

# Autologous blood injection: alternative treatment for bleb leak

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## Abstract

*Background:* To report a case of post-glaucoma drainage device (GDD) surgery with multiple small conjunctival defects treated with autologous blood injection.

*Case presentation:* A 28-year-old female with a history of juvenile open-angle glaucoma who had undergone multiple glaucoma surgeries with antimetabolite injections for uncontrolled intraocular pressure (IOP) of the left eye since 2006 underwent Baerveldt glaucoma implantation in 2017. One year postoperatively, she experienced persistent hypotony, which could not be resolved with a scleral bandage contact lens. Ocular examination revealed visual acuity of 6/9 and IOP of 8 mmHg. Multiple leakage points were identified with fluorescein at the junction between the plate and the tube. Subconjunctival injection of 1 ml autologous blood was administered near the conjunctival defects. Five months postoperatively, the leakage was sealed with IOP of 12 mmHg.

*Conclusion:* Autologous blood injection can be used as an alternative procedure for treating leaking blebs after a GDD surgery.

*Keywords:* autologous blood injection, bleb leak, glaucoma drainage device, glaucoma implant

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# Suntikan darah autologous: rawatan alternatif untuk kebocoran bleb

## Abstrak

*Latar belakang:* Melaporan satu kes kebocoran pada bahagian konjunktiva selepas pemasangan alat saliran glaukoma (glaucoma drainage device (GDD)) yang berjaya dirawat menggunakan suntikan darah autologous.

*Pembentangan case:* Seorang wanita berumur 28 tahun dengan sejarah glaukoma sudut terbuka juvana telah menjalani beberapa pembedahan glaukoma dengan suntikan antimetabolit bagi mengawal tekanan intraokular mata kiri sejak 2006 dan telah menjalani implantasi Baerveldt GDD pada 2017. Satu tahun selepas pembedahan, dia mengalami hipotoni yang berterusan dan tidak berjaya dirawat dengan kanta sentuh pembalut skleral. Pemeriksaan mata mendapati ketajaman penglihatan pesakit adalah 6/9 dengan tekanan mata 8 mmHg. Beberapa titik kebocoran dikenal pasti di persimpangan antara plat dan tiub menggunakan fluorescein. Suntikan subkonjunktival darah autologous sebanyak 1ml telah disuntik pada bahagian yang hampir kepada kawasan mengalami kebocoran konjunktiva. Lima bulan selepas suntikan, tiada lagi kebocoran dengan tekanan intraokular 12 mmHg.

*Kesimpulan:* Suntikan darah autologous boleh digunakan sebagai prosedur alternatif untuk merawat bleb yang bocor selepas pembedahan pemasangan alat saliran glaukoma.

*Kata kunci:* alat saliran glaukoma, kebocoran bleb, pembedahan implantasi glaukoma, suntikan darah autologous

## Introduction

Glaucoma drainage devices (GDDs) are surgically implanted devices designed to drain aqueous humour from the anterior chamber through a long tube by its absorption into the tissues around the eye.<sup>1</sup> The leakage of aqueous from a filtration bleb is a rare complication after GDD surgery. The tube versus trabeculectomy (TVT) study showed only one case (1%) of wound leak.<sup>2</sup>

Bleb leaks can result in a series of issues, including a flat anterior chamber, cataract, corneal decompensation, synechiae, choroidal effusions, macular oedema, and endophthalmitis, if left untreated.<sup>3</sup> Although endophthalmitis is a rare complication after GDD surgery, it can lead to significant vision loss.<sup>3</sup> Furthermore, the use of antifibrotic agents in glaucoma filtration surgery has led to an increase in the incidence of spontaneous bleb leaks due to the formation of extremely

thin, avascular blebs, and the highest risk was observed in those who received mitomycin-C (MMC) in comparison to 5-fluorouracil (5-FU).<sup>3</sup>

Bleb leaks can be managed conservatively by using aqueous suppressants such as carbonic anhydrase inhibitors and beta blockers. Pressure patching can be applied because it reduces eye and lid movement. Bandage contact lenses and collagen shields have also been used in bleb leaks.<sup>3</sup> When these methods fail, surgical repair is the definitive treatment to cover the conjunctival defect.<sup>3</sup> This can be done by transplanting or advancing healthy tissue from the conjunctiva, sclera, or amniotic membrane.<sup>3</sup>

