

Case report

Management of hypotony after glaucoma filtering surgery

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ABSTRACT

A 39-year-old male with open angle glaucoma in both eyes visited our clinic. The intraocular pressure (IOP) of both eyes fluctuated between 15 mmHg and 25 mmHg. The best corrected visual acuity (BCVA) was 20/20 in the right eye and 20/100 in the left eye. He underwent trabeculectomy with an adjunctive agent (mitomycin C; concentration, 0.2 mg/mL) smoothly on the right eye. After the removal of releasable sutures, the filtering bleb was prominent over the superior limbus for 3 consecutive clock hours with an IOP of about 4–5 mmHg. The Seidel test result was negative, and the anterior chamber depth was moderate to deep. The BCVA of the right eye decreased to 20/100, and optical coherence tomography revealed macular edema. We injected sodium hyaluronate (Healon, Abbott Medical Optics, Santa Ana, CA, USA) into the anterior chamber 2 months after the operation, and repeated the same procedure 4 days later. After each injection, the IOP spiked up to 50 mmHg, and an intravenous infusion of mannitol was required. Sodium hyaluronate was found migrating into the bleb on post-injection day 1. Then we decided to revise the bleb by suturing the scleral flap at two sides. The IOP of the right eye returned to 10 mmHg 4 days after the revision surgery. The BCVA of the right eye recovered to 20/20 6 months after the revision. Optical coherence tomography also showed recovery from macular edema. One IOP-lowering agent (1% brinzolamide ophthalmic suspension) was required for IOP control after bleb revision. Early revision of the scleral flap may resolve hypotony and associated serious complications.

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1. Introduction

Hypotony may occur after ocular inflammation, trauma, or surgery. The success rate of filtering operations has dramatically increased in the past decade, owing to the introduction of anti-fibrotic agents. One of the most often used drugs is mitomycin C (MMC), which was first introduced by Chen¹ in 1981 for refractory glaucoma. However, the adjunctive use of MMC with trabeculectomy may result in dysfunctional filtering bleb,² and even hypotony maculopathy.³ By definition, there are two types of hypotony: statistical hypotony and clinically significant hypotony. Statistical hypotony occurs when the intraocular pressure (IOP) is more than 3 standard deviations below the mean of IOP, which corresponds to less than 6.5 mmHg. Clinically significant hypotony can be defined

as the condition where the IOP is low enough to result in visual loss, although a low IOP alone may not result in vision loss.⁴ Hypotony is a significant complication that has been associated with delayed visual recovery following filtering surgery. Vision loss associated with low IOP may be attributed to many causes including corneal edema, astigmatism, and cystoid macular edema. Several procedures were taken intra- and postoperatively to decrease the incidence of hypotony, such as releasable suture, laser suture lysis techniques,^{5,6} and/or the adjunctive use of intraoperative viscoelastic material.⁷ Despite these approaches, however, hypotony can still occur. We report the case of a patient with open angle glaucoma who suffered from hypotony maculopathy after undergoing a filtering surgery. The hypotony maculopathy had no response to an intracameral injection of sodium hyaluronate but subsided after bleb revision. The patient's vision recovered, and the bleb function was also preserved.

2. Case report

A 39-year-old male with open angle glaucoma for 6 years in both eyes visited our clinic. The cup/disk ratios were 0.85 × 0.8 in

Conflicts of interest: All authors declare no conflicts of interest.

