Midterm Follow-up of Necrotic Bleb Excision and Advancement of the Fornical Conjunctiva

Sung-Min Hyung, M.D. and Dong Gyun Ahn, M.D.

Department of Ophthalmology, College of Medicine, Chungbuk National University, Chungbuk, Korea

Mitomycin C has improved the success rate of glaucoma filtering surgery in patients at high risk for surgical failure. However chronic hypotony is marked by decreased vision and a late-onset leaking bleb after filtration surgery using mitomycin C. Bleb excision and conjunctival advancement is the method of choice to repair bleb leakage and chronic hypotony. Five eyes from five patients were received glaucoma filtration surgery with topical mitomycin C. All of the patients’ blebs were avascular and transparent. The reasons for bleb excision were two spontaneous bleb leaks, two traumatic bleb leaks and one case of severe irritation. The mean follow-up period was 18.4±8.3 months (ten to 29 months). Cataract surgery was combined in one eye. Postoperative intraocular pressure (IOP) increased from 2.3±1.5 mmHg to 9.5±3.7 mmHg at nine months postoperatively in four eyes. It went from 28 mmHg to 40 mmHg in one patient with uveitis, for whom a second trabeculectomy with mitomycin C; 0.4 mg/ml for 3 minutes, was performed. After surgery, IOP decreased to 4 mmHg in three months. Postoperative visual acuity improved four snellen lines in three eyes. A partially avascular bleb recurred in three eyes, a corneal bleb in one eye and blepharoptosis, which disappeared spontaneously at four months postoperatively, in one eye. Necrotic bleb excision and advancement of fornical conjunctiva were useful methods to increase IOP and to improve visual acuity for the patient experiencing irritation symptoms, and for leaking blebs, and hypotonic maculopathy.

Key words: chronic hypotony, irritation symptom, leaking bleb, mitomycin C, necrotic bleb excision and advancement of fornical conjunctiva, trabeculectomy

INTRODUCTION

Leakage of a chronically thinned filtering bleb, a long term complication of glaucoma filtering procedures, can cause hypotony, choroidal effusion, macular edema, cataract formation, bleb infection, and endophthalmitis. Chronic hypotony after filtering surgery with mitomycin C (MMC) may induce secondary posterior segment structural alteration and decreased visual acuity, termed as hypotonic maculopathy. This complication of filtering surgery occurs frequently after the introduction of adjunctive antimetabolites. Normalization of IOP may improve visual acuity. However, despite successful IOP elevation, visual acuity may not return to normal, and permanent macular chorioretinal changes...
Table 1. The patients’ characteristics

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age/Sex</th>
<th>Diagnosis</th>
<th>Filtering surgery or combined surgery</th>
<th>Follow-up after BECA (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64/M</td>
<td>NVG, PDR</td>
<td>TRAB, MMC, ECCE, PCL</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>27/M</td>
<td>NVG, CRVO</td>
<td>TRAB, MMC</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>51/M</td>
<td>POAG</td>
<td>TRAB, MMC</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>62/F</td>
<td>POAG</td>
<td>TRAB, MMC</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>36/M</td>
<td>Uveitic glaucoma</td>
<td>TRAB, MMC</td>
<td>12</td>
</tr>
</tbody>
</table>


may ensue.\textsuperscript{4-8}

Methods of conservative management of late bleb leaks include pressure patching, bandage contact lenses, aqueous suppressants, glaucoma shells, collagen shields, and tissue adhesive.\textsuperscript{9-11} Surgical techniques include scleral patch grafts, free conjunctival grafts, rotational conjunctival Tenon’s flap grafts, Tenon’s capsule pedicle plugs, autologous blood injections, the use of the argon laser, and surgical excision and advancement of healthy conjunctiva.\textsuperscript{1,3,12-20} However, thin, avascular blebs can be resistant to treatment. We performed surgical excision of thinned necrotic blebs, and advancement of healthy conjunctiva to reform the filtering blebs, in five patients. We then evaluated the midterm effect of this surgical procedure.

**MATERIALS AND METHODS**

We reviewed the records of patients who received bleb excision and advancement of conjunctiva after trabeculectomy with topical mitomycin C, between November 1993 and November 1998. For each patient, information including age, sex, type of glaucoma and past surgical history was collected. IOP and visual acuity were recorded at every follow-up visit. The patients’ characteristics were tabulated (Table 1).

**Surgical procedure**

After retrobulbar anesthesia, the thinned necrotic conjunctival bleb was excised totally, leaving only the sclera and the scleral fistula exposed. The healthy conjunctiva and Tenon’s fascia between the superior border of the filtering bleb and the superior fornix was used to establish the new bleb. A horizontal relaxing incision was made with scissors on the superior fornix. This incision was made long enough to permit coverage of the filtration site without tension. The conjunctiva and Tenon’s capsule anterior to the relaxing incision were undermined, and the flap was carefully moved toward the limbus. Care was taken to avoid forming a button-hole incision. The limbal margins of conjunctival flap were sutured with 10-0 nylon.

