

FIVE POINTERS ON BLEB LEAKS

Strategies for proper detection and successful management.



BY GEORGES M. DURR, MD, FRCSC

Bleb leaks are part of all surgical glaucoma practices, and they can occur after any filtering surgery, during both the early and late postoperative periods. Because these leaks can lead to serious complications, proper detection and successful management are paramount. This article provides an overview of the differences between early and late bleb leaks and discusses when conservative or surgical management is warranted.

1. KNOW YOUR LEAKS

Bleb leaks have a reported incidence of up to 18%¹ and can be classified as *early* (< 1 month) or *late*. Risk factors for early leaks include age, ocular inflammatory disease, a prior history of incisional surgery, long-term use of eye drops, surgical technique, and type of conjunctival flap used.² Trabeculectomy involves the creation of either a fornix-based or limbus-based conjunctival flap, the first of which is more commonly performed. Fornix-based flaps, however, are at higher risk of leaking at the limbus. With either technique, watertight conjunctival closure is essential to preventing early leaks.

Early leaks may also occur along the suture tracks depending on the needle used, the amount of tension on the conjunctiva, the amount of tension placed on the suture during

tying, how thin the conjunctival tissue is, and whether Tenon capsule is used to close the incision in one or two planes.² If drawn forward, Tenon capsule can act as an extra layer of protection against leaks. Some surgeons, however, believe that this approach increases resistance over the scleral flap, thereby hindering flow, and thus they prefer to perform a tenectomy.

Late leaks after filtering surgery began to be reported after surgeons started using antifibrotic agents such as mitomycin C (MMC) and 5-fluorouracil during the procedure.³ Certain factors related to the use of these antifibrotic agents may increase the risk of leaks, such as the concentration and amount of the antifibrotic agent and the location of its application. Additional antimetabolites may be applied to eyes that require needling after surgery, and this may also increase the risk of late leaks.

One of the main reasons to address late leaks is to reduce the risk of infection. The conjunctiva and sclera are the main barriers to intraocular infection from indigenous bacteria. A disruption of the conjunctiva allows these bacteria to travel from the ocular surface into the bleb and, ultimately, into the anterior chamber and vitreous. Several studies have shown a higher risk of blebitis and endophthalmitis with a late-onset bleb leak.^{4,5}

2. IDENTIFY THE SIGNS OF A LEAK

Whether a patient's IOP is normal or low, glaucoma surgeons often look for a bleb leak in the immediate postoperative period. If the leak is slow, the IOP can be relatively normal. Conversely, even if the IOP is nearly zero, a visible leak may not be present, and the surgeon may need to apply gentle pressure on the globe to identify the

AT A GLANCE

- ▶ Bleb leaks are part of all surgical glaucoma practices and can occur after any filtering surgery, during both the early and late postoperative periods.
- ▶ Because bleb leaks can lead to serious complications, proper detection and successful management are paramount.
- ▶ Patients with bleb leaks require close monitoring, as these blebs are at higher risk of failing.

Seidel-positive area. The appearance of the bleb is also important to determining if a leak is present. In our practice, a Seidel test is performed routinely during the early postoperative phases and periodically for patients with more mature blebs that have areas of avascularity.

3. PURSUE CONSERVATIVE MANAGEMENT

Early leaks can sometimes be managed conservatively. If the leak is at the limbus, a bandage contact lens can be applied.⁶ The use of a compression patch, which decreases flow through the bleb, can also help treat a leak in the early postoperative period.

In the setting of a bleb leak, postoperative medications can be altered. Nonsteroidal antiinflammatory drugs (if in use) should be stopped, and steroids can be reduced because they delay necessary wound healing. Surgeons can consider prescribing tobramycin or gentamicin, which induce scarring, and oral doxycycline (20 mg/day) in the early postoperative period. Doxycycline has antiinflammatory and anticollagenolytic properties due to inhibiting matrix metalloproteinase activity.⁷ All of these conservative methods either promote inflammation or limit aqueous flow to the bleb, both of which increase scarring in order to seal the leak.

4. MOVE TO SURGICAL MANAGEMENT

An early leak that is unresponsive to conservative management may require surgical intervention to reduce the risk of blebitis.⁸ Suture track leaks or limbal leaks can be managed by sutures placed at the area of the leak or use of normal adjacent conjunctival tissue to cover the bleb. These approaches can be quite straightforward when utilized early in the postoperative phase. As the tissue contracts and fibroses, closure becomes more challenging.

For late leaks, several surgical strategies are available. Overall, the gold standard is revision of the surgical site with conjunctival advancement or

a rotational conjunctival flap with or without the use of a relaxing incision. The choice of conjunctival advancement or rotational flaps depends on the health of the tissue surrounding the bleb. Basic plastic principles are used to create a flap to cover the defect. The surgeon should aim to loosen the tissue as much as possible and may need to dissect broadly to recruit healthy conjunctiva. If the conjunctiva posterior to the bleb is inaccessible or is of poor quality, a rotational flap can provide excellent neighboring conjunctiva while maintaining its vascular supply. Additional relaxing incisions can be performed posteriorly, as needed, to further loosen the conjunctiva and allow it to be carried forward. These incisions are created about 12 mm from the limbus, through the conjunctiva, leaving Tenon capsule intact.