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the right eye and 0.8×0.9 in the left eye. Gonioscopy revealed a grade 4 open angle in four quadrants with 180° of angle recession in both eyes. The best corrected visual acuity (BCVA) was 20/20 in the right eye and 20/100 in the left eye. During the 3-month follow-up period in our hospital, the IOP of both eyes fluctuated between 15 mmHg and 25 mmHg. The patient received trabeculectomy with MMC as adjunctive agent (concentration 0.2 mg/mL for 3 minutes) smoothly on the left eye first. The same procedure was performed on the right eye 6 weeks later. After the removal of releasable sutures 10 days after the operation, the filtering bleb was prominent over the superior limbus for 3 consecutive clock hours with an IOP of about 4–5 mmHg, which fulfills the definition of statistical hypotony. No bleb leakage was shown by the Seidel test, and the anterior chamber depth was moderate to deep. The postoperative BCVA of the right eye decreased to 20/100, macular folding was noted by direct ophthalmoscope, and Stratus OCT (model 3000, software version A 4.0; Carl Zeiss Meditec, Dublin, CA, USA) revealed macular edema (Fig. 1). Owing to failure of conservative treatment (intravenous normal saline supplement, abundant water intake, and frequent use of high potent steroid) for hypotony maculopathy, we injected sodium hyaluronate (Healon) into the anterior chamber 9 weeks after the operation, and repeated the same procedure 4 days later. After each injection, the IOP spiked up to 50 mmHg a few hours later, and intravenous infusion of mannitol was needed on postoperative day 1. Sodium hyaluronate was found migrating into the bleb at post-injection day 1. Ten weeks after trabeculectomy with MMC, we decided to revise the bleb by suturing the scleral flap at two sides (Fig. 2). The IOP of the right eye returned to 10 mmHg 4 days after the revision surgery. The BCVA of the right eye recovered to 20/25 on postoperative day 11 and to 20/20 6 months after the revision. Optical coherence tomography also showed recovery from macular edema and restoration of the foveal contour (Figs. 3–5). Macular folding subsided completely 6 months after bleb revision. At the last follow-up (15 months after bleb revision), the filtering bleb was prominent over the superior limbus for 2 consecutive clock hours. The visual field defect was stable on Humphrey standard automated perimetry (Figs. 6 and 7). Only one IOP-lowering agent (1% brinzolamide ophthalmic suspension) was needed for IOP to be controlled below the target pressure.

3. Discussion

Hypotony caused by excess filtration after glaucoma filtering surgery occurs at a rate of 1.3–30%.⁸ A major risk factor for hypotony maculopathy is the use of antifibrotic drugs during

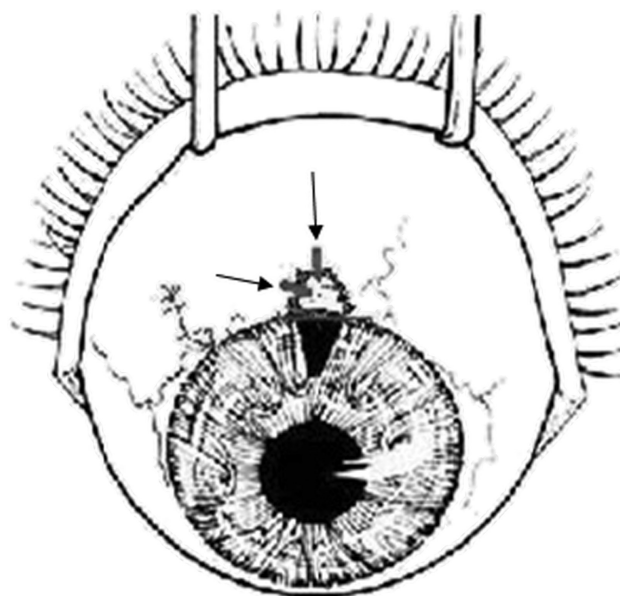


Fig. 2. Suturing sclera flap at two sides (arrow) to preserve the bleb function by reopening the conjunctival flap.

glaucoma filtering surgery, especially MMC. A retrospective case-control study revealed significant risk factors for hypotony maculopathy including young age, male sex, and myopia.⁹ IOP correction may not improve vision especially in cases of long-standing hypotony maculopathy. Although the intracameral injection of sodium hyaluronate raised the IOP significantly in those with early-onset hypotony, the overall clinical picture did not change because the endpoint IOP was still hypotonous. A prospective case series of intracameral 2.3% sodium hyaluronate to treat postoperative hypotony revealed that 20% of patients had IOP spikes that required medical treatment,¹⁰ just like the case we presented. Transconjunctival scleral flap resuturing is reported as an alternative and effective method for an overfiltering bleb. In a previous study, the mean baseline IOP of 2.9 ± 1.4 mmHg was elevated to 7.3 ± 4.5 mmHg at 1 week after the sutures were removed, and 8.1 ± 3.5 mmHg at the last follow-up (mean of 23 months) with improvement of the BCVA. Hypotony maculopathy and choroidal effusions were resolved in 92% and 100% of the patients, respectively.⁸ There is no bleb-associated infection reported in the study.

