Management of the Late Leaking Filtration Blebs.
A Report of Seven Cases and a Selective Review of the Literature

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Purpose: To describe the outcome of various treatment modalities in the management of late bleb leaks after glaucoma filtering surgery (GFS).

Materials and Methods: Seven consecutive patients treated for late bleb leaks (Seidel's positive) between July 1990 and June 1999 were enrolled in the study. The management strategy consisted of initial conservative therapy, and tailored surgery, if necessary. The surgical technique employed was either conjunctival-Tenon's advancement flap, hinged scleral flap, or fistulotomy with direct suturing. The main outcome measures were bleb characteristics and postoperative intraocular pressure (IOP). The secondary outcome measure was visual acuity.

Results: One patient responded to conservative therapy (aqueous suppressants, bandage contact lens) and six patients needed surgery. The successful surgical technique was conjunctival-Tenon's advancement flap in three, hinged scleral flap in two, and fistulotomy-direct suturing to the wound (combined with cataract surgery and intraocular lens implantation) in one patient. The bleb leak stopped in all cases and 5 of the 6 surgical patients sustained functioning filtering blebs. Follow-up ranged from 8 to 56 months (mean = 20 ± 16.2 months). Visual acuity improved to 6/12 or better in 4 cases, 6/36 in 2 cases and it remained at light perception in one case. None of the patients had any intraoperative or postoperative complications.

Conclusions: Late leaking blebs after GFS can be treated successfully. The management decision and selection of surgical technique should be based on the clinical condition.

Key Words: Bleb leak, glaucoma filtering surgery, conjunctival-Tenon's advancement flap, overturning scleral autograft, hinged scleral flap

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Bleb leaks have been recognised as a complication of glaucoma filtering surgery (GFS) ever since Elliot first described the procedure of limbal trephination in 1909.12 Bleb leaks develop more frequently after full-thickness filtering surgery than after trabeculectomy.23 The widespread adjunctive use of antimetabolites such as 5-Fluorouracil (5-FU) and Mitomycin-C (MMC) with trabeculectomy has significantly increased the occurrence of bleb leaks.24 In eyes treated with 5-FU or MMC bleb leaks may occur in as many as 5 - 20% of patients.25-31,33-35 Late bleb leaks may develop months to years after the initial surgical procedure.34-36,21 Complications of leaking bleb include hypotony, shallow or flat anterior chamber, hypotony maculopathy,32 choroidal detachment,33 cataract formation, epithelial downgrowth, chronic inflammation, and filtration bleb failure. A leaking bleb may predispose the patient to infection and endophthalmitis,35,36,38,39 leading to loss of the eye. These complications can be avoided with appropriate management. This article describes the management strategies used in seven late leaking blebs with different treatment modalities.

Materials and Methods

We reviewed the medical records of all patients who underwent therapy for late bleb leaks between July 1990 and June 1999. A total of 7 eyes of 7 patients who underwent therapy for late bleb leaks were included in the study. The diagnosis of bleb leaks was confirmed by a positive Seidel's sign. An individualised approach was used to manage the late bleb leaks.

The first line of therapy was conservative. This consisted of aqueous suppressants like β-adrenergic blocking agent used twice a day in combination with carbonic anhydrase inhibitor. In addition, topical gentamicin was used four
times a day to incite conjunctival inflammation and stimulate healing. A large diameter bandage contact lens (BCL) 18-22 mm in diameter, depending on the location of the leak, was placed on the eye. The BCL was left undisturbed for at least one week to facilitate epithelial healing. Failing this, cyanoacrylate tissue adhesive with large diameter BCL was attempted. When non-surgical methods of bleb leak management failed, one of the following described surgical techniques were performed. The choice of the surgical procedure depended on the location and size of the leak, and the briskness of the aqueous leak, the nature of the conjunctival and scleral tissues adjacent to the leaking bleb. All surgeries were performed by the author after having obtained informed consent from the patients.

Surgical Technique

A. Conjunctival-Tenon's advancement flap

A fornix-based conjunctiva-Tenon flap is made just behind the leaking bleb. The flap is undermined and pulled towards the limbal region to assess closure of the fistulous opening by the flap. Superficial necrotic tissue around the fistulous track is removed and the intensity of leakage assessed. Three double-armed fixation sutures are applied between the Tenon’s capsule and the posterior aspect of the fistulous opening using 8-0 vicryl sutures. A superficial incision is made at the anterior limbal region and debridement of the epithelial lining behind the incision line is performed. Watertight closure is achieved by suturing conjunctiva at the incision with 10-0 nylon suture. Abrasion of the corneal margin helps facilitate the adherence between tissues while fixation sutures at the base of the fistula ensure stability of the conjunctival-Tenon’s flap and prevent postoperative retraction of the flap.

