

LIGHT ON THE HORIZON



Evidence from randomized controlled trials supports the use of two less invasive glaucoma treatment options, selective laser trabeculoplasty and a microstent.

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SELECTIVE LASER TRABECULOPLASTY VERSUS EYE DROPS FOR THE FIRST-LINE TREATMENT OF OCULAR HYPERTENSION AND GLAUCOMA (LIGHT): A MULTICENTRE RANDOMISED CONTROLLED TRIAL

Gazzard G, Konstantakopoulou E, Garway-Heath D, et al; LiGHT Trial Study Group¹

ABSTRACT SUMMARY

Investigators recruited treatment-naïve patients with open-angle glaucoma (OAG) or ocular hypertension (OHT) and no ocular comorbidity from six sites in the United Kingdom and randomly assigned these patients to receive initial selective laser trabeculoplasty (SLT; laser-first, n = 356) or glaucoma medical therapy (medicine-first, n = 362). An objective target IOP was determined based on severity of disease. The primary outcome was health-related quality of life (HRQL) at 3 years (EuroQol EQ-5D). Secondary outcomes were cost and cost-effectiveness, disease-specific HRQL, clinical effectiveness, and safety.

At 36 months, 652 patients (91%) returned the primary outcome questionnaire, and no significant difference in EQ-5D was found between the two groups (difference, 0.012; 95% confidence interval [CI], -0.007 to 0.031; $P = .23$). Compared with the medicine-first group, more visits in the laser-first arm were within target IOP (93.0% vs 91.3%), and fewer individuals required subsequent glaucoma surgery (0 vs 11 patients).

STUDY IN BRIEF

- ▶ An observer-masked, multicenter, randomized controlled trial showed a reduced need for subsequent glaucoma surgery, lower cost, and similar health-related quality of life in treatment-naïve patients with open-angle glaucoma (OAG) and ocular hypertension (OHT) who underwent primary selective laser trabeculoplasty (SLT) compared with patients who received primary treatment with medication. Among patients who underwent SLT, 74.2% were medication-free with stable IOP for at least 3 years.

WHY IT MATTERS

- ▶ Medication is the conventional first line of treatment for patients newly diagnosed with OAG and OHT. Despite its safety, SLT is rarely used as primary treatment in newly diagnosed patients. This is the first study to directly compare SLT and glaucoma medical therapy in terms of health-related quality of life and clinical and cost-effectiveness outcomes in a pragmatic hospital setting that was guided by a robust treatment-escalation protocol to minimize the risk of bias. The results support a change in clinical practice by providing evidence that primary SLT should be offered to treatment-naïve patients with OAG and OHT.

There was a 97% probability of greater cost-effectiveness over 36 months for laser-first compared with medicine-first if the willingness to pay for every quality-adjusted life year was £20,000 per quality-adjusted life year gained.

DISCUSSION

What are the clinical benefits of offering SLT as a first-line treatment?

Glaucoma progressed in a lower proportion of patients in the laser-first versus the medicine-first arm (3.8% vs 5.8%). Over the course of 36 months, IOP control was also better in the laser-first arm, with more visits at target IOP compared with the medicine-first arm, a lower number of glaucoma

medications, and no glaucoma surgeries. Patient noncompliance with topical glaucoma therapy may partially explain this difference between the treatment arms. In addition, SLT may provide better diurnal IOP stability compared with the episodic administration of glaucoma medication.

At 36 months, 74.2% of patients in the laser-first arm were free of medications, a substantially higher figure than reported in previous studies in which SLT was used as either a primary or an adjunctive treatment. It is possible that treatment-naïve patients respond better to SLT because prior treatment and more severe disease may reduce the efficacy of

SLT in lowering the IOP. There was a low rate of SLT-related adverse events in this study, with an IOP spike after only one out of 776 SLT applications, which is much lower than the rates of up to 28.8% reported in other studies. Treatment at an earlier stage of the disease may help reduce the incidence of SLT-related complications. The rate of cataract surgery was also lower in the laser-first arm, supporting evidence that glaucoma eye drops are associated with a greater incidence of nuclear cataract.²

Patients in the LiGHT study were predominantly white, so the clinical efficacy of SLT reported in the study may not be generalizable to patients of other ethnicities.

What are the economic benefits of SLT as a first-line treatment?

