

Surgical Outcomes of a Small Incision Limbus-Based Revision for Failed Trabeculectomies

Marcus Suehiro, Fabio Luis de Arruda Zantut*, Flavio Siqueira Lopes, Michele Ushida Barbosa, Syryl Dorairaj, Tiago Santos Prata

Paulista School of Medicine, Federal University of Sao Paulo, Sao Paulo, Brazil

Email: *fabiozantut@gmail.com

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Abstract

Background: Trabeculectomy does not always work as long as necessary to control glaucoma. This study aimed to describe the initial outcomes of a surgical technique for restoring failed trabeculectomies. **Methods:** We reviewed patients with failed trabeculectomy with mitomycin (MMC) who underwent limbus-based revision. After the dissection of the subconjunctival area through a smaller incision (3 mm), MMC was applied and episcleral fibrosis was excised. Each criterion was classified as complete or qualified for glaucoma medication. **Results:** Nineteen patients (19 eyes) were included in this study. The mean follow-up was 9.4 ± 8.6 months. At the last follow-up visit, the mean intraocular pressure was reduced from 20.9 ± 8.4 (range, 12 - 44 mmHg) to 11.6 ± 3.6 mm Hg (range, 6 - 19 mmHg) ($p < 0.01$). The mean number of glaucoma medications was reduced from 2.6 ± 0.8 to 0.4 ± 0.7 during the same period ($p < 0.01$). At 6 months postoperatively, the qualified success rate was 68% and 85% for stricter and less strict criteria, respectively. Two cases of transient leakage and reoperation were required in three eyes. No sight-threatening complications were noted. **Conclusions:** Our initial results suggest that limbus-based revision is an effective alternative to restoring failed trabeculectomies with minor postoperative complications.

Keywords

Glaucoma Surgery, Trabeculectomy, Revision, Mitomycin

1. Introduction

Glaucoma is an optic neuropathy characterized by progressive structural and functional damage. Intraocular Pressure (IOP) is the most important known risk

factor for disease development and progression as well as the only modifiable risk factor to date [1] [2]. Therefore, an effective reduction in IOP is the primary goal in glaucoma treatment [3].

Regarding treatment options for IOP reduction, we have three main categories: topical medication, laser procedures, and incisional surgery. Topical hypotensive medications are often used as first-line treatment options, while incisional surgery is generally used when topical and laser treatments do not achieve the target IOP [4]-[12].

Trabeculectomy has been considered the gold standard procedure for primary glaucoma undergoing first-time glaucoma surgery since 1971 [13]. Although good initial IOP outcomes are generally obtained following trabeculectomy, many eyes will present surgical failure over time, mainly due to postoperative wound healing response and subconjunctival scarring in the filtering tract and bleb [14] [15]. For example, a previous study by Chen *et al.* [16] found a failure rate of 33% in the control of IOP 10 years after trabeculectomy surgery, even with the use of mitomycin; the good control of IOP was only achieved in 50% of patients in the long-term [17] and compared to implant tube, trabeculectomy has a higher rate of reoperation [18]. Life expectancy is increasing, and so is the probability of a second surgery; success is known to be lower. A previous study showed that only 33% of the patients reached IOP 16 mmHg in these cases [19].

We believe that the attempt to restore the function of the initial trabeculectomy is a reasonable approach before further glaucoma procedures, such as the second trabeculectomy or glaucoma drainage device implantation, as it could delay the need for such interventions and gain time. Although needling has been used for this purpose in recent decades with relatively good outcomes, the procedure is not always feasible in cases with extensive conjunctival fibrosis, and its results can vary significantly [20] [21]. In this context, our aim was to investigate a small incision limbus-based revision procedure as an alternative to restoring failed trabeculectomies.

2. Methods

This retrospective study adhered to the tenets of the Declaration of Helsinki and was approved by the institutional review board of the Federal University of Sao Paulo.

2.1. Patients

Noncomparative, interventional case series in which all patients with glaucoma were from the Brazilian National Health System (Sistema Unico de Saúde, SUS). All patients were selected in the glaucoma division of the Federal University of São Paulo, which is a tertiary care hospital in which these patients were already undergoing follow-up. The patients underwent revision surgery between January 2016 and February 2018. Patients who underwent limbus-based revision were those who did not achieve the target IOP after primary trabeculectomy, even un-

der the maximum tolerated medication. Before the procedure, all patients underwent a gonioscopy to confirm that the ostium was clear. Key exclusion criteria were other intraocular surgeries (in addition to uneventful surgeries), ocular trauma, and secondary glaucoma.

2.2. Procedure Description

The limbus-based revision consists of a 15 min procedure in which a large subconjunctival area around the failed bleb is initially dissected and treated with mitomycin C through a 3 mm incision. The incision was made as posteriorly as possible and the 12 o'clock location was avoided due to its proximity to the rectus muscle. The fibrotic tissue was then excised (the scleral flap was reopened by needling when necessary), reestablishing the flow to the treated area. The conjunctiva and Tenon capsule were closed using 8-0 polyglactin sutures. The eye was then inspected for leaks and the anterior chamber was inflated to the proper pressure using a balanced salt solution whenever necessary. All included patients were treated with topical corticosteroids (prednisolone acetate 1% eye drops) every 2 h and antibiotics (gatifloxacin 3 mg/ml) four times daily during the first week. Prednisolone was then regressed slowly over 6 - 8 weeks.