B. Hinged partial thickness scleral flap

An eyelid speculum is placed and a stay suture is passed through the superior rectus muscle insertion to expose the leaking bleb and adjacent area. A fornix-based conjunctival-Tenon flap is dissected just behind the leaking bleb. The site of the fistula is identified. If the fistula is judged to be draining excessively and if hooing by sliding conjunctival-Tenon flap is judged inadequate, a hinged scleral flap is performed. A partial thickness quadrangular scleral flap is raised just behind the leaking fistula. The scleral flap is raised with its attached margin at the posterior border of the leaking fistula. The necrotic tissue around the fistulous opening is debrided and a very superficial incision is made at the anterior limbal region and the epithelial lining is scraped off using a Beaver blade. The partial thickness scleral flap is then turned over and sutured at the anterior limbal region covering the fistula by the superficial surface of the dissected scleral flap. The scleral flap is sutured in place using interrupted 10-0 nylon suture. No sutures are applied on the sides of the scleral flap in anticipation that some filtration would continue to maintain the intraocular pressure (IOP) at a safe level even when the leaking bleb is successfully repaired. The conjunctival flap is sutured to the anterior limbus to create a watertight closure.

Case Reports

Two representative case reports are described below.

Case report 1

A 52-year-old year male (Case 1) presented to the glaucoma department on January 1997 with pain, redness and watering in his right eye. He had been diagnosed to having bleb infection with endophthalmitis. He had absolute glaucoma in the left eye. He had undergone iridencleisis in his right eye 20 years ago with good IOP control and had recorded visual acuity of 6/9 until December, 1996. He developed in the following month acute red eye and reduction in vision. There was bleb infection with 5 mm hypopyon and vitreous exudates. He received intravitreal antibiotics after vitreous tap at the Institute. Subconjunctival antibiotic was also injected. Culture was negative till 7 days of incubation. The patient responded to this treatment regimen and regained visual acuity of 6/9 within a month which was maintained till February 1998. After 3 months, in May 1998, he presented with sudden decrease in vision. The IOP was unrecordably low and Seidel test was positive. The patient was diagnosed to have late bleb leak. A trial of cyanoacrylate tissue adhesive and BCL failed. The patient underwent sliding conjunctiva-Tenon flap for revision of the fistula as described previously (Figure 1).

Case report 2

A 71-year-old male (Case 2) underwent trabeculectomy in the right eye in September, 1988. He underwent extracapsular cataract extraction (ECCE) with posterior chamber intraocular lens (PC IOL) implantation in January 1991. The vision was 6/9. He maintained normal IOP in his right eye without any medication until February 1996, when a routine examination disclosed an IOP of 2 mmHg and a positive Seidel test. An attempt at primary closure of the fistula by cyanoacrylate tissue adhesive and BCL failed. The patient underwent hinged partial thickness scleral flap for revision of the leaking filtering bleb associated with excessively draining fistula 3 weeks later. Postoperatively there were no complications such as retraction of the flap or leakage. At the last follow-up at 36 months, his visual acuity was 6/9, the IOP was 14 mmHg without any medication and the filtration bleb appeared functioning (Figure 2).

Results

Patient data and clinical summaries are presented in Table 1. Six of 7 patients were male, the mean age was 61.4 ± 9.4 years (range, 46-71 years). The interval between filtration surgery and bleb leak ranged from 1.5 years to 16 years (mean 8.7 ± 5.7 years). The primary surgery was thermal sclerostomy in one patient, iridencleisis in 3 patients, trabeculectomy in 2 patients and glaucoma triple procedure in one patient. No patient had a history of adjunctive antimetabolite therapy.

