CASE REPORT

Baerveldt–Baerveldt Apposition: A New Surgical Technique to Salvage Obstructed Glaucoma Drainage Tubes

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Abstract

Aim: Glaucoma drainage device (GDD) failure is usually rectified by the replacement of the entire device or using a tube extender, both of which were associated with postoperative complications. To minimize these risks, we developed a technique to replace the failing section of a tube while keeping the filtration plate in place, and without resorting to an extender clip.

Background: We describe the case of a 69-year-old man, whose left posttraumatic glaucoma was initially treated with a XEN-augmented Baerveldt procedure. Following recurrent obstructions, a kinked section of the Baerveldt tube was sectioned and replaced.

Technique: After sectioning the blocked section of the tube, a new Baerveldt tube was inserted into the anterior chamber. Its filtration plate was removed, and the posterior end of the new tube was connected to the anterior end of the existing device so that both lumens would be continuous. The adjoining tubes were stitched to each other with two 8-0 nylon sutures passing through the walls of the tubes. An allograft patch was replaced over the tubes and the conjunctival fornix was closed. Intraocular pressure (IOP) normalized immediately after surgery and remained stable through 6 months.

Conclusion: This surgical approach offers a new way to salvage a failing Baerveldt tube without replacing the filtration plate, repeating a complete surgery, or potentially compromising the conjunctiva with an extender. The minimal residual gap at the junction between the tubes appears to provide the same additional IOP-lowering effect as the "venting slits" that are sometimes performed to minimize the initial hypertensive phase without causing hypotony.

Clinical significance: This report illustrates a simple yet effective technique to replace the failing section of a GDD or lengthen a short GDD without replacing the entire device or using an extender clip, and thus minimizing the risks of complications.

Keywords: Blockage, Clinical technique, Complications, Erosion, Extender, Glaucoma, Glaucoma drainage devices, Obstruction, Refractory, Revision.

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Background

Glaucoma drainage devices (GDD) are surgical devices commonly used in the treatment of refractory glaucoma. While different designs of GDDs exist, they all work on a similar principle consisting of a tube connecting the intraocular compartment to an external filtering plate attached posteriorly beneath the Tenon's capsule.[1] Tube filtration faces less resistance and subsequent scarring than subconjunctival filtration, hence GDDs can achieve better success rates than mitomycin C trabeculectomies in refractory glaucoma.[2] Despite of this, failure of GDDs has been observed and is predominantly associated with tube blockage or malposition rather than a filtration plate defect.[3] Glaucoma drainage device failure is usually rectified by the replacement of the entire device, the implantation of another GDD on a new surgical site, or the use of a tube extender to replace the failing section of the tube.[4] While the first two options are associated with similar complication rates as a new GDD procedure, including nonnegligible risks of diplopia,[5] tube erosion is a frequent complication of the latter.[6] To minimize these risks, we developed a technique to replace the failing section of the tube without resorting to a subconjunctival clip, while keeping the filtration plate in place. We present the case of a kinked Baerveldt tube and the surgical technique that was developed to salvage the posterior tube and plate.

Initial Presentation

A 69-year-old man, who sustained posttraumatic glaucoma in his left eye since an accident involving an elastic strap at the age of 13 years, attended our tertiary glaucoma center. He had remained aphakic since the incident and was initially stable under travoprost (Alcon, Texas, USA). After undergoing anterior segment surgery in the affected eye, including iris repair, retropupillary iris claw lens implantation, and Descemet's stripping automated endothelial keratoplasty for a decompensating cornea, he developed intense inflammation and intraocular pressure (IOP) rise to 38 mm Hg. His glaucoma subsequently progressed with marked thinning of the retinal nerve fiber layer (RNFL) and increasing disc cupping over the course of 6 months, despite maximal topical and systemic anti-glaucomatous therapy. The patient then underwent XEN-augmented Baerveldt surgery, which temporarily restored adequate IOPs between 14 mm Hg and 16 mm Hg. Six months after surgery, IOP had increased to 41 mm Hg and the XEN gel stent was

