aqueous humor and SLT improves outflow. (13) In a study on the management of open-angle glaucoma patients under the Ontario Health Insurance Plan, SLT as primary therapy, at a per-patient level, has shown to offer a modest potential cost saving over primary medical therapy. (27).

Conclusion

In conclusion, SLT treatment is efficacious and quick, lasting no longer than a slit lamp examination. It makes efficient use of the physician's time and reduces the stress and inconvenience caused to patients through repeated hospital visits and medication compliance.

The consistent safety profile of SLT greatly reduces the glaucoma patients' reliance on years of treatment with expensive medications. In addition to its favourable profile from a health economics perspective, SLT as a first-line therapy would eliminate worries over patient drug therapy compliance, which recent studies have proven to be appallingly deficient.

SLT should be considered as 'a first drop,' in a glaucoma treatment regime, and additional medications can be introduced as needed.

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