Editorial

Supraciliary microstenting with phacoemulsification in patients with open-angle glaucoma and cataracts

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Elevated intraocular pressure (IOP) is a major risk factor for the development or progression of glaucoma. Lowering IOP is the only proven therapeutic approach to the management of glaucoma. IOP can be lowered by medication, laser treatment or surgery (1). Generally, instillation of IOP-lowering eye drops remains the first-line treatment because it enables the patients to avoid the potential risk of vision-threatening complications associated with filtering surgery such as blebitis, hypotony maculopathy, and endophthalmitis. However, topical anti-glaucoma treatment also has downsides such as drug-related adverse effects, ocular surface toxicity, and poor adherence. Moreover, medical treatment often fails to reduce IOP sufficiently enough to prevent glaucomatous progression. Despite the risks of complications, surgical treatment is recommended in such cases (2,3).

For decades, trabeculectomy has been the standard surgical intervention of choice for glaucoma. However, with concerns over bleb-related complications of trabeculectomy, glaucoma drainage implants have gained popularity in recent years. Several studies comparing drainage implants and trabeculectomy have reported comparable success rates and better safety profiles with drainage implants versus trabeculectomy (4). However, implantation of glaucoma drainage devices (GDD) may also be followed by failure of IOP control or tube-related complications. Considering that glaucoma is a chronic life-long disease and that human life expectancy has increased in modern societies, a glaucoma patient may need multiple surgical procedures in his or her life. With the need for a safer surgical procedure, which may compare well to trabeculectomy and GDD in terms of IOP reduction and a better safety profile, the concept of minimally invasive glaucoma surgeries (MIGS) has emerged (5-7).

Supraciliary microstenting is one example of MIGS approach, targeting non-trabecular meshwork/Schlemm's canal-mediated aqueous outflow by creating a conduit from the anterior chamber to the suprachoroidal space. Several prior non-randomized studies have demonstrated good IOP reduction and safety profiles of the supraciliary stenting alone or combined with cataract surgery, compared to other MIGS procedures (8-11). In a recent study, Vold and colleagues demonstrated the two-year outcomes of their randomized controlled trial where subjects were intraoperatively randomized to phacoemulsification only (control) or supraciliary microstenting with phacoemulsification (microstent) groups after completing cataract surgery (12). Mean IOP reduction was 7.4 mmHg for the microstent group versus 5.4 mmHg in controls. Mean medication use in controls decreased from 1.3 drugs at baseline to 0.7 and 0.6 drugs at 12 and 24 months, respectively, and in the microstent group from 1.4 to 0.2 drugs at both 12 and 24 months, respectively. No vision-threatening microstent-related adverse events

occurred. This RCT demonstrated safe and sustained 2-year reduction in IOP and glaucoma medication use after microinterventional surgical treatment for mild-to-moderate POAG.

The main strength of their work lies in that it is the first RCT on the efficacy of the supraciliary tenting procedure in patients with glaucoma and cataract. Other strengths include implementation of anti-glaucomatous medication washout both at baseline and at one- or two-year postoperative visits, and comparisons of the mean values of IOP readings obtained at three different time points of the day. Thus, they could eliminate the confounding effect of glaucoma medications on the efficacy of the surgical intervention, and minimize the potential influences of diurnal variations in IOP.

However, this study has several limitations and leaves some unanswered questions. First, the study population was predominantly Caucasian. Therefore, as acknowledged by the authors, their observations may not be applicable to other ethnic groups, where there exist differences in types of glaucoma or biomechanical properties of ocular tissues. Second, no preoperative data were provided on the refractive error or axial length. High myopia is a well-known risk factor for hypotony maculopathy following filtering surgery. Since early postoperative hypotony has been reported to occur in about 10% following this surgical intervention, the proportion of myopic eyes or the severity of myopia of the study eyes would be of interest, and inform us better of the actual risk for this surgical intervention. Third, only untreated IOPs were compared between the baseline and the postoperative examinations. Although the supraciliary stenting decreased the number of postoperative glaucoma medications compared to the control group, the perioperative IOP changes or the level of postoperative IOP in the medicated state can be useful but were not provided. Clinicians would be equally keen to know how much the supraciliary stenting can decrease IOP additionally in eyes on the same glaucoma medications as preoperatively. If it happens to offer a substantial additional drop in IOP, the surgical indications may expand to patients with uncontrolled IOP or with more severe glaucoma.

Fourth, one may question the stability of the implanted stents and their effects on corneal endothelial cell loss. Previously, Saheb *et al*. evaluated the supraciliary space with anterior segment optical coherence tomography imaging after supraciliary stent implantation (13). They reported that fluid accumulation around the stent in the supraciliary space persisted up to postoperative 1 year, and that the fluid accumulation decreased in some eyes. However, the migrations of the stent or its effects on the corneal endothelial cells were not assessed. Longer-term stability of the implanted stent needs to be studied. Fifth, the postoperative morphologic alterations in the ciliary body and supraciliary space may influence the position of the intraocular lens, thereby inducing astigmatism and/ or myopic or hyperopic shift. Further evaluation of perioperative refractive or biometric changes will help us better predict the refractive outcomes of the combined surgery of phacoemulsfication and supraciliary stenting. Sixth, the efficacy of the supraciliary stenting was assessed only in eyes with high-tension glaucoma. It needs to be studied in eyes with open-angle glaucoma with normal IOP (normal-tension glaucoma; NTG) since good surgical outcomes obtained in eyes with high-tension glaucoma may not be reproduced in NTG. Finally, it remains to be explored whether implantation of multiple supraciliary stents may provide greater IOP reduction compared to implantation of a single stent. A recent study demonstrated that implantation of two trabecular micro-bypass stents in glaucoma patients provided additional IOP reduction (14).

Notwithstanding these shortcomings, the supraciliary stenting seems to be a promising MIGS approach because of the following reasons: (I) conjunctiva can be saved for future filtering surgeries; (II) microstenting can be implemented in eyes with extensive scars complicated by other ocular surgeries (e.g., post-keratoplasty, post-vitrectomy or s/p multiple filtering surgeries) or trauma; (III) combined surgery with phacoemulsification saves a visit to the operation room, decreasing the number of glaucoma medications required for patients with mild to moderate glaucoma; and (IV) supraciliary microstenting may augment the IOP reduction provided by other MIGSs, with different mechanisms of enhancing aqueous outflow.

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None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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