2.3. Data Acquisition and Statistical Analysis

Data collected included demographic and clinical characteristics of patients. Preoperative and postoperative IOP, number of antiglaucoma medications, surgical complications, and any subsequent related events were recorded and analyzed. Success was defined according to two criteria based on postoperative IOP values: 1) IOP between 6 and 18 mmHg; 2) IOP between 6 and 15 mmHg. Success was also characterized according to whether this had been achieved without (complete success) or with antiglaucoma medications (qualified success). Failure was defined as an IOP level measured above or below the upper limit in two consecutive visits or whenever additional glaucoma surgery was required.

Descriptive analysis was used to present demographic and clinical data. The D'Agostino-Pearson test was performed to determine whether the data had a normal distribution. Since normality was rejected, we used a nonparametric test (Wilcoxon signed-rank test) to compare IOP values and the number of antiglaucoma medications at baseline and the last follow-up visit. Kaplan-Meier survival analysis was used to estimate success rates at specific postoperative time points. Computerized analysis was performed using MedCalc software (MedCalc, Inc., Mariakerke, Belgium), and the statistical significance was set at $p < 0.05$.

3. Results

Nineteen patients (19 eyes) with a mean age of 56.7 ± 13.4 years were included in the study; 58% were male and 42% female, 79% Caucasian and 21% of other ethnicities, 42% diagnosed with primary open-angle glaucoma, 32% with primary closed-angle glaucoma, 15% secondary glaucoma, and 11% with pigmentary glaucoma. The results are presented in **Table 1**.

Table 1. Demographic and ocular characteristics of study patients.

Variables	Group (n = 19)
Age (years)	56.7 ± 13.4
Sex (M/F)	11 (58%)/8 (42%)
Ethnicity (C/O)	15 (79%)/4 (21%)
FU (months)	9.4 ± 8.6
POAG/PACG/SC/PG	8 (42%)/6 (32%)/3 (15%)/2 (11%)

M, male; F, female; C, Caucasian; O, others; FU, follow-up; POAG, primary open-angle glaucoma; PACG, primary angle-closure glaucoma; SC, secondary glaucoma; PG, pigmentary glaucoma. *Data are presented as mean ± standard deviation.

The mean follow-up was 9.4 ± 8.6 months, and the mean IOP was reduced from 20.9 ± 8.4 mmHg (range, 12 - 44 mmHg) to 11.6 ± 3.6 mmHg (range, 6 - 19 mmHg) at the last follow-up visit ($p < 0.01$). The mean number of glaucoma medications was reduced from 2.6 ± 0.8 to 0.4 ± 0.7 during the same period ($p < 0.01$). At 6 months postoperatively, the qualified success rates were 85% and 68% for criteria 1 and 2, respectively. Additionally, we found the complete success rate was 79% and 63% for criteria 1 and 2, respectively. Two cases of transient leakage and reoperation (postoperative needling) were required in three eyes. No sight-threatening complications were noted.

4. Discussion

Even with evidence that shows that the use of multiple eye drops [22] and the patient's profile [23] are associated with lower adherence to treatment, clinical treatment with eye drops remains the first choice for treating glaucoma by the majority of ophthalmologists [24]. However, it has been shown that most patients would benefit from a surgical approach to best control the IOP. Considering that trabeculectomy is usually the first choice of surgery, and it has a limited lifetime, a fast and easy procedure, such as limbus-based revision, is of great importance in increasing the lifetime of trabeculectomy and postponing a second surgery.

Our series of cases that evaluated patients who underwent the limbus-based revision showed a decrease of 45% in IOP after the procedure, a decrease in the use of antiglaucoma medications to achieve the target IOP (from 2.6 to 0.4), with a low index of complications such as transient leakage and needling, and minor side effects. Therefore, limbus-based revision may increase not only the useful life of trabeculectomy but also the adherence to treatment.

Compared with other procedures to increase the lifetime of trabeculectomy, such as needling with MMC and 5-fluorouracil, our study showed similar results in the percentage of decrease in the IOP (45% limbus-based revision vs. 50% needling with MMC [25] vs. 44% needling with 5-fluorouracil [26]) with a higher success rate (79% limbus-based revision vs. 63% needling with MMC [25]). The difference between the success rates was even higher when we compared our tech-

nique with a repeat trabeculectomy (46.7%) [27] with a lower index of complications. It is important to note that the follow-up in these studies was longer than in our study.

The initial study has limitations because it is a series of cases with relatively short follow-up (9.4 ± 8.4 months) and may present a higher level of failure of the procedure with longer monitoring. The small number of patients who undergo the procedure is justified because it is not a standard technique in the literature. We presented a series of cases with their initial results of efficacy and safety so that we could conduct a prospective, comparative study. Some authors might consider the target IOP of 16 mmHg for entry into the study insufficient to consider the failure of trabeculectomy.

5. Conclusion

Our initial results suggest that limbus-based revision is an effective alternative to restore failed trabeculectomies with minor postoperative complications. In most cases, lowering the IOP to the patient target levels, and decreasing the necessity of antiglaucoma medications.

Disclosure

Project number and institution responsible for the approval of the Research Ethics Committee: CEP/UNIFESP No. 834.138.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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