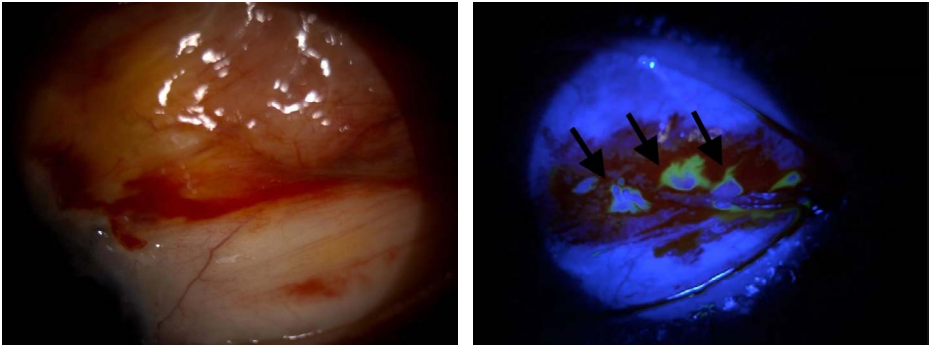
Another treatment modality is autologous blood injections, wherein fibrin and erythrocytes can obstruct the fluid flow through defects, with plasma proteins diffusing to the defect and a subsequent cross-linking of the coagulating factors sealing the leak.<sup>4</sup> Autologous blood injections have been used to treat both overfiltering and leaking blebs.<sup>5</sup> This technique has been described as a safe procedure with fewer complications.<sup>5</sup> A small sample size of 10 patients who received autologous blood injections in Choudhri *et al.*<sup>6</sup> showed the average intraocular pressure (IOP) after autologous blood injection increased from  $4.3 \pm 2.5$  mmHg to  $6.4 \pm 5.1$  mmHg on the final visit, but this was statistically insignificant.<sup>6</sup> Another study done by Leen and associates showed a significant increase in IOP and visual acuity in 7 out of 12 eyes by a mean of  $5.1 \pm 2.9$  mmHg and  $5.3 \pm 2.1$  lines.<sup>4</sup>

We report a case of a young patient with multiple glaucoma surgeries for uncontrolled IOP who presented with multiple small conjunctival defects that were treated with autologous blood injection.

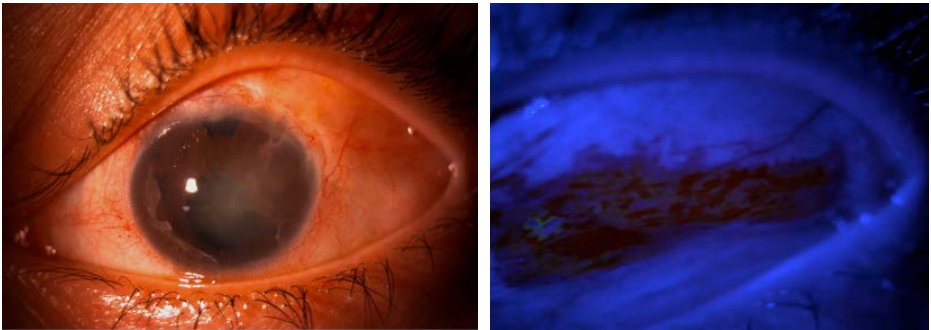
## Case presentation

A 28-year-old female with a history of juvenile open-angle glaucoma had undergone multiple surgeries since 2006 for uncontrolled glaucoma in the left eye. The right eye had been enucleated for painful absolute glaucoma in 2015. Baseline IOP in the left eye was 38 mmHg. She initially underwent trabeculectomy with adjunctive 0.03% MMC applied into the conjunctival flap for 3 minutes, followed by a trabeculectomy revision and 5-FU a year later. Multiple needlings with subconjunctival 5-FU injection were administered and antiglaucoma medications were restarted, but IOP was still not under control.

