Effect of Phacoemulsification Surgery on Hypotony Following Trabeculectomy Surgery

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**Objective:** To review the effect of phacoemulsification surgery in eyes with chronic hypotony following trabeculectomy with mitomycin C.

**Design:** Retrospective analysis of all eyes that underwent phacoemulsification surgery for symptomatic cataracts and had a preoperative diagnosis of chronic hypotony (intraocular pressure [IOP] ≤ 6 mm Hg) for at least 6 months following trabeculectomy with mitomycin C. Each case had at least 6 months’ follow-up after the phacoemulsification surgery.

**Setting:** A tertiary care referral center.

**Intervention:** Clear cornea phacoemulsification surgery, with minimal perioperative anti-inflammatory medication and retention of viscoelastic in eyes at case conclusion.

**Main Outcome Measures:** Intraocular pressure, visual acuity, and complications.

**Results:** Nine eyes of 9 patients were identified. Mean preoperative IOP was 4.2 ± 1.4 mm Hg; the mean postoperative IOP was 7.3 ± 2.8 mm Hg (P = .009). Intraocular pressure increased in all but 2 eyes. One of these 2 eyes experienced an acutely elevated IOP (34 mm Hg) on postoperative day 4, which dropped back to preoperative levels after trabeculectomy flap needling. Mean preoperative visual acuity was 20/300; mean postoperative visual acuity was 20/40.

**Conclusion:** Phacoemulsification surgery may be associated with a statistically significant elevation in IOP in previously filtered eyes with hypotony, resulting in resolution of hypotony in some of these challenging cases.


ANTIMETABOLITE application in trabeculectomy surgery has dramatically increased the chances of achieving low final “target” intraocular pressure (IOP). However, antimetabolite-associated complications can be frustrating to manage, and none is so bedeviling as chronic hypotony.

Both 5-fluorouracil and mitomycin C have been associated with persistent postoperative hypotony after their use with trabeculectomy surgery. Hypotony can cause visual fluctuation from corneal curvature changes during blinking. Additionally, chronic hypotony has been related to cataract progression, choroidal effusions, and retinal folds. Multiple techniques have been used to treat this problem.

Many patients have or develop cataracts following trabeculectomy. Postoperative inflammation following large-incision extracapsular or intracapsular cataract extraction has been associated with decreased bleb function in some eyes with preexisting trabeculectomies.

More recently, Sibayan et al reported resolution of hypotony in 2 eyes following routine phacoemulsification surgery. The purpose of this study was to review the effect of viscoelastic-supplemented phacoemulsification surgery in eyes with visually significant cataracts and chronic hypotony. We hypothesized that a surgical technique that maximized viscoelastic use and minimized anti-inflammatory medication might result in significantly decreased bleb function, despite the previous use of mitomycin C.

**RESULTS**

Presurgical and postoperative characteristics of the 9 identified eyes with chronic hypotony are outlined in the Table. Prior to phacoemulsification, 6 of 9 eyes had been treated with oversized bandage contact lenses and autologous blood injections to the bleb. Additionally, patient 1 had un-
PATIENTS AND METHODS

University of Florida Eye Center patient records were retrospectively reviewed to identify consecutive patients with a history of prior trabeculectomy with mitomycin C and associated chronic hypotony who underwent phacoemulsification surgery for cataracts in the style described below. Informed consent was obtained prior to all procedures. All trabeculectomies used intraoperative mitomycin C, 200 μg/mL over 3 to 5 minutes. Each patient demonstrated at least a 6-month history of IOP of 6 mm Hg or lower prior to undergoing phacoemulsification surgery. Patients had also had at least 6 months’ follow-up after the phacoemulsification surgery. Nine eyes of 9 patients were identified.

