

Assessing and Managing Hypotony Maculopathy

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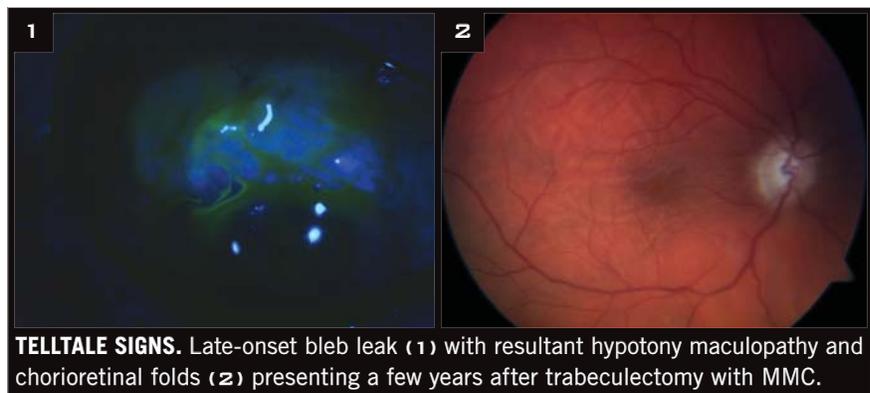
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Hypotony may occur after ocular inflammation, trauma or surgery, especially glaucoma filtration surgery with antifibrosis drugs.

Several definitions may be used for hypotony. A statistical definition is intraocular pressure under 6.5 mmHg, which is more than three standard deviations below the mean. An alternative clinical definition is IOP low enough to result in vision loss, although low intraocular pressure alone may not result in vision loss. Vision loss associated with low IOP is commonly caused by corneal edema, astigmatism, cystoid macular edema or maculopathy.

Hypotony maculopathy is characterized by a low IOP with associated fundus changes, including chorioretinal folds, optic nerve swelling and vascular tortuosity. The chorioretinal folds are most likely secondary to the collapse of the scleral wall. Wrinkling in the retina or thickening in the choroid may cause axial shortening of the eye, leading to hyperopia.

Disc swelling is not secondary to increased intracranial pressure but results from restricted axoplasmic flow, presumably from anterior bowing of the lamina cribrosa in the optic nerve. These findings may be less pronounced in eyes with advanced glaucoma because these eyes have fewer remaining axons that can swell. Clinically, patients may experience metamorphopsia or central vision loss, or they may be asymptomatic.



TELLTALE SIGNS. Late-onset bleb leak (1) with resultant hypotony maculopathy and chorioretinal folds (2) presenting a few years after trabeculectomy with MMC.

Assessing Risk Factors

Hypotony maculopathy can occur with increased outflow of aqueous humor or, less often, with decreased aqueous production. Outflow can increase because of a wound leak, a scleral rupture, a cyclodialysis cleft, a retinal detachment or an overfiltering bleb—or, rarely, from a ciliochoroidal detachment. Decreased aqueous humor production may be secondary to iridocyclitis, hypoperfusion of the ciliary body in ocular ischemia, or a ciliochoroidal detachment.

A major risk factor for hypotony maculopathy is the use of antifibrosis drugs, especially mitomycin C, during glaucoma filtration surgery. After intraoperative use of MMC, overfiltration or bleb leaks in the late postoperative period may be associated with hypotony maculopathy. Higher concentrations and increased application times of antifibrosis agents not only may lead to excessive filtration but also may have a toxic effect on the ciliary body, thus leading to decreased aque-

ous humor production.

In a retrospective study of other risk factors for hypotony maculopathy, researchers found that young age, male gender and myopia increased the risk, whereas a history of diabetes and the presence of choroidal effusions decreased the risk.¹ Younger age also emerged as a risk factor in another study, which evaluated the relationship between central corneal thickness and hypotony maculopathy. In this study, the researchers found that if the central cornea was thin, there was a decreased risk of maculopathy; if the central cornea was thicker, there was an increased risk of maculopathy.²

Imaging Tips

Ophthalmic imaging modalities help identify hypotony maculopathy, especially in subtle cases.

Intravenous fluorescein angiography can help reveal choroidal folds. On the angiogram, there is an increase in the choroidal fluorescence along the crest of each fold because of thin-

ning of the retinal pigment epithelium and relative hypofluorescence in the troughs. This pattern results in narrow dark lines that run within a background of either slightly intensified or normal choroidal fluorescence.