The patient underwent 101-350 Baerveldt glaucoma tube implantation in 2017. The tube lumen was stented with prolene 4-0 and the tube was ligated with vicryl 7-0. MMC was not used during GDD implantation. Extensive superior fibrosis over the previous trabeculectomy site was noted intraoperatively. On day 2 postoperative, a slow leak was noted, but the leakage sealed completely after 3 weeks with IOP of 19 mmHg. Multiple leaking points were found at 4 months postoperative, followed by persistent hypotony for 1 year with IOP ranging between 6 and 9 mmHg. The leaks



*Fig. 1.* Superotemporal conjunctiva of the left eye 1-week post-autologous blood injection. (Left) Subconjunctival haemorrhage surrounding the bleb area. (Right) Multiple slow leaks at the junction between the plate and the tube shown with black arrows.



*Fig. 2.* Superotemporal conjunctiva 5 months post-autologous blood injection. (Left) White conjunctiva with resolved subconjunctival haemorrhage. (Right) Presence of minimal transconjunctival aqueous flow or “bleb sweating” at the junction between the plate and the tube.

could not be resolved with a scleral bandage contact lens, leading to the diagnosis of late postoperative leak with chronic hypotony.

Ocular examination revealed visual acuity of 6/9 and IOP of 8 mmHg in the left eye. The conjunctiva was mildly injected. The Baerveldt tube and plate were placed 10 mm from the limbus, with the elevated bleb seen above the implant. There was no exposed plate noted. Multiple leakage points were identified with fluorescein at the junction between the plate and the tube (Fig. 1). Eccentric central corneal opacity was observed due to the tube touching the cornea endothelium with a moderately deep anterior chamber and no cell activity. Peripheral anterior synechiae were present from 6 to 9 o'clock, and the pupil was round and reactive. Fundus examination revealed a pale optic disc with a cup-to-disc ratio of 0.9 with no sign of choroidal detachment or ocular hypotony.

The patient underwent a subconjunctival injection of 1 ml autologous blood near the conjunctival defects under topical anaesthesia. The left eye was anesthetized with proparacaine hydrochloride 0.5%. The area was then cleaned with povidone-iodine 5% and draped with a sterile eye surgical towel. A sterile lid speculum was placed on the eye. The antecubital fossa was cleaned with alcohol swabs and povidone-iodine 5%, and approximately 1 ml of venous blood was withdrawn in a 1 cc syringe. A 30-gauge needle was placed on a 1 cc syringe for injection of 0.5 to 0.75 ml of unclotted blood into the subconjunctival area near the defects. Antibiotic ointment and an ocular patch were then applied. Postoperatively, the patient was prescribed chloramphenicol ointment QID. At 5 months postoperative, the leakage was sealed (Fig. 2) with an IOP of 12 mmHg.

## Discussion

A GDD is a drainage implant that is inserted under the conjunctiva to create an alternative pathway for aqueous humour from the anterior chamber, wherein a fibrous capsule forms around the reservoir for approximately 1 month after surgery.<sup>1</sup> GDDs can be associated with various postoperative complications such as hypotony, suprachoroidal haemorrhage, infections, valve malfunctions, and tube erosion, which increase the risk of endophthalmitis and strabismus that result from fibrosis around the surrounding muscle and corneal decompensation.<sup>3</sup>

Hypotony secondary to leaking bleb after GDD surgery is uncommon, but it is important to understand the treatments available to prevent further complications.<sup>3</sup> A serious complication such as endophthalmitis can happen as a result of the direct communication between the anterior chamber and the ocular surface.<sup>3</sup> Leaking blebs can be divided into early, occurring within 3 months of surgery, and late, occurring from 3 three months postoperatively.<sup>3</sup> Early postoperative bleb leaks are usually related to surgical trauma to the conjunctiva or inadequate conjunctival closure and can be avoided by careful and meticulous surgical technique.<sup>7</sup> Late-onset leaks are typically associated with thin, cystic, avascular blebs and occur months to years after surgery.<sup>7</sup>