All phacoemulsification procedures were performed in the usual fashion by 1 of 2 surgeons (J.W.D., M.F.S.), using a clear corneal incision and Visco (Alcon Laboratories Inc, Ft Worth, Tex) instillation. If necessary, multiple microphacotomies were made and the pupil was stretched. Foldable silicone lenses (AMO S140; Allergan Inc, Irvine, Calif) were implanted. In contradiction to our usual practice in eyes with existing filters, no preoperative anti-inflammatory eyedrops were prescribed. Viscoelastic was not removed at case conclusion. Postoperative use of anti-inflammatory eyedrops was minimized (ie, dexamethasone twice daily for 1-2 weeks), even if pupil stretching had been done intraoperatively. Follow-up examinations carefully monitored intraocular inflammation, bleb height, and IOP.

<table>
<thead>
<tr>
<th>Patient No./Age, y/Race/Sex</th>
<th>Pretrabeculectomy Visual Acuity</th>
<th>Pretrabeculectomy IOP, mm Hg</th>
<th>Time to Phacoemulsification Surgery, mo</th>
<th>Prephacoemulsification Visual Acuity</th>
<th>Prephacoemulsification IOP, mm Hg</th>
<th>Postoperative Day 1 Visual Acuity</th>
<th>Postoperative Day 1 IOP, mm Hg</th>
<th>Final Visual Acuity</th>
<th>Final IOP, mm Hg</th>
<th>Follow-up, mo</th>
<th>Visual Acuity Limited by</th>
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<tbody>
<tr>
<td>1/54/W/F 20/200</td>
<td>21</td>
<td>19</td>
<td>5</td>
<td>20/300</td>
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<td></td>
<td></td>
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<tr>
<td>2/64/B/F 20/70</td>
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<td>20/25</td>
<td>3</td>
<td>20/20</td>
<td>10</td>
<td>20/50</td>
<td>11</td>
<td>Glaucoma</td>
<td></td>
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</tr>
<tr>
<td>3/61/B/M 20/50</td>
<td>28</td>
<td>20/80</td>
<td>4</td>
<td>20/60</td>
<td>5</td>
<td>20/50</td>
<td>9</td>
<td>11</td>
<td>Meningitis-associated optic neuropathy</td>
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<td>12</td>
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<td>7</td>
<td>11</td>
<td>Subtle macula folds</td>
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<tr>
<td>5/76/W/F 3/81/B/M 20/50</td>
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<td>12</td>
<td>22/2000</td>
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<td>9</td>
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<tr>
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<td>Subtle macula folds</td>
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<td>20/200</td>
<td>8</td>
<td>Subtle macula folds</td>
<td></td>
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</table>

IOP indicates intraocular pressure; LP, light perception; CF, counting fingers; HM, hand motions; and ellipses, not applicable.

* IOP indicates intraocular pressure; LP, light perception; CF, counting fingers; HM, hand motions; and ellipses, not applicable.

d ergone choroidal effusion drainage and intraocular viscoelastic placement prior to phacoemulsification.

Mean preoperative visual acuity was 20/300. Four of 9 patients (patients 3, 4, 5, and 8) complained of fluctuations in vision superimposed on a generalized decreased visual acuity. Three of 9 patients (patients 1, 4, and 7) had macula folds visible on preoperative retina examination. On average, there was a span of 20.1 months between trabeculectomy surgery and phacoemulsification surgery. Mean postoperative visual acuity was 20/40. Visual acuity was limited postoperatively in 4 eyes by glaucoma, in 1 eye by a coexisting optic neuropathy, and in 1 eye by subtle macula folds (patient 7).

The mean phacoemulsification IOP in this group of 9 eyes was 4.2 ± 1.4 mm Hg. All blebs were moderately large to large and avascular. Mean postoperative IOP at an average of 20.3 months’ follow-up was 7.3 ± 2.8 mm Hg (P < .001). The blebs of 7 of 9 eyes (patients 1, 3-6, 8, and 9) were notably smaller, though still avascular, at last examination. Intraocular pressure increased in 7 (78%) of 9 eyes. Intraocular pressure was unchanged at last follow-up in 2 eyes (patients 2 and 7). One of these 2 eyes (patient 7) experienced an acute elevation of IOP to 34 mm Hg on postoperative day 4. In that this eye had a very compromised optic nerve to start with, the pressure elevation was treated with flap needling. Immediately following revision, IOP dropped to 9 mm Hg. Intensive topical steroids were given, and 25 months later IOP was 6 mm Hg, with subtle macula folds again present on examination and a visual acuity of 20/40.

