

A Comparative study of Non-penetrating deep sclerectomy versus trabeculectomy in bilateral primary open-angle glaucoma at tertiary health care center

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Abstract

Background: Trabeculectomy is the commonly performed surgical procedure for treatment of glaucoma. Despite of numerous advantages over full-thickness procedures, it can cause undesirable early postoperative complication. NPDS is used for the surgical treatment of medically uncontrolled open angle glaucoma and was developed to avoid the complications of trabeculectomy procedure. This study was undertaken to assess the safety and efficacy of deep sclerectomy versus trabeculectomy. **Material and Methods:** A total of 70 eyes of 35 patients with uncontrolled bilateral primary open-angle glaucoma (intraocular pressure of 21 mmHg) despite maximally tolerated medications underwent trabeculectomy in one eye and NPDS in other eye over a period of 6 months. **Results:** Significant OP reduction was seen in both groups during follow up period. However, in the trabeculectomy group there was a statistically significant reduction. Less number of cases required postoperative antiglaucoma medications in trabeculectomy group. More complications such as hyphaema, conjunctival leak, flat or shallow anterior chamber and uveitis were noted in trabeculectomy group. **Discussion:** NPDS was found to be a safer procedure, with fewer postoperative complications, which were less severe, compared with trabeculectomy. In conclusion, NPDS and trabeculectomy offered comparable IOP reduction, visual outcome, and need for postoperative glaucoma medications. In cases where larger reduction in IOP is required trabeculectomy is a better method than NPDS.

Key Words: Bilateral primary open-angle glaucoma, Non-penetrating deep sclerectomy, trabeculectomy, Intraocular pressure, complications.

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INTRODUCTION

Trabeculectomy is currently considered the standard surgical procedure for control of intraocular pressure (IOP) in patients with open-angle glaucoma (OAG)¹. Trabeculectomy provides a non-physiologic route for

aqueous outflow and complications may occur despite the best efforts of the surgeon. Although, it has many advantages over full-thickness procedures, it can cause early postoperative complications, including hyphema, excessive filtration leading to shallow or flat anterior chamber, choroidal detachment, hypotony, maculopathy, and suprachoroidal hemorrhage^{2,4}. Non-penetrating deep sclerectomy (NPDS) is a filtering surgery where the internal wall of Schlemm's canal is excised, allowing subconjunctival filtration without actually entering the anterior chamber. NPDS is used for the surgical treatment of medically uncontrolled open angle glaucoma⁴. The major advantage of NPDS is that it precludes the sudden hypotony that occurs after trabeculectomy by creating progressive filtration of aqueous humour from the anterior chamber to the subconjunctival space, without perforating the eye⁵. This, technique was developed to

minimize the complications of trabeculectomy. However, Demailly *et al* found that although NPDS carries fewer complications than trabeculectomy, its medium term tonometric results remain slightly inferior to those of trabeculectomy⁶. This study was undertaken to assess the safety and efficacy of deep sclerectomy versus trabeculectomy.

MATERIAL AND METHODS

A total of 70 eyes of 35 patients with uncontrolled bilateral primary open-angle glaucoma (intraocular pressure of 21 mmHg) despite maximally tolerated medications underwent bilateral filtering surgery over a period of 6 months. Patients were assigned randomly to receive deep sclerectomy in one eye and trabeculectomy in the other; the surgeries were scheduled with no more than 3 days between the two procedures. Patients with previous ocular surgery, patients younger than 35 years of age, or those with significant posterior segment eye disorders were excluded from the study. Patients were informed of the risks, benefits, and alternative of surgery, and informed consent was obtained. Full preoperative baseline data were obtained for each patient and included age, sex, ocular history, visual acuity, applanation tonometry, slit-lamp examination, and ophthalmoscopy. All surgical procedures were performed by same surgeon using topical anesthesia consisting of bupivacaine 0.5% eyedrops.

Non-penetrating deep sclerectomy

A superior rectus muscle suture was placed. The conjunctiva and Tenon's capsule were opened in the upper fornix and the sclera exposed; careful haemostasis was performed. A superficial scleral flap, one-third thickness, 5.0 X 5.0 mm, was dissected 1.0 mm into clear cornea. A triangle of deep sclera was then removed, leaving a thin layer of deep sclera over the choroid posteriorly. Anteriorly, the dissection was made to Schlemm's canal, opening its external wall, leaving in front of it only the Descemet plane, taking care not to perforate it. At this stage, the aqueous humour must rise from the anterior chamber, along the whole trabeculo-Descemet surface. The superficial scleral flap was repositioned and secured in place with two loose 10-0 nylon sutures; the knots were buried. The conjunctiva and Tenon's capsules were carefully closed with interrupted 8-0 silk sutures.