**CASE REPORTS**

**Case 1**

A 64-year-old man referred to the glaucoma clinic was suffering from proliferative diabetic retinopathy and neovascular glaucoma in both eyes. Despite maximal medical therapy, IOP in the left eye was 38 mmHg and visual acuity was 20/200. The patient was already blind in the right eye. Extracapsular cataract extraction, intraocular lens implantation, and trabeculectomy were performed with MMC, 0.4 mg/ml, for three minutes. Three weeks later, IOP was 26 mmHg and visual acuity was 20/100. After panretinal photocoagulation and argon laser suture lysis, IOP decreased to 3 mmHg, visual acuity was 20/300 and choroidal detachment occurred. Two weeks later, the choroidal detachment resolved spontaneously, but hypotony with a large bleb persisted and visual acuity stabilized at 20/40. Thirty months later, spontaneous bleb leakage occurred. In order to prevent infection, the necrotic avascular bleb was excised, and reconstruction of the filtering bleb, involving advancement of the fornical conjunctival flap, was undertaken. For four months, a
diffuse bleb with a partially avascular conjunctival area was present, and a beta blocker was used. IOP was 13 mmHg, and visual acuity was 20/30. Ten months after reconstruction of the bleb, the avascular area had become localized, IOP was 9 mmHg without medication and visual acuity was 20/30.

Case 2
A 27-year-old man was suffering from neovascular glaucoma of the left eye, complicated by central retinal vein occlusion. Despite panretinal photocoagulation and maximal medical therapy, IOP was 52 mmHg and he did not perceive light. Trabeculectomy was performed; MMC, 0.4 mg/ml, for five minutes. Three days postoperatively, IOP was 42 mmHg and the bleb was small and only shallowly elevated. A 26G needle was used to cut one suture of the scleral flap, and IOP subsequently fell to below 5 mmHg. One month postoperatively, choroidal effusion and tortuous retinal vasculature were noted, but these conditions spontaneously resolved after one month. A beta blocker was used, and IOP rose to 15-20 mmHg. One year later, the patient complained of the sensation of a foreign body. This, and other ocular discomforts, was being aggravated by the large bleb. IOP was 2 mmHg and the left eye appeared enophthalmic. Thirty-four months after filtration surgery, autologous blood was injected into the bleb, and one week later, IOP increased to 7 mmHg. Five weeks after injection, IOP decreased to 3 mmHg, and blood was injected for the second time. Two days later, bleb leakage occurred and IOP was 1 mmHg. The necrotic bleb was excised and the fornical conjunctival flap was advanced. During the procedure, the exposed scleral flap and adjacent sclera were seen to be avascular and friable, and no apparently healthy flap margins were observed. During the first postoperative year, IOP remained stable at 6-8 mmHg, and the bleb was diffusely elevated. The avascular conjunctival area was slowly increasing. At 29 months postoperatively, IOP remained stable at 10 mmHg without medication, and the avascular bleb area remained unchanged (Fig. 1A).

Case 3
A 51-year-old male, who underwent trabeculectomy; MMC, 0.4 mg/ml, for five minutes, a few years before, was referred to the glaucoma clinic because of the sensation of a foreign body. Visual acuity was 20/40 and a visual field defect was found in the nasal step pattern. IOP was 11 mmHg. After 19 months, IOP was 4 mmHg, and visual acuity was 20/50 with spontaneous leakage of a necrotic avascular bleb. The avascular necrotic bleb was excised, and the filtering bleb was reconstructed. Seven weeks later, visual acuity was 20/30, and IOP had increased to 12 mmHg.

Two months later, microleakage occurred, and visual acuity and IOP were unchanged. Carbonic anhydrase inhibitors, and a soft bandage contact lens were used. Three months after bleb excision, a corneal bleb occurred (Fig. 1B). Gentamicin eye drop, and a beta blocker were added to induce shrinkage of the corneal bleb. Six months after bleb excision, additional corneal full thickness sutures to the limbus were added to ablate the corneal bleb. The corneal bleb disappeared and the microleaking point was sealed. However, the corneal bleb recurred. Puncture with a 26G needle and Nd: YAG laser was performed. The corneal bleb subsequently disappeared and did not recur. At 16 months after bleb excision, visual acuity was 20/20, and IOP was 14 mmHg. The functioning bleb was stabilized and no necrotic avascular bleb area was found (Fig. 1C).

