7 The Role of Selective Laser Trabeculoplasty in Primary Angle Closure Glaucoma

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Abstract

Selective laser trabeculoplasty is proven to be safe and effective in the treatment of primary open-angle glaucoma. It reduces intraocular pressure by 20 to 30% from the baseline. However, the role of SLT in the treatment of primary angle-closure glaucoma remains an area worth exploring. Current data have shown it to be effective in selected cases. Nevertheless, there remain many uncertainties in the intraocular pressure response and long-term treatment outcome when SLT is used in the treatment of primary angle closure glaucoma.

Keywords

Selective laser trabeculoplasty · Primary angle closure glaucoma

Selective laser trabeculoplasty (SLT) is an outpatient procedure that reduces intraocular pressure in patients with ocular hypertension and glaucoma. The Q-switched, frequency-doubled Nd:YAG (532 nm) laser is applied through a special contact lens to the trabecular meshwork where it stimulates a biochemical change that increases the aqueous outflow from the anterior chamber. SLT can lower intraocular pressure by 20–30% from the baseline in about 80% of the treated patients. It therefore has a similar efficacy compared to ocular hypotensive eye drops. The intraocular pressure reduction effect may last for 3–5 years after a single treatment and SLT can be repeated when the therapeutic effect diminishes with time. SLT has been indicated as a safe and efficient treatment for primary open-angle glaucoma. Recent studies have also shown its effectiveness in the treatment of primary angle closure glaucoma (PACG). It is possible to apply SLT to angle closure patients who have at least 90 degrees of visible trabecular meshwork either because of incomplete angle closure or angle reopening after laser peripheral iridotomy, lens/cataract extraction, and/or goniosynechialysis. Despite the potential benefits of SLT in selected cases of PACG, the mechanisms underlying the intraocular pressure reduction in these glaucoma cases are still poorly understood.

Ho CL; et al. in 2009 studied whether SLT could lower intraocular pressure in eyes with primary angle closure after laser peripheral iridotomy [1]. In their study, patients with primary angle closure who had undergone laser peripheral iridotomy and who had an intraocular pressure greater than 21 mm Hg and a gonioscopically visible pigmented trabecular meshwork for at least 90 degrees were enrolled. SLT was applied

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to the open-angle segments. It was found that SLT was safe and effective in reducing the intraocular pressure in patients with primary angle closure glaucoma and a patent iridotomy when there was a sufficient extent of the visible trabecular meshwork.

Ali Aljasim L; et al. in 2016 achieved a success rate of 84.7% in PAC/PACG subjects treated with SLT. They defined success as clinically significant intraocular pressure reduction of 20% or more from the baseline or discontinuation of one or more of glaucoma medications in [2]. The success rate was comparable to that of the primary open-angle glaucoma which was 79.6%. However, an IOP spike occurred in 10% in the PAC/PACG groups which were two times more than that of the primary open-angle glaucoma group.

Raj S; et al. in 2018 also showed SLT to be a safe and cost-effective treatment for reducing intraocular pressure in primary angle closure glaucoma in the presence of a patent laser iridotomy and a visible trabecular meshwork [3]. They also found that a high baseline intraocular pressure positively correlated with the degree of intraocular pressure reduction.

However, despite the favorable short-term outcomes of SLT in the treatment of PACG, Kurysheva NI; et al. in 2016 found that the initial success rate was 87% in the first year dropped to 4% in the sixth year after SLT [4]. The long-term outcome of the initial SLT and the repeat SLT in the treatment of PACG needs further evaluation through large controlled clinical trials.

What are the factors that may lead to a different short-term and long-term outcome of SLT in the treatment of PACG compared to primary open-angle glaucoma? The histopathological changes going on in the trabecular meshwork in PACG may differ from those of primary open-angle glaucoma. One cannot translate the SLT outcomes of primary open-angle glaucoma directly to PACG. Theoretically, the SLT response should be better in PACG eyes with incomplete angle closure than in eyes with angle reopened up angle after laser peripheral iridotomy. This is because the peripheral anterior synechiae (PAS) free trabecular meshwork should have less histopathological changes than trabecular meshwork that had previous PAS closure. In the treatment of PACG patients with SLT, a variable response is expected. This is because the degree of visible trabecular meshwork that can be treated varies in different individuals. Furthermore, it is technically difficult to identify the trabecular meshwork because of irregular pigment deposits in the angle especially after laser peripheral iridotomy. It is also difficult to quantify the degree of the visible trabecular meshwork. Even if the open area is clearly identified and the trabecular meshwork is clearly visualized, there is still less treatable area than in primary open-angle glaucoma. Furthermore, it is not clear how the degree of pigmentation in the angle affects the outcome of SLT.

Since the pathogenesis of the PACG is caused by a relative anatomical derangement of the anterior segment, the treatment strategy aims at the reconstruction of the anatomical defect as well as intraocular pressure control. With the emergence of evidence, early cataract extraction and clear lens extraction have become more affirmative in the treatment of PACG. The role of SLT in the treatment of PACG seems to be trivial. However, SLT may still have a role in the following situations. In ophthalmic centers with long wait list for cataract surgery, SLT may be a useful tool to control the intraocular pressure while patients are waiting for the surgery. In patients who prefer to preserve their clear lens for reading and in patients who will suffer from severe anisometropia after lens removal, SLT may be considered as an alternative to lens extraction. SLT may also have a supplementary role in PACG by modulation of the unhealthy trabecular meshwork after cataract/lens extraction and/or goniosynechialysis. The cataract extraction and the goniosynechialysis serve to reconstruct the anterior segment anatomical defect while SLT revitalizes the trabecular tissue. In PACG eyes with persistently elevated intraocular pressure after angle opening procedures, SLT may be considered in replacement of medical therapy in medically controlled cases and in medically uncontrolled cases, it may be offered before proceeding to glaucoma surgery.

There are limitations of SLT in the treatment of PACG. If there is total angle occlusion or if the visible angle is less than 90 degrees, SLT cannot

or should not be used. And SLT cannot be used to treat acute attack of angle closure. SLT should not be used in PACG eyes in which the angle where the visible trabecular meshwork is located is very narrow. This is because of the risk of corneal damage if a large area of the laser spots is placed on the corneal endothelial tissue [5].

SLT alone cannot open a closed angle. It can only be applied to angle where the trabecular meshwork can be visualized. It cannot replace other angle opening procedures that need to be present to minimize the chance of angle reclosure. Therefore, PACG eyes receiving SLT should have a patent laser peripheral iridotomy and/or pseudophakia. Up to date, there is no reported sight-threatening complications directly related to SLT in the treatment of PACG. Provided that we minimize the post-SLT intraocular pressure spike magnitude and duration with medications, it appears to be a safe treatment option for selected cases of PACG. It offers a minimally invasive intervention in intraocular pressure control in PACG.

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