B-scan ultrasonography may reveal thickening of the posterior sclera and choroid in affected eyes.

Ultrasound biomicroscopy can be used to measure anterior chamber depth, ciliary body position and anterior ciliary body detachment. It can be especially helpful in detecting a cyclodialysis cleft, an often-overlooked cause of hypotony and associated maculopathy.

Optical coherence tomography may show folds in the retina. Budenz and colleagues reported positive OCT findings in three cases that had decreased vision secondary to hypotony with a normal ocular exam.³ In these cases, the OCT findings improved with normalization of IOP and improvement of visual acuity. The authors reported that the macular folds may be oriented in any axis, which emphasizes the need to review all radial line scans of the macular OCT to improve the diagnostic yield.

Treatment Tips

In treating hypotony maculopathy, the goal is to normalize IOP as quickly as possible to prevent permanent retinal dysfunction and associated vision loss. However, IOP correction may not lead to improvement in visual acuity, especially in cases of long-standing hypotony maculopathy. Treatment considerations are as follows:

- **Bleb leaks.** Hypotony maculopathy secondary to a leaking bleb after filtration surgery can be managed in several ways, depending on the timing of the bleb leak. They may be managed by conservative therapy with aqueous suppressants, topical antibiotics or bandage contact lenses, or they may require direct suturing of the bleb.

The aqueous suppressants reduce flow through the leak; the antibiotics are used for prophylaxis against infection; and the contact lenses help facilitate wound healing. Other options

Differential Diagnosis

Other ophthalmic conditions can cause folds in the posterior pole similar to hypotony maculopathy. These include posterior scleritis, a retrobulbar mass, choroidal neovascularization, thyroid eye disease and idiopathic choroidal folds with hyperopia. All of these ocular conditions are likely to be associated with normal or elevated IOP.

are autologous blood injection into the bleb, fibrin tissue glue, cyanoacrylate glue, argon laser application or direct suturing of the bleb, although these treatments seldom produce a long-lasting solution.

Late-onset bleb leaks that do not resolve spontaneously or with conservative measures often require surgical intervention. In a study of 26 eyes with late-onset bleb leaks that underwent conjunctival advancement, 92 percent were treated successfully.⁴ However, 50 percent required additional glaucoma medications to control the IOP, and three eyes underwent a second glaucoma surgery.

- **Overfiltering blebs.** Hypotony maculopathy secondary to overfiltration may be managed by adding compression sutures to the elevated, overfiltering bleb. Autologous blood injection, in or around the bleb, may be helpful in some patients. During the early postop period, with an overfiltering bleb, anti-inflammatory medications may be rapidly tapered to facilitate episcleral scarring. Cataract surgery in some of these patients who have visually significant cataracts may result in increased IOP due to inflammation usually encountered in the postoperative period. Depending on the clinical findings, bleb revision may include resuturing of the trabeculectomy flap or scleral patch graft reinforcement with conjunctival advancement. If the posterior conjunctiva is not amenable to advancement, an autologous conjunctival graft may be needed.

Prevention Tips

Preventive measures can be taken intraoperatively during glaucoma surgery to reduce the risk of hypotony maculopathy in the postoperative period. Multiple flap sutures should be placed, with additional sutures if aqueous flow

is excessive. The conjunctiva should be closed with the use of tapered (vascular) needles to reduce suture track leaks. If possible, the conjunctival closure should incorporate Tenon's capsule, whether by a two-layer or a one-layer method. Postoperatively, properly timed removal of releasable sutures or laser lysis of other sutures can decrease the precipitous reduction of IOP and the potential for hypotony maculopathy.

Conclusion

Hypotony maculopathy can be a vision-threatening complication of ocular inflammation, trauma or surgery, especially glaucoma filtration surgery. Good outcomes depend on early detection and treatment of the underlying condition to help normalize IOP. Permanent visual loss can occur if the reversal of hypotony maculopathy is delayed.

1 Fannin, L. A. et al. *Ophthalmology* 2003; 110:1185–1191.

2 Nicoleta, M. T. et al. *Ophthalmology* 2007; 114:1266–1271.

3 Budenz, D. L. et al. *Arch Ophthalmol* 2005; 123:113–114.

4 Budenz, D. L. et al. *Arch Ophthalmol* 1999; 117:1014–1019.

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