Trabeculectomy

Trabeculectomy was performed using a technique similar to that described by Cairns⁷. A superior rectus muscle suture was placed, and the conjunctiva and Tenon's capsule were opened in the upper fornix. The sclera was exposed, and careful haemostasis was performed. A one-third thickness limbal-based 4.0 X 4.0 mm scleral flap

was dissected. The paracentesis was performed. The trabeculectomy was followed by a peripheral iridectomy. The superficial scleral flap was sutured in place with two 10-0 nylon sutures with buried knots. The sutures were adjusted to allow a leakage around the edge of the scleral flap after reformation of the anterior chamber with balanced salt solution through paracentesis. The conjunctiva and Tenon's capsule were sutured with interrupted 8-0 silk sutures. Post-operatively, patients were treated with topical neomycin and polymyxin B sulphate and dexamethasone 3timesa day for2 weeks, and then with topical fluoromethol one 3 times a day for3-6 months. Post-operative data (including visualacuity, visualfield and C/D measurements, repeated every3 months) were collected at 1 day, 1 week, and1,2,3,6,12 months. All post-operativel O P measurements were done by the same physician who was masked to the procedure performed in each eye of aspecific patient. Complete success was defined as a final IOP 21 mmHg without antiglaucoma medications; qualified success was defined as IOP 21 mmHg with medications, whereas failure was con- side red when IOP was 21 mmHg with medications or when an eye required further glaucoma surgery. The paired *t* test was used to compare IOP differences, whereas the chi-square analysis was used to compare the qualitative data between the two groups.

RESULTS

Seventy eyes of 35 patients were enrolled in the study. The average age of the patients was 60.17 ± 7.30 years (range 45-75 years). Most patients were men (68.5%). No statistically significant difference was observed in pre-operative IOP, visual acuity and C/D ratio between eyes operated on by the trabeculectomy or NPD Stechniques (Table 1).

Table 1: Pre-operative intraocular pressure, visual acuity and C/D ratio

	Trabeculectomy Mean±SD	NPDS Mean±SD	p value
IOP	27.7±3.8	27.9±3.4	0.817
Visual acuity	0.45±0.22	0.46±0.33	0.881
C/D ratio	0.75 ±0.12	0.75 ±0.11	1.000

Throughout the follow-up period, significantl OP reduction was seen in both groups. However, in the trabeculectomy group there was a statistically significant reductionin IOP compared with the NPDS group (Table 2).

Table 2: Post-operative intraocular pressure in both study groups

Follow-up period (Months)	Trabeculectomy Mean±SD	NPDS Mean±SD	p value
1	12.84±2.9	14.32±2.4	0.002
2	14.72±3.2	15.78±2.6	0.132
3	15.36±2.8	17.64±3.2	0.002
6	16.64±3.4	17.89±2.9	0.102
12	17.48±3.6	20.91±3.4	0.001

It was observed that, 7 cases from NPDS group required antiglaucomatous medications postoperatively, whereas, only 4 cases from trabeculectomy group required antiglaucomatous medications. This difference was not statistically significant ($p > 0.05$). Complications such as hyphaema, conjunctival leak, flat or shallow anterior chamber and uveitis were noted in trabeculectomy group whereas hyphaema and conjunctival leak were noted in NPDS group. There were statistically significantly fewer complications in the NPDS group. No major complications like frank perforation of the trabeculo Descemet's membrane was observed in the present study. Although, microporation was identified in 2 eyes with no iris prolapse or shallowing of the anterior chamber. Seven eyes in the trabeculectomy group needed secondary cataract surgery compared with none in the NPDS group.

DISCUSSION

Trabeculectomy is the most commonly used approach for surgical reduction of IOP. To avoid the numerous post-operative complications of trabeculectomy such as hypotony, flat anterior chamber or uveitis several techniques of non-perforating filtration surgery were developed with differentiates of success^{8,9}. Despite the advantages of decreased postoperative complications when compared with trabeculectomy in primary open angle glaucoma surgery, NPDS has not gained wide acceptance because of the difficulty of the technique. Moreover, it was shown in several studies that, NPDS is less effective than trabeculectomy for intraocular pressure reduction on a medium and long-term basis¹⁰⁻¹³. The present study was aimed to follow the IOP lowering results of the two techniques, need of post-operative antiglaucomatous medications along with post-operative complications. The number of patients who needed post-operative antiglaucomatous medications was lower in the trabeculectomy group, although the difference between the two groups was statistically not significant. The IOP lower ingrate was higher in the eyes that underwent trabeculectomy than in those that had NPDS. In a study by, El Sayyad *et al.*, 12 in 78 eyes of 39 POAG patients, found that NPDS and trabeculectomy offered comparable IOP reduction, success rate and need for post-operative glaucoma medication¹⁴. That could be due to the use of 5-

fluorouracil and goniopuncture with Nd: YAG laser in some of their NPDS cases. In present study, a smaller number of eyes were included but we did not use any implants or antimetabolites, thus the different results obtained were due to the technique perse. In present study, complications were more frequently encountered in the trabeculectomy group. Inflammation, hyphaema, shallow or flat anterior chamber and cataract-related surgery were complications more frequently encountered in the trabeculectomy group, while bleb fibrosis and post-operative ocular hypertension were findings more often occurring in the NPDS group. These findings are in contradiction to many studies that have found NPDS has a more satisfactory outcome compared with trabeculectomy^{15,16}. In present study, NPDS was found to be a safer procedure, with fewer post operative complications, which were less severe, compared with trabeculectomy. This finding is in accordance with other previous studies^{11,17}. However, the different types of post-operative complications are related mainly to the differences in the two techniques. In conclusion, non penetrating sclerectomy and trabeculectomy offered comparable IOP reduction, visual outcome, and need for postoperative glaucoma medications. The immediate postoperative complications were fewer after the sclerectomy. But, in cases where larger reduction in IOP is required trabeculectomy is a better method than NPDS.

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