All the patients presented with reduced visual acuity; 3 of them presented with epiphora and intermittent
blurred vision. One patient (Case 1) had history of bleb infection and endophthalmitis, successfully treated with topical and intravitreal antibiotics. All the patients had positive Seidel’s test. The results of therapy are summarised in Table 1. One patient (Case 3) responded to conservative therapy with BCL application for one week. This patient had a pinpoint leak and had undergone a trabeculectomy for chronic angle closure glaucoma (CAGC) by the author 3 years before the diagnosis of bleb leak. This is the only patient on whom the original surgery was performed in the institute; others had been referred to the institute.
### Table 1. Patient demographics and summary of clinical data (7 eyes of 7 patients)

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (Yrs)</th>
<th>Eye</th>
<th>Glaucoma diagnosis</th>
<th>Time from surgery to bleb leakage</th>
<th>Type of glaucoma surgery</th>
<th>Surgery to treat leakage</th>
<th>IOP (mmHg)</th>
<th>VA</th>
<th>Follow-up (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52 M</td>
<td>OD</td>
<td>POAG</td>
<td>15 yrs</td>
<td>Iridencleisis</td>
<td>Conjunctival advancement flap</td>
<td>5</td>
<td>13</td>
<td>20/400 20/30 18</td>
</tr>
<tr>
<td>2</td>
<td>71 M</td>
<td>OD</td>
<td>POAG</td>
<td>7.5 yrs</td>
<td>Trabeculectomy</td>
<td>Hinged partial thickness scleral flap</td>
<td>2</td>
<td>14</td>
<td>20/200 20/25 56</td>
</tr>
<tr>
<td>3</td>
<td>61 M</td>
<td>OD</td>
<td>CACG</td>
<td>3 yrs</td>
<td>Trabeculectomy</td>
<td>Conservative therapy</td>
<td>5</td>
<td>14</td>
<td>20/400 20/40 12</td>
</tr>
<tr>
<td>4</td>
<td>48 F</td>
<td>OD</td>
<td>CACG</td>
<td>12 yrs</td>
<td>Trabeculectomy</td>
<td>Hinged partial thickness scleral flap</td>
<td>0</td>
<td>18</td>
<td>20/100 20/40 20</td>
</tr>
<tr>
<td>5</td>
<td>65 M</td>
<td>OS</td>
<td>POAG</td>
<td>6 yrs</td>
<td>Iridencleisis</td>
<td>Fistulectomy + ECCE + PC IOL &amp; direct suturing</td>
<td>0</td>
<td>12</td>
<td>20/400 20/100 12</td>
</tr>
<tr>
<td>6</td>
<td>64 M</td>
<td>OD</td>
<td>PACG</td>
<td>16 yrs</td>
<td>Iridencleisis</td>
<td>Conjunctival advancement flap</td>
<td>9</td>
<td>20</td>
<td>LP LP 8</td>
</tr>
<tr>
<td>7</td>
<td>71 F</td>
<td>OS</td>
<td>POAG</td>
<td>1.5 yrs</td>
<td>Glaucoma Triple Procedure</td>
<td>Conjunctival advancement flap</td>
<td>2</td>
<td>14</td>
<td>20/400 20/100 17</td>
</tr>
</tbody>
</table>

POAG – Primary open angle glaucoma; PACG – Primary angle closure glaucoma; IOP – Intraocular pressure; VA – Visual acuity; LP – Light perception; ECCE – Extracapsular cataract extraction; CF – Counting fingers

Three patients (Cases 1, 6, 7) received conjunctival-Tenon’s advancement flap, two patients (Cases 2, 4) received hinged partial thickness scleral autograft and one patient (Case 5) needed fistulectomy and direct suturing of the corneo-scleral wound combined with ECCE and PC IOL. The mean IOP at presentation was 3.3 ± 3.2 mmHg (range, 0 to 9 mmHg) and at the last follow-up visit it was 15 ± 2.9 mmHg (range, 12 - 20 mmHg). There was significant visual improvement (6/12 or greater) in 3 patients (Cases 1, 2, 3, 4) and IOP was under control in all patients without any medication. The bleb appearance was satisfactory in all patients except in Case 5. In this eye there was no bleb, but the IOP was under control. The bleb appearance remained unchanged in Case 3; it was managed conservatively. The mean follow-up was 20.4 ± 16.2 months (range: 8 - 56 months).

### Discussion

Late bleb leak is a recognised complication that may occur months or years after initial surgery. Late bleb leak is a recognised complication that may occur months or years after initial surgery. The reported rate of late bleb leakage after glaucoma filtering surgery varies widely. This complication develops more frequently following full-thickness filtration procedures than after trabeculectomies. Bleb leakage is thought to be more frequent in eyes that have received perioperative antifibrotic agents such as 5-FU and MMC. Late onset sequential multifocal bleb leaks as part of the complication after GFS with 5-FU and MMC have also been described.