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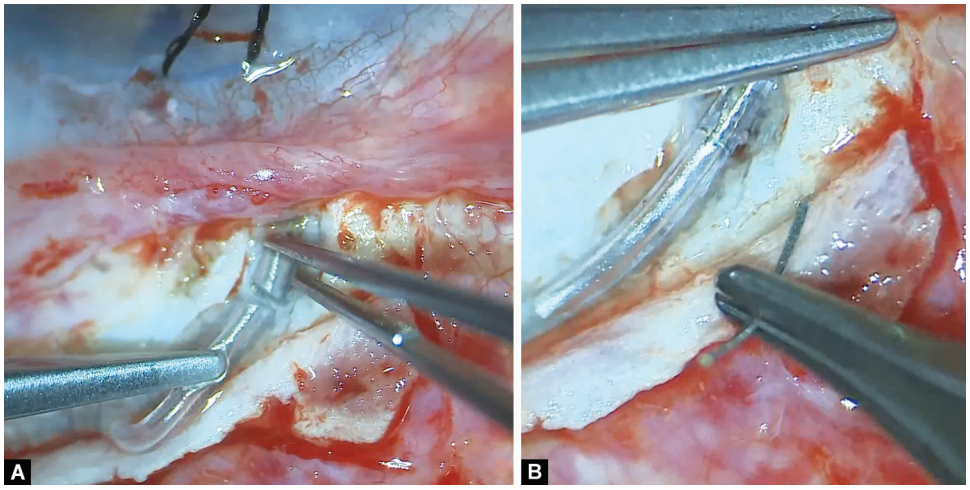

Figs 1A and B: Illustration of the surgical technique: (A) Positioning of the two Baerveldt tubes to ensure a smooth course within the scleral grove and adequate length for both ends to touch; (B) Suture of the two sections of Baerveldt tubes with nylon 8-0, securing a continuous lumen

noted to be blocked by fibrin. It was replaced by another XEN gel stent, which became obstructed 3 weeks later. Surgical exploration confirmed a blocked XEN gel stent and revealed a kinked Baerveldt tube at its junction with the stent. It was then decided to replace the blocked XEN gel stent by a new Baerveldt tube, while salvaging the filtering plate and functional section of the existing tube, thus restoring a functional anterior drainage system.

Technique

The patient's skin was cleaned and prepared with sterile dressing. Topical anesthesia was administered and a lid retractor was positioned. The superior conjunctival fornix was incised at the limbus and the pericardium allograft patch (Tutoplast, Innovative Ophthalmic Products, Inc., Costa Mesa, CA, USA) covering the tubes to minimize the risk of erosion was lifted to expose the Baerveldt tube and the XEN gel stent within their scleral grove. The blocked XEN tube was removed and the kinked anterior section of the Baerveldt tube was sectioned and removed. A new Baerveldt tube was unpacked and the filtration plate was removed and discarded. One end of the new tube was cut to create a beveled edge. A 23 gauge needle was used to create a track to the anterior chamber, on the site from which the XEN gel stent had been removed. The beveled end of the new Baerveldt tube was then inserted into the anterior chamber. The other end was laid over the scleral grove created during the first surgery. The course of the first tube was corrected to ensure a smooth curve and avoid any sharp bend, and the anterior end of the first tube was secured to the sclera using nylon 8-0 sutures. The new Baerveldt tube was cut at the level of this anterior end in order to be positioned in continuation of the existing tube so that both lumens would be continuous. The adjoining tubes were stitched to each other with two 8-0 nylon sutures passing through the walls of the tubes (Fig. 1). An allograft patch was replaced over the tubes and sutured to the conjunctiva at each corner. The operation was then concluded by suturing the conjunctival fornix with continuous Vicryl 8-0.

Outcome

Intraocular pressure normalized at 15 mm Hg immediately after surgery, and no peri- or postoperative complications were noted. Six months later, IOP remained stable between 12 mm Hg and 15 mm Hg with no additional treatment or subsequent revisions. There was no sign of conjunctival erosion.

Discussion

This case illustrates that Baerveldt–Baerveldt apposition is a viable option when a filtration plate is still functioning and a localized defect in a tube section could be identified. It is similar in principle to the tube-in-tube extension technique described by Chiang et al.,[7] with the main differences residing in the simple apposition and the securing sutures proposed in our technique. It could be theorized that the minimal residual gap at the junction between the tubes would provide the same additional IOP-lowering effect as the "venting slits" that are sometimes performed to minimize the initial iatrogenic hypertensive phase without causing hypotony,[8] and would not be responsible for any more complications as long as the two tube segments are properly secured together. A study on more cases will be needed to confirm the long-term viability of this surgical technique.

Conclusion

In conclusion, this surgical approach offers a new way to salvage a failing Baerveldt tube without replacing the filtration plate or repeating a complete surgery. This contributes to reducing the peri- and postoperative risks of complications by minimizing extraocular muscle manipulation and scleral dissection and reducing the risk of erosion associated with thicker tube extender clips.[6]

Clinical Significance

This report illustrates a simple yet effective technique to replace the failing section of a GDD or lengthen a short GDD without replacing the entire device or using an extender clip, and thus minimizing the risks of complications.

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