Case 4
A 62-year-old female patient was presented with primary open angle glaucoma. IOP was 22 mmHg, and the cup to disc ratio was 1.0 in the right eye, and 0.8 in the left eye. Central tunnel vision was found in the visual field of the right eye. Despite maximal medical therapy, IOP was 20 mmHg in the right eye. The patient underwent fornical based trabeculectomy in the right eye; MMC, 0.4 mg/ml, for five minutes. After trabeculectomy, IOP ranged from 10 to 16 mmHg. Thirty months after trabeculectomy, IOP fell to 3 mmHg, and visual acuity was 20/100. The conjunctival bleb was diffuse, large, necrotic and avascular. The lens was opaque. Extracapsular cataract extraction, intraocular lens implantation, bleb excision and fornical conjunctival advancement were performed. After surgery, there was a well formed bleb, IOP ranged from 5 to 8 mmHg, and irritation symptoms disappeared (Fig. 1D). Blepharoptosis occurred immediately postoper-
Fig. 1. Partially avascular bleb 29 months after bleb excision and conjunctival advancement in case 2 (A). Large corneal bleb inducing irritation symptoms occurred after bleb excision and conjunctival advancement in case 3 (B). The corneal bleb has disappeared and the filtering bleb without the avascular bleb area in 16 months after bleb excision and conjunctival advancement in case 3 (C). Filtering bleb after bleb excision and conjunctival advancement in case 4; Immediately after surgery (D), Partially avascular filtering bleb 25 months after surgery (E). Filtering bleb after second filtering surgery in case 5 (F).

Eventually, but it disappeared spontaneously four months after surgery.

The avascular conjunctival area in the bleb partially developed beginning nine months postoperatively. At 25 months postoperatively, IOP was 4 mmHg, visual acuity was 20/30, and there was no leakage from the partially avascular bleb (Fig. 1E).

*Case 5*

A 36-year-old man was referred to the glaucoma clinic due to a traumatic ruptured necrotic avascular bleb of the left eye. The prefiltrational diagnosis was secondary glaucoma due to uveitis. He had received trabeculectomy; MMC 0.2 mg/ml, for three minutes. IOP was 8 mmHg and the anterior chamber was deep with no inflammation. A soft contact lens
**Table 2.** Intraocular pressure of the patients (mmHg)

<table>
<thead>
<tr>
<th>Case No.</th>
<th>BECA</th>
<th>Final follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preoperation (preoperative)</td>
<td>Postoperation (postoperative)*</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>4*</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>33</td>
</tr>
</tbody>
</table>

**BECA:** bleb excision and conjunctival advancement, *:* one month postoperative, #: BECA combined with cataract surgery (ECCE, PCL)

**Table 3.** Corrected visual acuity of the patients

<table>
<thead>
<tr>
<th>Case No.</th>
<th>BECA</th>
<th>Final follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preoperation (preoperative)</td>
<td>Postoperation* (postoperative)*</td>
</tr>
<tr>
<td>1</td>
<td>20/40</td>
<td>20/33</td>
</tr>
<tr>
<td>2</td>
<td>NLP</td>
<td>NLP</td>
</tr>
<tr>
<td>3</td>
<td>20/50</td>
<td>20/70</td>
</tr>
<tr>
<td>4*</td>
<td>20/100</td>
<td>20/40</td>
</tr>
<tr>
<td>5</td>
<td>20/70</td>
<td>20/50</td>
</tr>
</tbody>
</table>

**BECA:** bleb excision and conjunctival advancement, NLP: no light perception, *:* one month postoperative, #: BECA combined with cataract surgery(ECCE, PCL)

and an aqueous suppressant drug had no effect in stopping the leakage. To prevent infection of the bleb, the ruptured necrotic bleb was excised and a fornical conjunctival flap with a relaxing incision was advanced to reconstruct the filtering bleb. Postoperatively the bleb leaking stopped but IOP increased greatly (range, 28-40 mmHg) despite the cutting of one of the three scleral flap sutures and antiglaucoma medication. The patient stopped attending follow-up visits for a few months. Recently he revisited to the glaucoma clinic. IOP was 38 mmHg, and visual acuity was 20/150. He received trabeculectomy with MMC, 0.4 mg/ml, for three minutes. IOP decreased postoperatively, and at three months after second filtering surgery, IOP was 4 mmHg, and visual acuity was 20/100 (Fig. 1F).