The laser-first approach resulted in overall cost savings of £451 per patient for the National Health Service in England and Wales, with a significant reduction in the cost of surgery and glaucoma medications. For every

patient treated with primary SLT rather than primary medication, the amount of money saved exceeded the cost of SLT procedures for two additional patients or was equivalent to the cost of five additional ophthalmology outpatient appointments.

The results of this study indicate that SLT is cost-effective over a 3-year period in a National Health Service setting, but these findings may not be applicable to other health care settings. That said, cost savings have also been predicted for the Canadian health care system at 6 years when SLT was compared with topical glaucoma therapy with a single agent or multiple drugs and allowing for repetition of SLT within 2 to 3 years.³

Was there a difference in HRQL between first-line SLT and first-line medical therapy?

The primary outcome of HRQL using the EQ-5D questionnaire was a requirement of the UK National Institute for Health and Care Excellence cost-utility analyses required by the study's funder, and

there was no significant difference between the treatment arms. That said, the EQ-5D has a low sensitivity for ophthalmology, particularly for glaucoma, which can be asymptomatic, even when the disease is severe enough to make driving unsafe.⁴

The Glaucoma Utility Index and the Glaucoma Quality of Life-15 (GQL-15) are glaucoma-specific HRQL instruments that capture differences in glaucoma severity more effectively than treatment side effects, so it was not surprising that the Glaucoma Utility Index and GQL-15 scores were similar between the two treatment arms. The Glaucoma Symptom Scale (GSS) incorporates measures related to the side effects of treatment, and repeated measures analysis showed worse GSS scores for the medicine-first arm at five of six time points over 36 months. Better GSS scores for the laser-first arm might have been a consequence of glaucoma eye drop use, but they may also reflect differences in baseline scores between the two arms.

A SCHLEMM CANAL MICROSTENT FOR INTRAOCULAR PRESSURE REDUCTION IN PRIMARY OPEN-ANGLE GLAUCOMA AND CATARACT: THE HORIZON STUDY

Samuelson TW, Chang DF, Marquis R, et al; HORIZON Investigators⁵

This prospective, multicenter, single-masked, randomized controlled trial compared outcomes at 24 months in eyes that underwent implantation of the Hydrus Microstent (Ivantis) combined with cataract surgery to those of eyes that had cataract surgery alone. The study enrolled patients with mild to moderate primary open-angle glaucoma and visually significant cataract. They were randomly assigned 2:1 to receive a single microstent in Schlemm canal (HMS, n = 369) or no implant (NMS, n = 187) after uncomplicated phacoemulsification. Medication washout and modified

diurnal IOP (MDIOP) measurement were performed at baseline, 12 months, and 24 months.

At 24 months, the unmedicated MDIOP had decreased by at least 20% in 77.3% of HMS eyes and in 57.8% of NMS eyes (difference = 19.5%; 95% CI, 11.2% to 27.8%; $P < .001$). The mean reduction in unmedicated MDIOP was -7.6 ± 4.1 mm Hg (mean \pm standard deviation) in the HMS group and -5.3 ± 3.9 mm Hg in the NMS group (difference = -2.3 mm Hg; 95% CI, -3.0 to -1.6 ; $P < .001$). The mean number of glaucoma medications had decreased from 1.7 ± 0.9 at baseline to 0.3 ± 0.8 at 24 months in the HMS group and from 1.7 ± 0.9 to 0.7 ± 0.9 in the NMS group (difference = -0.4 medications; $P < .001$). There were no significant differences in safety parameters between the two groups, and no serious ocular adverse events were associated with the microstent.

DISCUSSION

What complications were associated with implantation of the Hydrus Microstent?

The most common adverse event in the HMS group was focal adhesions consisting of peripheral anterior synechiae or iris tissue near the device inlet. The adhesions were obstructive in 3.8% (14 of 369) of HMS eyes and were not obstructive in 14.9% (55 of 369) of HMS eyes. Notably, the presence of focal adhesions was not associated with a significant difference in MDIOP. HMS patients whose devices were obstructed still had a significantly greater MDIOP reduction at 24 months compared with the NMS group (-7.6 ± 4.1 vs -5.3 ± 3.9 mm Hg, $P < .001$). This suggests either that trabecular flow through the microstent windows is maintained despite obstruction of the device inlet or that aqueous still flows through the inlet despite its gonioscopic appearance.