It is believed that the use of augmenting antimetabolites such as MMC and 5-FU may further increase the risk of bleb leaks.<sup>2,4</sup> This was observed in our patient, who had a late-onset bleb leak 1 year post-Baerveldt tube implantation. She had received multiple antimetabolites at the bleb area, resulting in conjunctival thinning that predisposed the patient to persistent hypotony for more than 12 months with multiple small conjunctival defects. Conservative management failed to seal the leak. Post-autologous blood injection, IOP increased to 10–13 mmHg. The leakage was completely sealed after 5 months, especially in the surrounding area containing the blood. It is believed that red cells can slowly trigger fibroblastic transformation, which remains under the bleb for weeks or more.<sup>4</sup>

The management of late-onset bleb leaks can be divided into two categories: conservative and surgical.<sup>3,8</sup> Conservative treatments include medications or the use of therapeutic bandage contact lenses, application of cryotherapy or laser therapy, and autologous serum eye drops.<sup>3,8</sup> These methods can mechanically close the leak and induce a wound healing process.<sup>3,8</sup> A bandage contact lens can be applied for small leaks at the limbus.<sup>9</sup> However, bandage contact lenses do not act well on dry eyes, and standard contact lenses, with a usual diameter of 14 mm, can cause erosive damage to the bleb.<sup>9</sup> This latter method can lead to blebitis and endophthalmitis.<sup>9</sup>

Lynch *et al.* reported the efficacy of Nd:YAG laser to treat overfiltering and leaking blebs, but the long term success after 4 years was unsatisfactory.<sup>8</sup> This laser technique can also cause complications such as iatrogenic leaks, transient IOP spikes, corneal oedema, bleb pigmentation, pupil peaking, and late recurrences.<sup>8</sup> Another type of laser is the argon laser, which causes focal thermal damage and shrinkage of the conjunctiva.<sup>8,10</sup> Argon laser therapy has shown successful results in sealing the leaks requiring dyeing of the ischemic bleb with the use of large spot size, but this technique has not been universally accepted as it has not gained widespread use.<sup>8</sup>

When conservative treatments fail to seal the leaks, patients may require surgical intervention to prevent further complications. Surgical revision of late-onset bleb leak usually attempts to cover the blebs with various membranes such as conjunctiva-Tenon's flap, scleral patch graft, or amniotic membrane transplant.<sup>8,11</sup> A conjunctival-Tenon's flap has a long-term success rate for small blebs wherein the healthy conjunctiva is incised at the limbus and posteriorly and laterally.<sup>8</sup> A scleral patch graft is another alternative method.<sup>8</sup> The fragility of the conjunctiva after surgery may further increase the risk of bleb failure.<sup>8</sup> Amniotic membrane has also been used to cover and preserve leaking blebs; due to its antimicrobial activity, it causes less risk of infection and is easy to obtain.<sup>12</sup>

This was the first reported case of autologous blood injection in post-GDD surgery in Malaysia. It was hypothesized that fibrin and red cells would obstruct the fluid flow in the bleb and remain under the bleb for a few weeks.<sup>13</sup> At the same time, the blood cells can cause a fibroblastic transformation to replace inactivated Tenon capsule cells.<sup>13</sup> Few studies have shown an improvement of vision post autologous blood injection.<sup>13,6</sup> In the study done by Smith *et al.*, four of six eyes were leak-free and able to maintain IOP between 8 and 12 mmHg with no further complications.<sup>13</sup> In our patient, we opted to use autologous blood injection as the patient showed multiple small defects at the junction between the plate and the tube. This method is cheap, easily available, and safer since we utilized the patient's own blood. Furthermore, autologous blood injection enhances the healing process while maintaining bleb function.<sup>4,13</sup> It is believed that the whole blood, which consists of erythrocytes, leukocytes, white blood cells, and some clotting factors, can promote healing.<sup>13</sup> Bleb leakage was shown to be sealed 5 months after surgery and IOP remained stable until then.

## Conclusion

Autologous blood injection can be used as an alternative procedure in treating leaking bleb after GDD surgery.

## Declarations

### Consent for publication

The patient has given informed consent for publication of the clinical data and images contained in this case report.

### Competing interests

None to declare.

### Funding

None to declare.

### Acknowledgements

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