**RESULTS**

We studied five eyes from five patients who received glaucoma filtration surgery with topical mitomycin C (MMC), four eyes with trabeculectomy (cases 2-5), and one eye with triple glaucoma surgery (case 1). Table 1 lists the patient characteristics. Three patients underwent trabeculectomy with 0.4 mg/ml MMC for five minutes (cases 2-4), one patient for three minutes (case 1), and one patient (with 0.2 mg/ml) for three minutes (case 5). Their mean age was 36.0±16.2 years (range, 27-64 years). Two patients suffered from primary open angle glaucoma, two from neovascular glaucoma, and one from uveitic glaucoma. The average prefiltrational IOP was 34.4±14.9 mmHg. After filtration surgery, the average IOP was 2.3±1.5 mmHg in the four hypotonic eyes. All of the patients’ blebs were avascular and transparent. The reasons for bleb excision were two spontaneous bleb leaks (cases 1 and 3), two traumatic bleb leaks (cases 2 and 5), and one case of severe irritation (case 4). In one eye, cataract surgery was combined. The average follow-up period was 18.4±8.3 months (range, ten to 29 months). At one month after surgery, the average IOP was 11.3±5.4 mmHg (range, 6-18 mmHg), and at nine months after surgery, 9.5±3.7 mmHg (range,
5-14 mmHg) in four eyes. It went from 28 mmHg to 40 mmHg in one case of uveitis, in which IOP decreased after a second filtering surgery, trabeculectomy with topical MMC.

Postoperative visual improvement was average 4 snellen lines in three eyes.

A corneal bleb occurred in one eye, and was successfully relieved with surgery and laser therapy (case 3). At 6.7 months (range, four to nine months) after bleb excision and conjunctival advancement, a partially avascular bleb recurred in three eyes (case 1, 2, 4). Blepharoptosis, which disappeared spontaneously at four months postoperatively, occurred in one eye (case 4).

**DISCUSSION**

Leakage of a chronically-thinned filtering bleb, a long-term complication, can cause hypotony, a flat anterior chamber, choroidal effusion, macular edema, cataract formation, bleb infection, and endophthalmitis. Prolonged hypotony may cause permanent macular damage and cataract progression. The incidence of bleb leaks has been reported to be 1.3% to 25% of cases after trabeculectomy with adjunctive antimetabolites in various studies, and the reported frequency of hypotony induced maculopathy after trabeculectomy with adjunctive mitomycin C ranges from 1.3% to 7.7%. The likelihood of developing visual loss with hypotony may depend on factors other than intraocular pressure, such as scleral thickness and rigidity, structural variation in the choroid and its vessel, and extraocular muscle tone.

The success rate for the treatment of hypotonic maculopathy, defined as an increase in intraocular pressure to values greater than 6 mmHg, is 90%, when various methods, including autologous blood injection and surgical revision are used.

Surgical management may be needed for hypotony that proves unresponsive to medical therapy and for persistent bleb leaks. Due to the friable nature of the conjunctiva in long established filtering blebs, it is difficult to close the defect directly. Surgical methods have included free conjunctival patches, donor scleral graft patches, free conjunctival autografts, conjunctival flaps, and Tenon’s capsule plugs.

Excision of necrotic blebs, and the advancement of fornical healthy conjunctiva with a relaxing incision, are effective surgical methods to repair bleb leakage and hypotony. In this procedure, the relaxing incision prevents the small, tight bleb which induces filtration failure, and extreme care should be taken not to make a button-hole incision.

In our study, excision of the necrotic bleb and advancement of the fornical conjunctiva was effective in controlling IOP in four out of five eyes without medication. But, in one uveitic eye with glaucoma whose bleb was small, localized postoperative IOP was not controlled, and further filtration surgery was necessary.

After re trabeculectomy with topical MMC, IOP decreased. Postoperative visual acuity improved an average of four snellen lines in three eyes (cases 1, 3, and 4).

Partially avascular blebs recurred in three eyes after 6.7 months (range, four to nine months). However, bleb filtration was well maintained, and complications such as bleb leakage, chronic hypotony, and decreased visual acuity did not appear. Its pathogenesis is not known, but the authors believe that the residual MMC component in the scleral bed is one of the causes of the recurrence of necrotic blebs, as is the case with necrotizing scleritis after pterygium excision with topical MMC.

Corneal bleb developed postoperatively in one eye, and the patient complained of irritation. Visual acuity decreased due to astigmatism. This complication was induced by dissection into the corneal anterior stroma. We successfully ablated this corneal bleb with surgery and laser therapy, including an additional suture at the limbus, laser photodisruption, and aqueous suppressant.

In one eye, postoperative blepharoptosis appeared, which disappeared spontaneously four months postoperatively. This was thought to be related to an incomplete relaxing incision, thus it is very important to make the relaxing incision the appropriate length.

In summary, excision of the necrotic bleb and the advancement of fornical conjunctiva was successful method for IOP control, improving visual acuity for the patients experiencing severe irritation symptoms, leaking blebs, and hypotonic maculopathy
after filtering surgery with MMC.

REFERENCES