

THE IMPACT OF TRABECULECTOMY IN ADVANCED OPEN-ANGLE GLAUCOMA



Functional and structural changes in glaucoma patients with severe visual field loss.

BY MICHELLE PACKLES, MD; AND LOUIS R. PASQUALE, MD, FARVO

FACTORS ASSOCIATED WITH LAMINA CRIBROSA DISPLACEMENT AFTER TRABECULECTOMY MEASURED BY OPTICAL COHERENCE TOMOGRAPHY IN ADVANCED PRIMARY OPEN-ANGLE GLAUCOMA

Esfandiari H, Efatzadeh A, Hassanpour K, et al¹

ABSTRACT SUMMARY

In a single-center prospective study, Esfandiari and colleagues investigated the relationship between lamina cribrosa (LC) displacement and visual function after trabeculectomy augmented with mitomycin C. Using enhanced depth imaging spectral-domain OCT, the investigators scanned 81 eyes with primary open-angle glaucoma before and after trabeculectomy. In addition, they measured corneal biomechanical properties with the Ocular Response Analyzer (Reichert) before surgery. The researchers marked the anterior LC at several points on each of six radial scans to evaluate LC displacement in response to IOP reduction. Patients underwent Humphrey visual field testing (Carl Zeiss Meditec) before surgery and at 3 and 6 months after surgery. The investigators evaluated the effect of surgery on LC position. They recorded the position as more anterior (negative), more posterior (positive), or no change.

Factors associated with a deeper baseline anterior LC depth were cup-to-disc ratio, higher baseline IOP, corneal hysteresis, and corneal resistance factor. The mean LC displacement was -42 μ m; displacement was positively correlated with the magnitude of IOP reduction and negatively correlated with patient age and baseline cup-to-disc ratio. Eyes with a larger negative LC displacement were more likely to experience a gain in mean deviation of greater than 3 dB on Humphrey visual field testing. Baseline corneal

biophysical properties (central corneal thickness and corneal hysteresis) were not correlated with LC displacement after trabeculectomy.

DISCUSSION

Patients who have glaucoma lose visual function secondary to axonal ganglion cell damage initiated in and near the lamina cribrosa.^{3,4} Although a causative link between high IOP and optic nerve damage is well established in glaucoma, the exact mechanism of axonal loss is only partially understood.⁵ Some researchers

STUDY IN BRIEF

- The results of a prospective study suggested that the factor most strongly associated with anterior displacement of the lamina cribrosa (LC) after trabeculectomy in patients with advanced primary open-angle glaucoma is the magnitude of IOP reduction. Larger anterior displacement of the LC was more likely to be associated with a gain in mean deviation of greater than 3 dB on Humphrey visual field testing.

WHY IT MATTERS

- Trabeculectomy is a procedure designed to protect the optic nerve from progressive damage. In glaucoma, there is backward bowing of the LC that produces excavation of the neuroretinal rim. This backward bowing puts retinal ganglion cell axons on stretch, compromising their structural integrity and their function.² These investigators used enhanced depth imaging spectral-domain OCT to document reversal of the backward displacement of the LC in primary open-angle glaucoma after trabeculectomy. The study is important because it found that larger IOP reductions were associated with more forward movement of the LC and better visual field outcomes.

consider corneal hysteresis to be a surrogate for biophysical properties of the LC, but this study found that corneal biophysical properties

did not predict LC displacement after trabeculectomy. This finding is consistent with a report by Caprioli et al that patients' vision

can improve after trabeculectomy, particularly when the patient is younger and achieves a low IOP in the postoperative period.⁶

THE EFFECT OF TRABECULECTOMY SURGERY ON THE CENTRAL VISUAL FIELD IN PATIENTS WITH GLAUCOMA USING MICROPERIMETRY AND OPTICAL COHERENCE TOMOGRAPHY

Ratnarajan G, Jolly JK, Yusuf IH, Salmon JF⁷

ABSTRACT SUMMARY

Using microperimetry and OCT imaging, Ratnarajan and colleagues sought to determine the functional and structural effects of trabeculectomy surgery on the central visual field in glaucoma patients who had an established visual field defect.

OCT imaging did not detect any significant change in retinal nerve fiber layer thickness after trabeculectomy surgery.

In microperimetry, a light stimulus is projected onto specific retinal locations using eye-tracking technology. This novel diagnostic technique can be used to detect subtle changes in central retinal function by topographically mapping retinal threshold sensitivity across the macula.⁸ The technique is considered to be more sensitive than standard automated perimetry for the evaluation of scotomas, with microperimetry findings correlating closely with structural changes on OCT.⁹ In this study, microperimetry did not detect any significant change in central retinal sensitivity after trabeculectomy surgery in patients with advanced glaucoma.

DISCUSSION

In this study, during the early postoperative period, both central visual function and retinal nerve fiber layer thickness appeared to be preserved in glaucoma patients with central visual field defects undergoing trabeculectomy surgery. This finding

STUDY IN BRIEF

- A prospective study indicated that, after trabeculectomy, central visual function and nerve fiber layer tissue are preserved in patients with primary open-angle glaucoma who have preexisting visual field loss within 10° of fixation.

WHY IT MATTERS

- There is concern that patients with primary open-angle glaucoma who have damage that threatens their central vision will experience a snuff-out of their central visual field.¹⁰⁻¹⁵ This is the first study to use microperimetry to measure threshold sensitivity at precise retinal locations before and 3 months after trabeculectomy. Researchers reported that those locations retained their structural and functional integrity 3 months after trabeculectomy. Thus, although snuff-out can occur after trabeculectomy, the risk-benefit ratio of performing trabeculectomy on a patient who has advanced glaucoma may be in his or her favor as long as measures are taken to avoid postoperative hypotony.

may influence glaucoma surgeons' decisions regarding performing trabeculectomy surgery in this patient group. ■

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