Other ocular adverse events were infrequent and similar between the HMS and NMS groups. None of the patients developed a potentially sight-threatening complication such as hypotony, a flat or shallow anterior chamber, choroidal detachment, device-cornea contact, or endophthalmitis. The occurrence of IOP-related adverse events (IOP spikes, secondary glaucoma filtration surgeries) was more frequent in the NMS group.

How do the results of the HORIZON study compare with those of other studies of microinvasive glaucoma surgery (MIGS) devices?

Because of the different patient populations, investigators, and methods used to collect data, caution should be exercised when comparing results among or between clinical trials. Nonetheless, there are similarities between the HORIZON and COMPASS studies in terms of trial design, patient demographics, inclusion and exclusion criteria, endpoints, and long-term results in the cataract surgery arm that may provide some basis for comparison. The assessment of both baseline and terminal washout IOP was critical to assessing device effectiveness in both randomized controlled trials. The COMPASS study⁶ showed the efficacy of the CyPass Micro-Stent (Alcon), a

supraciliary MIGS device no longer on the market, to be similar to that of the Hydrus Microstent, a trabecular bypass MIGS device, with 72% of unmedicated eyes achieving at least a 20% reduction in MDIOP, a reduction of 1.7 mm Hg in unmedicated MDIOP, and a decrease in glaucoma medications from 1.4 at baseline to 0.2 at 24 months.

Another study assessing the iStent Trabecular Micro-Bypass Stent (Glaukos), a trabecular bypass MIGS device, showed a significant reduction at 1 year in number of medications among patients randomly assigned to undergo implantation of the microstent combined with cataract surgery compared to those who were randomly assigned to cataract surgery alone. This difference was not statistically significant at 2 years, however, although the study was not powered for 2-year follow-up.⁷ The IOP reduction was similar in the device arm (8.4 mm Hg) and the control arm (8.5 mm Hg) at 1 year. The IOP decrease attributable to the device alone was not directly assessed in this study, as terminal medication washout was not performed.

To compare the safety and efficacy of the Hydrus Microstent with those of other MIGS devices in greater detail, long-term head-to-head studies are required. ■

STUDY IN BRIEF

- This prospective, multicenter, single-masked, randomized controlled trial showed that implantation of the Hydrus Microstent combined with phacoemulsification was more effective than phacoemulsification alone at reducing both IOP and the number of glaucoma medications in patients with mild to moderate primary open-angle glaucoma.

WHY IT MATTERS

- The US FDA recently approved the Hydrus Microstent based on the results of the HORIZON study. This study joins the COMPASS study as a second large randomized controlled trial to evaluate a microinvasive glaucoma surgery device and to incorporate postoperative medication washout in the study design, thereby allowing direct assessment of the IOP reduction attributable to the device alone.

1. Gazzard G, Konstantakopoulou E, Garway-Heath D, et al; LIGHT Trial Study Group. Selective laser trabeculoplasty versus eye drops for the first-line treatment of ocular hypertension and glaucoma (LIGHT): a multicentre randomised controlled trial [published online ahead of print March 8, 2019]. *Lancet*. doi: 10.1016/S0140-6736(18)32213-X.
2. Heijl A, Leske MC, Bengtsson B, et al. Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. *Arch Ophthalmol*. 2002;120:1268-1279.
3. Lee R, Hutnik CM. Projected cost comparison of selective laser trabeculoplasty versus glaucoma medication in the Ontario Health Insurance Plan. *Can J Ophthalmol*. 2008;41:449-456.
4. Saunders LJ, Russell RA, Crabb DP. Practical landmarks for visual field disability in glaucoma. *Br J Ophthalmol*. 2012;96(9):1185-1189.
5. Samuelson TW, Chang DF, Marquis R, et al; HORIZON Investigators. A Schlemm canal microstent for intraocular pressure reduction in primary open-angle glaucoma and cataract: The HORIZON Study. *Ophthalmology*. 2019;126(1):29-37.
6. Vold S, Ahmed II, Craven ER, et al; CyPass Study Group. Two-year COMPASS trial results: supraciliary microstenting with phacoemulsification in patients with open-angle glaucoma and cataracts. *Ophthalmology*. 2016;123(10):2103-2112.
7. Samuelson TW, Katz LJ, Wells JM, et al; US iStent Study Group. Randomized evaluation of the trabecular micro-bypass stent with phacoemulsification in patients with glaucoma and cataract. *Ophthalmology*. 2011;118(3):459-467.

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