Interestingly, none of our patients received any antifibrotic agents during or after filtering surgery. This may be related to referral bias. In a series reported by Kosmin and Wishart, two of 8 patients with late filtration bleb leak had adjunctive 5-FU therapy. Wilson and Kotas-Newman had 4 patients with persistent late bleb leaks, of whom 2 had trabeculectomy with 5-FU therapy and 2 had full thickness filtering procedures. Susanna et al. also reported late bleb leaks after trabeculectomy with 5-FU or MMC. In our series of the 7 eyes three had iridencleisis, one had thermal sclerostomy, two had trabeculectomy without any antimetabolite therapy and one eye had glaucoma triple procedure. Similarly, Tomlinson et al. described 11 patients and Buxton et al. reported 5 patients in whom late bleb leaks or thinning occurred without use of any antimetabolite therapy during the primary filtering surgery.

Aqueous humour has lytic properties, and is known to inhibit subconjunctival fibroblasts and its flow through the epithelial track presumably keeps the fibroblasts from growing over to fill the hole, leading to persistent leaking bleb in free filtering surgery. In guarded filtration surgery, the partial thickness scleral flap may get thinner with the passage of time by the lytic properties of the aqueous and may resemble full-thickness filtering surgery which is prone to developing late bleb leaks. It is reasonable to conjecture that the process is further enhanced with the adjunctive antimetabolite therapy.

A variety of treatment modalities have been advocated for management of late leaking filtering blebs. In our series, only one (Case 3) of 7 patients responded to conservative therapy. This consisted of aqueous suppressants, BCL and topical gentamicin therapy. The Seidel’s test was negative after 10 days of treatment.
treatment. The mechanism of conservative therapy has been well established in the literature. Aqueous suppressants decrease production of aqueous humour and reduce bulk flow through the leak thereby allowing epithelial proliferation; BCL facilitates epithelial migration; and topical aminoglycoside (eg, gentamicin) incites mild conjunctival inflammation and stimulates wound healing. The author believes that conservative therapy may help some patients. Indeed, this may even be the sole therapy required as seen in one of our patients. Despite the reservations expressed by Sinnreich et al, conservative treatment should be considered. This includes patching, aqueous suppressants, BCL, collagen shield, glaucoma tamponade shell and symblepharon ring.

Tissue adhesive is a valuable non-surgical adjunct in the management of late leaking blebs. The use of autologous fibrin tissue glue has also been reported to successfully seal both early and late postoperative bleb leaks. Other modalities include injection of autologous blood and a variety of laser therapies. Cyanocrylate tissue adhesives were tried in 4 of our cases (Cases 1, 2, 4, 5), but were not successful.

Surgical repair of late bleb leak is a more definitive therapy. We used conjunctivo-Tenon’s flap and hinged partial thickness scleral flaps in the majority of our cases; fistulectomy and the leaking site was directly sutured in one patient. There have been several successful reports of rotational or sliding conjunctival Tenon’s flap to cover the previous filtration site. O’Connor et al described a method of repairing leaking blebs by mobilising conjunctival-Tenon’s fascia using large horizontal relaxing incisions at the junction of the palpebral and bulbar conjunctiva. The posterior margin of the Tenon’s and the conjunctiva were tacked in the sclera using interrupted 9-0 polygalactin (vicryl) sutures.

In two cases (Cases 2 and 4), hinged partial thickness scleral flap was performed as the size of the leak was large and the aqueous leakage was brisk and the adjacent conjunctival and scleral tissue were healthy. The partial thickness scleral flap was overturned and secured tightly to limit flow of aqueous past its anterior margins, but no suture was applied on the lateral boundaries, simulating a trabeculectomy with a well guarded sclerostomy. As expected, IOP was controlled without any medication and the bleb appearance was satisfactory in both cases. If the scleral flap had been sewn down on the sides, the scleral flap would have closed the sclerostomy, causing flattening of the bleb leading to an increase in IOP. Singh et al reported they have used this technique, but were not successful.