No complications, other than the need to revise 1 bleb (see above), occurred. At last follow-up only 1 patient (patient 7) had fluctuations in vision. All visual fields were stable or improved.

There are multiple reports of chronic hypotony following trabeculectomy with either 5-fluorouracil or mitomycin C.1-4,18 Patients without visual complaints and with stable anterior chambers and posterior poles might be observed. However, individuals with visual symptoms or significant examination findings may require intervention.

One treatment option is to paint the bleb with trichloroacetic acid.6 Oversized compressive contact lenses are another option, though they are most helpful in treating chronic hypotony when combined with an additional modality, such as intrableb fibrin sealant.7 Alternatively, intrableb autologous blood injections have been used suc-
cessfully to treat these eyes. However, risks exist, such as egress of blood posteriorly into the vitreous or significantly increased IOP and corneal blood staining. Direct treatment of the bleb or peribleb sclera with either cryotherapy or YAG laser as reported by Lynch et al can induce sufficient inflammation as to partially close down an overdraining bleb. Unfortunately, YAG laser therapy to sclera underlying blebs may be painful and requires both a retrobulbar anesthetic injection and a Nd:YAG laser with retrofocus abilities.

Other, more invasive ways to address the problem of significant hypotony include restressing the scleral flap or covering the sclerostomy with a tissue flap. Also, pars plana vitrectomy and silicone oil placement may successfully treat chronic, vision-limiting, hypotony maculopathy, but it is a highly complex intervention.

Cataracts are not uncommon in filtered eyes. Extracapsular cataract extraction in eyes with filters is associated with late diminished bleb function, presumably secondary to inflammation induced by the large incision. In our experience, phacoemulsification surgery is far less traumatic to eyes compared with extracapsular, large-incision cataract extraction. In fact, we found that by maximizing the dose of perioperative anti-inflammatory eye drops and carefully removing all viscoelastic at case conclusion, phacoemulsification in patients with functioning blebs was associated with no significant IOP elevation in 73% of cases, and with only a mild, medically controllable, elevation in another 17% of eyes. Park et al similarly found a 79% IOP control rate 3 years following temporal corneal phacoemulsification in eyes with filters. However, Sibayan et al reported that routine phacoemulsification surgery resulted in resolution of hypotony and visual complaints in 2 patients with postfiltration hypotony. Thus, we wondered if a phacoemulsification technique minimizing anti-inflammatory medication and maximizing viscoelastic use might consistently result in a beneficial decrease in bleb function in hypotony eyes.

This study suggests that a mildly modified phacoemulsification technique, as described earlier, may be associated with significant increases in postoperative IOP. Leaving viscoelastic in eyes at case conclusion would cause some initial decreased aqueous flow through the bleb. Thereafter, minimizing topical steroid use (and nonsteroidal anti-inflammatory drug use) presumably results in increased inflammation and the associated decrease in bleb size and function we observed. Thus, in a patient with symptomatic cataract in an eye with coexisting hypotony, it would be reasonable to delay any other hypotony-resolving treatment, pending final results after cataract surgery. Additional treatment of hypotony can always be done after phacoemulsification, if necessary. But if an overfiltering bleb had been “successfully” treated with one of the other aforementioned therapies prior to phacoemulsification, underfiltration could develop following cataract extraction.

Complications were negligible in this review. However, phacoemulsification surgery, performed as described, warrants closer than average follow-up. As demonstrated by patient 7, leaving viscoelastic in the eye and limiting postoperative anti-inflammatory medication can be associated with a serious late postoperative IOP spike.

In conclusion, chronic hypotony in antimetabolite-treated filtered eyes can be difficult to manage. It is helpful to be aware of yet another approach to take with these difficult eyes. We recommend a modified phacoemulsification technique with close postoperative follow-up in patients with symptomatic cataract and significant invertebrate hypotony.

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REFERENCES