Novel Surgical Technique in Refractory Open Angle Glaucoma: Case Report

Abstract

Purpose: To review two cases of open angle glaucoma (OAG) refractory to medical and surgical treatment that underwent a novel surgical technique.

Methods: Case reports of a novel surgical technique which consists in a trabeculectomy with Mitomycin C and aqueous diversion to the suprachoroidal space.

Results: The target intraocular pressure remains stable after surgery without using any medical treatment. No severe complications were observed during follow-up.

Conclusion: Managing intraocular pressure in refractory glaucoma has always been a challenge, and the need of both surgical and medical approaches is common. This novel surgical technique has the advantage of using 2 filtering pathways, which allows an adequate aqueous humor drainage even if one of the pathways fails.

Introduction:

Primary open angle glaucoma (POAG) is a progressive, chronic disease where intraocular pressure (IOP) and other factors produce an optic neuropathy with loss of retinal ganglion cells and their axons, becoming a major cause of blindness worldwide.

Trabeculectomy has been the most used surgical approach since it was described by Cairns, providing lower IOP and lesser daily fluctuation when compared to medical treatment. Despite this, at least 20% of eyes that have undergone trabeculectomy will need topical glaucoma medication to achieve the target IOP five years after surgery.

Antimetabolites are used frequently to improve the success rate of trabeculectomy; however, both 5-fluorouracil and Mitomycin C have been associated with significant side-effects and complications.

We present two case reports of OAG refractory to both surgical and medical treatment that underwent a novel surgical technique.

Case Reports:

Case 1:

An 80-year old male patient with advanced POAG was referred with a best corrected visual acuity (BCVA) of 20/30 in both eyes (OU) and IOP of 21 mmHg in the right eye (OD) and 19 in the left eye (OS) with maximal medical therapy. Slit-lamp examination showed mild cataract and an optic nerve cupping of 0.9 OU. Gonioscopy was Grade IV in the Shaffer classification OU. The visual field showed advance damage (Figure 1). Combined surgery with Mitomycin (3 minutes) was performed in the right eye, maintaining an IOP close to 14 mmHg for a few months, but resulting in fibrosis of the bleb and a need to return to maximal medical therapy. Despite adding a fixed-combination of timolol / dorzolamide and latanoprost, bleb fibrosis made the IOP raise again to 23 mmHg OD. We decided to perform a novel glaucoma surgery: Trabeculectomy...
with Mitomycin C and suprachoroidal derivation. At the first postoperative day IOP was 8mmHg. In the course of the one year follow-up, we obtained a stable BCVA of 20/25, an IOP between 8 and 10 mmHg and the visual field remained stable (Figure 2).

Case 2:
A 32-year old male patient with pigmentary glaucoma was referred with a BCVA of 20/60 OU and an IOP under medical treatment of latanoprost, timolol and brimonidine of 16mmHg OD and of 23mmHg OS. He underwent an iridotomy OU 12 years ago and argon laser trabeculoplasty (ALT) OU 12 years ago. In gonioscopy examination we observed increased pigment in the trabecular meshwork. The optic nerve cupping was 0.8 OU. Due to visual field damage progression (Figure 3) we decided to perform a trabeculectomy with Mitomycin C and suprachoroidal derivation in the left eye. At the first postoperative day IOP was 6mmHg and in the course of one year follow-up we obtained a stable BCVA of 20/40, and an IOP between 6 and 11 mmHg with no medical glaucoma medication. Also, the visual field remained stable (Figure 4).

Surgical Procedure:
Patients were operated under topical (Proparacaine hydrochloride 0.5%) and subconjunctival (Lidocaine 2%) anesthesia. The procedures were performed in the superior temporal quadrant because of conjunctival scarring from previous surgeries. A 6 mm fornix-based conjunctival incision with 2 mm relaxing incisions in each end was performed to provide better visualization of the operating area. Next step was a Tenon’s capsule dissection and episcleral vessel cauterization. Using a 2 mm Crescent knife we then performed a 5 x 5 x 5 mm limbus-based scleral flap of 50% scleral thickness that reached clear cornea. Later, a second rectangular 4 x 3 x 4 mm limbus-based scleral flap of 30% scleral thickness was made below the previous one. Mitomycin-C (0.4 mg/mL) was applied for 3 minutes with a microsponge in a central area of 7 mm² and then irrigated with saline solution. Later, the inner flap was divided in three 1-mm flaps performing 2 cuts along the anterior-posterior axis with Vannas scissors and then the 1-mm central flap was removed. Using a 2-mm Crescent knife we performed a 3-mm incision of the 20% remaining scleral thickness, located 3-mm posterior to the limbus, reaching the suprachoroidal space. Using a blunt spatula we...
carefully dissected the suprachoroidal space and then performed a bite in the posterior lip of this scleral incision with a 0.9 mm Kelly Punch. The 2 lateral flaps were inserted in the suprachoroidal space, forming a channel that will direct the aqueous humor from the anterior chamber to the suprachoroidal space (Figure 5). A 1-mm penetrating incision was made at the limbus (base of the second scleral flap) with a sideport knife, followed by a bite with a 0.9 mm Kelly Punch and basal iridectomy with Vannas scissors to communicate the anterior chamber with the scleral channel. The channel was covered with the first scleral flap in order to create a tunnel and sutured with 1 stitch in each corner and 2 stitches in each of the 3 sides of the flap using Nylon 10/0 in order to get a watertight seal. Finally, the conjunctiva was sutured to the limbus using Nylon 10/0.

**Discussion:**

The wound healing process is still the most important factor for success or failure in glaucoma filtration surgery, affecting IOP control and, therefore, progression of disc cupping and of visual field loss.

Eyes in which trabeculectomy has failed have a higher risk of further failure with subsequent filtering surgeries and glaucoma draining devices.

Emi et al. studied hydrostatic pressure in the suprachoroidal space by direct cannulation and found a significant fall from the anterior chamber to the suprachoroidal space. This difference, at an IOP of 15 mmHg was -0.8 ± 0.2 mmHg in the anterior suprachoroidal space, increasing to -3.7 ± 0.4 mmHg in the posterior suprachoroidal space. This negative difference in hydrostatic pressure and the clinically relevant resorptive function of the choroid are the main reasons to the suprachoroidal surgical approach.

Also, the natural pressure gradient helps maintaining aqueous drainage.

This procedure does not depend on the filtering bleb, so it can be performed in eyes where the conjunctival scarring would not allow a conventional filtration surgery.

Unlike classic trabeculectomy, our surgical procedure has the advantage of using 2 different drainage pathways to lower the IOP: the anterior chamber to subconjunctival space fistula and the uveoesthescleral drainage through the suprachoroidal space. If the filtration bleb becomes increasingly vascularized, and/or excessive capsular fibrosis appears, the uveoesthescleral pathway is still patent.

In our patients, both subconjunctival and suprachoroidal fluid have been found by means of Ultrasound biomicroscopy. The typical image is an unusually evident suprachoroidal space (Figure 6).

No severe complications were found in both cases, achieving the target IOP without appealing to any glaucoma medication.

**REFERENCES**