Scleral patch graft is a good surgical alternative in difficult situations. There have been several successful reports of donor scleral patch graft using both full thickness and partial thickness sclera. Preserved and processed cadaver tissues such as fascia lata, pericardium and meninges may also proven suitable for patch graft in excessively draining fistulas. Fascia lata is an effective, safe and inexpensive alternative to alcohol-preserved donor sclera. However, glycerine preserved donor sclera (not alcohol preserved donor sclera) has the added risk of viral infection transmission. Full thickness corneal allografts have been used to seal persistent limbal wound leaks and half-thickness stromal corneal patch graft has been used for an incompetent scleral flap following trabeculectomy. Morris et al recently reported the use of autologous Tenon’s capsule and partial thickness scleral patch graft for revision of excessively draining fistulas with leaking filtering blebs. In their first case, a piece of Tenon’s tissue was dissected away from the adjacent sclera leaving a pedicle attachment butting the fistula site. The Tenon’s flap was rotated and sutured to close the fistulas and the conjunctival flap was sutured at the anterior limbus. In the second case, a 2.5 x 2mm rectangular 1/3 thickness sclera was dissected from an adjacent area approximately 3 - 4mm super temporally to the fistula and sutured in place over the fistula using interrupted 10-0 nylon sutures. This technique requires a relatively larger incision and extensive scleral dissection. Our technique in Cases 2 and 4 required less dissection and Tenon’s manipulation as this scleral flap was dissected just behind the site of the fistula. Overturning of the attached flap also required fewer sutures as the anterior end of the flap was sutured at the limbus. We feel the technique described in the present study is simple and easier to perform. The Morris technique is suitable when the adjacent sclera is friable following use of antimitabolites like MMC.

The autologous hinged scleral flap or patch graft may be difficult to obtain in repair of bleb leaks associated with thin-walled exuberant filtering blebs spread over a wide area as seen in MMC – augmented trabeculectomy. In such situations, full thickness and partial thickness donor sclera, pericardium, meninges and fascia lata may prove to be useful for patch grafting, and the hooing can be made by free conjunctival autograft from the same or contralateral eye. Recently, Budenz et al reported conjunctival advancement as a successful procedure for closing late-onset filtering bleb leaks. In their series, 22 of 26 eyes had MMC and one eye had 5-FU application at primary surgery. In our series, cases 1, 6 and 7 were managed by conjunctival advancement flap. No patient had received adjunctive antimetabolite therapy in primary surgery in our cases.

One patient (Case 5) with a pin-point leak presented 6 years after iridencleisis. He had a significant cataract, which was managed by fistulectomy combined with ECCE - PC IOL and direct suturing of cataract surgery wound along with closure of the fistula. The visual acuity improved from counting fingers at 2 meters to 6/26. This
Table 2. Summary of the reports evaluating different surgical techniques of repair of bleb leaks and limbal wounds