Tenon capsule management and/or the use of a scleral graft is important to ensure an adequate seal. If sclera is needed, the surgeon can try to drape the previous sclerostomy site while avoiding too much tissue elevation and the risk of creating a corneal dellen. If a large area of superior conjunctiva is scarred or avascular, the surgeon may need to use a free conjunctival flap from an area of healthy tissue. Free flaps can be challenging due to the risk of flap necrosis from an absence of vascular supply to the graft. Recruiting an area of healthy tissue in one of the inferior quadrants may preclude or hamper further glaucoma surgery in that quadrant. In general, the problem with any bleb revision is that it may cause the bleb to fail and result in uncontrolled IOP.

Other management options discussed in the literature include needling of bleb leaks to redistribute aqueous flow, injection of autologous blood to promote scarring,⁹ placement of amniotic membranes,¹⁰ and CXL.¹¹ Early experience with CXL has shown promising results, especially for sweaty blebs and blebs with slow leaks.

5. MONITOR PATIENTS CLOSELY

Patients with bleb leaks require close monitoring. These blebs are at higher risk of failing, so surgeons should strive to ensure that the leaks are fully sealed and consider earlier needling if the eyes are still amenable. Some patients may require a second glaucoma surgery at the time of the revision or shortly afterward to prevent significant IOP spikes and glaucomatous progression.

CONCLUSION

Bleb leaks are complex problems. The best way to avoid them, in the future, is through improvement in surgical techniques, new innovations, and optimization of antimetabolite use. As long as filtering surgery is performed, however, surgeons will continue to encounter bleb leaks. Careful examinations, thoughtful planning, and out-of-the-box thinking are therefore key to their repair and permanent treatment. ■

1. Edmunds B, Thompson JR, Salmon JF, Wormald RP. The National Survey of Trabeculectomy. III. Early and late complications. *Eye (Lond)*. 2002;16(3):297-303.
2. Parrish RK 2nd, Schiffman JC, Feuer WJ, Heuer DK; Fluorouracil Filtering Surgery Study Group. Prognosis and risk factors for early postoperative wound leaks after trabeculectomy with and without 5-fluorouracil. *Am J Ophthalmol*. 2001;132(5):633-640.
3. Belyea DA, Dan JA, Stamper RL, Lieberman MF, Spencer WH. Late onset of sequential multifocal bleb leaks after glaucoma filtration surgery with 5-fluorouracil and mitomycin C. *Am J Ophthalmol*. 1997;124(1):40-45.
4. Soltan JB, Rothman RF, Budenz DL, et al. Risk factors for glaucoma filtering bleb infections. *Arch Ophthalmol*. 2000;118(3):338-342.
5. Sugimoto Y, Mochizuki H, Ohkubo S, Higashide T, Sugiyama K, Kiuchi Y. Intraocular pressure outcomes and risk factors for failure in the Collaborative Bleb-Related Infection Incidence and Treatment Study. *Ophthalmology*. 2015;122(11):2223-2233.
6. Gollakota S, Garudadri CS, Mohamed A, Senthil S. Intermediate term outcomes of early posttrabeculectomy bleb leaks managed by large diameter soft bandage contact lens. *J Glaucoma*. 2017;26(9):816-821.
7. Kiranmaye T, Garudadri CS, Senthil S. Role of oral doxycycline and large diameter bandage contact lens in the management of early post-trabeculectomy bleb leak. *BMJ Case Rep*. 2014;2014.
8. Burnstein AL, WuDunn D, Knotts SL, Catoira Y, Cantor LB. Conjunctival advancement versus nonincisional treatment for late-onset glaucoma filtering bleb leaks. *Ophthalmology*. 2002;109(1):71-75.
9. Burnstein A, WuDunn D, Ishii Y, Jonescu-Cuypers C, Cantor LB. Autologous blood injection for late-onset filtering bleb leak. *Am J Ophthalmol*. 2001;132(1):36-40.
10. Rauscher FM, Barton K, Budenz DL, Feuer WJ, Tseng SC. Long-term outcomes of amniotic membrane transplantation for repair of leaking glaucoma filtering blebs. *Am J Ophthalmol*. 2007;143(6):1052-1054.
11. Choy BN, Zhu MM, Shum JW, et al. Collagen crosslinking in the management of leaking cystic blebs: a prospective study. *Graefes Arch Clin Exp Ophthalmol*. 2016;254(3):529-533.

GEORGES M. DURR, MD, FRCS

- Centre Hospitalier Universitaire de Montréal
- University of Montreal, Canada
- georgesdurr@gmail.com
- Financial disclosure: None