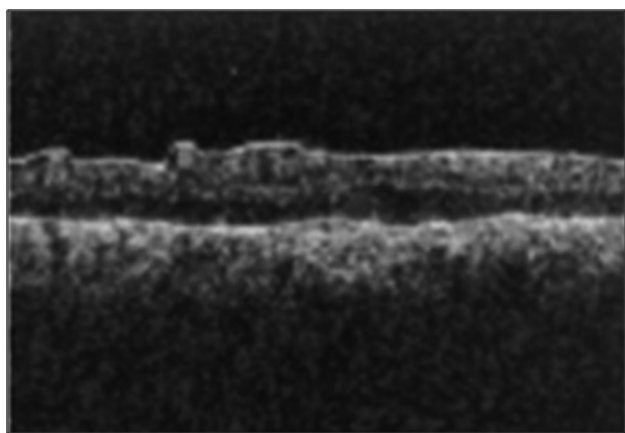


Fig. 1. Three weeks prior to bleb revision, optical coherence tomography (OCT) of the right eye shows macular edema with folding (central foveal thickness is 308 μm).

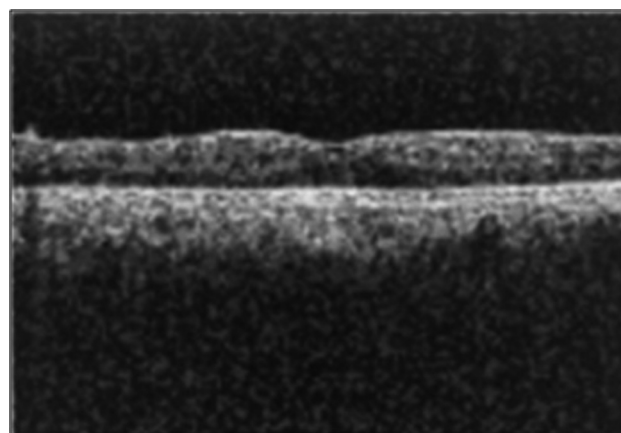


Fig. 3. One week after bleb revision, optical coherence tomography (OCT) of the right eye shows macular edema with folding decreased (central foveal thickness is 210 μm).

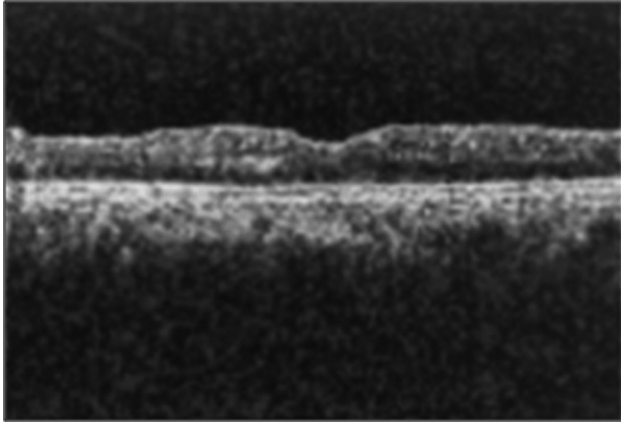


Fig. 4. Three weeks after bleb revision, no macular edema of the right eye is noted (central foveal thickness is 202 μm).

Another study revealed that even 4 years after resuturing of the scleral flap through the intact conjunctiva, the bleb function was still preserved.¹¹ In our case, we failed to treat hypotony maculopathy with an intracameral injection of sodium hyaluronate, although the IOP spiked temporarily after each injection. The injected sodium hyaluronate was found to migrate to the subconjunctival space soon after each injection, and the IOP became hypotonous again only days after the procedure. In addition, the IOP spike may further damage the vulnerable atrophic optic nerve.

In this case, hypotony with a moderate to deep depth of the anterior chamber and prominent filtering bleb over the superior limbus for 3 consecutive clock hours was noted. No bleb leakage was shown by the Seidel test. There are several possible reasons for hypotony without a flat chamber. First, the drug effect of the IOP-lowering agent continues to persist after the surgery. Second, the scleral flap is overfiltering. Because there is no conjunctival wound leakage, the anterior chamber may remain formed.