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Authors</th>
<th>Year of Publication</th>
<th>Surgical technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fitzgerald &amp; McCarthy⁵⁵</td>
<td>1962</td>
<td>Rectangular flap of Tenon's capsule rotated trap door fashion</td>
</tr>
<tr>
<td>2.</td>
<td>Illiff⁷⁴</td>
<td>1964</td>
<td>Conjunctival tissues patch after iodine cautery</td>
</tr>
<tr>
<td>3.</td>
<td>Maumenee⁷³</td>
<td>1964</td>
<td>Direct closure with sutures for epithelial down growth</td>
</tr>
<tr>
<td>4.</td>
<td>Sugar⁷⁴</td>
<td>1967</td>
<td>Thick conjunctival Tenon's flap, Tenon's capsule plugging</td>
</tr>
<tr>
<td>5.</td>
<td>Cohen et al⁷²</td>
<td>1977</td>
<td>Excision of the leaking bleb with conjunctiva and Tenon's flap</td>
</tr>
<tr>
<td>6.</td>
<td>Galin &amp; Hung⁷⁹</td>
<td>1977</td>
<td>Conjunctival flap alone or combined with Tenon's fascia</td>
</tr>
<tr>
<td>7.</td>
<td>Sinnreich et al⁹⁹</td>
<td>1978</td>
<td>Free conjunctival grafts or conjunctival flap</td>
</tr>
<tr>
<td>8.</td>
<td>Petersson &amp; Fraunfelder⁶⁰</td>
<td>1979</td>
<td>Direct closure using delicate atraumatic needle</td>
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<tr>
<td>9.</td>
<td>Tomilson et al⁶⁵</td>
<td>1987</td>
<td>Mattress sutures to close conjunctival defects</td>
</tr>
<tr>
<td>10.</td>
<td>Soong et al⁶⁸</td>
<td>1988</td>
<td>Full thickness corneal allograft for persistent limbal wound leaks</td>
</tr>
<tr>
<td>11.</td>
<td>Hyams⁷⁸</td>
<td>1988</td>
<td>Bleb excision with scleral and conjunctival flap</td>
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<tr>
<td>12.</td>
<td>Melamed et al⁷⁰</td>
<td>1991</td>
<td>Glycerine preserved full-thickness donor scleral patch graft</td>
</tr>
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<td>13.</td>
<td>O'Connor⁷⁵</td>
<td>1992</td>
<td>Conjunctival and Tenon's flap with relaxing incision at fornix</td>
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<tr>
<td>14.</td>
<td>Clune et al⁶⁴</td>
<td>1993</td>
<td>Absolute alcohol preserved partial thickness sclera patch graft</td>
</tr>
<tr>
<td>15.</td>
<td>Buxton et al⁶⁶</td>
<td>1994</td>
<td>Free conjunctival autografts</td>
</tr>
<tr>
<td>17.</td>
<td>Singh et al⁸¹</td>
<td>1995</td>
<td>Hinged partial thickness scleral flap</td>
</tr>
<tr>
<td>19.</td>
<td>Hughes et al⁸⁵</td>
<td>1996</td>
<td>Facia lata patch graft</td>
</tr>
<tr>
<td>20.</td>
<td>Rumelt &amp; Rehany⁷⁹</td>
<td>1996</td>
<td>Partial thickness corneal stromal allograft</td>
</tr>
<tr>
<td>22.</td>
<td>Morris et al⁷⁰</td>
<td>1998</td>
<td>Autologous Tenon's capsule and partial thickness scleral patch graft</td>
</tr>
<tr>
<td>23.</td>
<td>Budenz et al⁷¹</td>
<td>1999</td>
<td>Conjunctival advancement flap</td>
</tr>
<tr>
<td>24.</td>
<td>Sekhar⁷⁶</td>
<td>2000</td>
<td>Direct suturing, scleral flap/graft, autologous fascia lata graft</td>
</tr>
<tr>
<td>25.</td>
<td>La Borwit et al⁷⁶</td>
<td>2000</td>
<td>Direct closure, free grafts</td>
</tr>
<tr>
<td>26.</td>
<td>Harris et al⁷⁷</td>
<td>2000</td>
<td>Autologous conjunctival resurfacing</td>
</tr>
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<td>27.</td>
<td>Wadhwa et al⁸⁰</td>
<td>2000</td>
<td>Pedicle flap, advancement or free conjunctival autografts</td>
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<tr>
<td>28.</td>
<td>Mandal (Present study)</td>
<td></td>
<td>Hinged scleral flap, conjunctival advancement flap, direct suturing</td>
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</tbody>
</table>

Patient had glaucomatous disc damage. There were no high IOP spikes, but the patient had 12 months' follow-up only. To my knowledge, this is the first reported case of late leaking bleb, wherein repair of the bleb and cataract surgery was performed in a single operative session. Clune et al⁶⁴ has reported a patient in whom cataract extraction with IOL implantation was performed in addition to revision of an exuberant non-leaking filtering bleb. This patient had hypotony maculopathy and complicated cataract following trabeculectomy with MMC. In suitable cases, cataract surgery and IOL implantation can be combined with repair of the leaking bleb in the absence of bleb infection.

All 7 patients in our series had successful restoration of leaking bleb. Six of the 7 patients underwent repair of the leaking bleb, and all sustained functioning filtering blebs. The technique described in the present study using conjunctival Tenon's advancement flap or hinged partial thickness scleral flap or autograft should be considered in cases where the leaking bleb is to be managed surgically. The literature report of surgical techniques for bleb repair and revision of bleb are summarised in Table 2. The choice of surgical approach should depend on site or size of leaking fistula, briskness of leakage, health of adjacent sclera or conjunctiva, and availability of donor tissues from eye banks or commercial sources.
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2. Elliot RA. Sclero-Corneal Trephining in the Operative Treatment Of Glaucoma. New York: Paul B. Hoeber;1914.