In our case, although intervention was a little bit delayed until 10 weeks after trabeculectomy, bleb revision that involves suturing the scleral flap at two sides successfully reversed hypotony maculopathy (and the vision eventually recovered to 20/20), while preserving the bleb function. The visual field defect also remained stable 14 months after the filtering surgery. Prompt treatment of

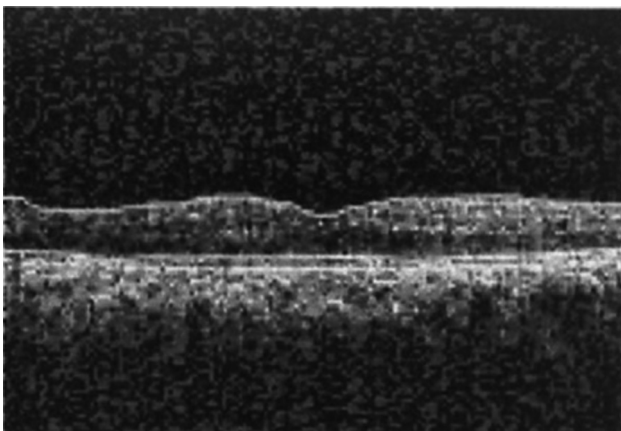


Fig. 5. Four months after bleb revision, no macular edema of the right eye is noted (central foveal thickness is 207 μm).

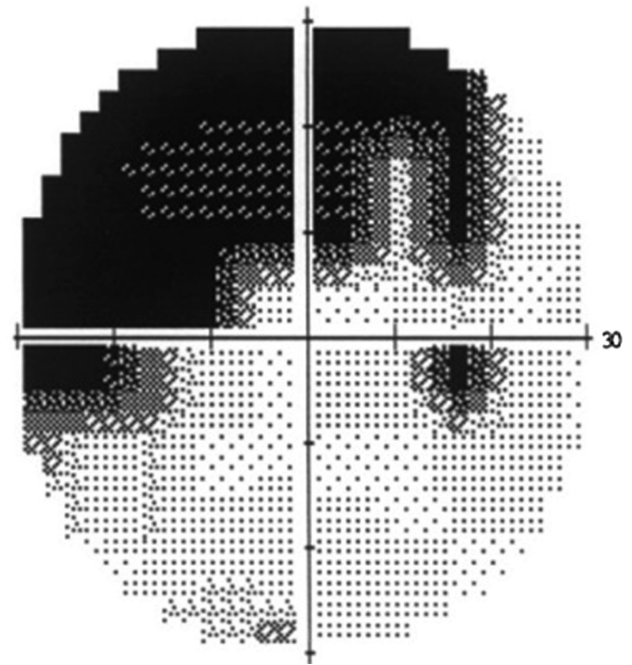


Fig. 6. Visual field prior to trabeculectomy (mean deviation = -12.53 dB).

hypotony, as early as possible after the filtering surgery, may be mandatory to prevent permanent damage of the macula.

4. Conclusion

Hypotony after a filtering surgery may deteriorate vision and requires properly timed intervention. When spontaneous resolution has not taken place by observation alone, several noninvasive and invasive techniques should be considered to normalize the IOP. The effect of an intracameral injection of sodium hyaluronate is

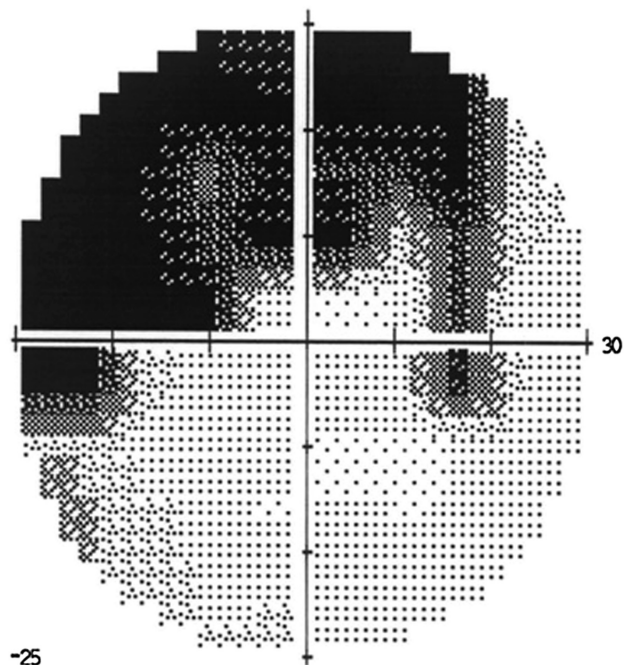


Fig. 7. Visual field 14 months after trabeculectomy (mean deviation = -12.44 dB).

limited even in patients without flat chamber and may cause early postinjection IOP spikes, which may further damage the delicate optic nerve. Early revision of the scleral flap may help resolve hypotony and associated serious complications. Prompt management to correct the hypotony as early as possible is mandatory and may preserve the patient's vision.

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