

Sutureless trabeculectomy as a substitute for conventional trabeculectomy in the management of primary open angle glaucoma

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Abstract

Aim: To assess the safety and efficacy of sutureless punch trabeculectomy, as a substitute for conventional scleral flap trabeculectomy, in the management of primary open angle glaucoma.

Materials and methods: In a prospective, randomized study, 40 eyes of 40 patients with primary open angle glaucoma (POAG), who were candidates of trabeculectomy were included and randomly assigned into two groups, conventional scleral flap trabeculectomy (A) or sutureless scleral tunnel trabeculectomy (B). Assessment of intraoperative complications and postoperative visual acuity, intraocular pressure, antiglaucoma medications used and postoperative complications were followed for a period of 6 months.

Results: The mean preoperative IOP in the conventional group was 26.7 ± 3.010 mm Hg and in the sutureless group was 26.6 ± 3.067 mm Hg. The mean reduction in IOP in the conventional group after 6 months was 12.4 ± 0.350 mm Hg and in the sutureless group was 12.3 ± 0.407 mm Hg. The complete success rate in Group A was 55% and in Group B was 50%. No significant difference in complication rate was noted between the two groups.

Conclusion: It was seen that the sutureless scleral tunnel trabeculectomy has efficacy and safety comparable to conventional scleral flap trabeculectomy and hence can be used as a substitute for conventional scleral flap trabeculectomy.

Keywords: Primary open angle glaucoma, conventional scleral flap trabeculectomy, sutureless scleral tunnel trabeculectomy, intraocular pressure.

1. Introduction

Glaucoma is a chronic, progressive optic neuropathy caused by a group of ocular conditions which lead to damage to the optic nerve with loss of visual function.[1]

Glaucoma is a leading cause of irreversible blindness throughout the world, responsible for 13.5% of global blindness, becoming the second most common cause of bilateral blindness.[2] Trabeculectomy has remained the most commonly performed glaucoma surgery since its first description by Cairns in 1968.[3] The conventional method of trabeculectomy involves use of sutures which lead to many suture related complications such as scleral flap

laceration, tissue trauma, foreign body sensation and local irritation.

Lai and Lam conducted a study in 1996 in which they used the method of sutureless scleral tunnel to perform trabeculectomy.[4] Hence they overcame the complications associated with the use of sutures.

The purpose of our study is to compare the results of conventional trabeculectomy with sutureless trabeculectomy in patients of POAG in terms of intraoperative complications, postoperative visual acuity, IOP, bleb status, use of antiglaucoma medications and complications.

2. Materials and Methods

This hospital based, prospective, randomized, parallel study was done among cases of primary open angle glaucoma admitted for trabeculectomy at a tertiary care centre in Central India, during the period of two years from October 2014 to October 2016.

A total of 40 eyes of 40 patients with indications of operation for POAG were randomized to either conventional scleral trabeculectomy (20 eyes) or a sutureless scleral flap trabeculectomy (20 eyes). Before entry into the study, informed consent was obtained from all patients. Inclusion criteria for the study were all patients of primary open angle glaucoma who have medically uncontrolled intraocular pressure on maximum medical treatment, suffering from unacceptable side effects of antiglaucoma medications, and who have poor compliance to treatment. Exclusion criteria included previous intraocular surgery, previous anterior segment laser therapy, presence of ocular inflammation or advanced cataract, congenital glaucoma, secondary glaucoma, patients having neurological disorders affecting the optic nerve.

Preoperatively, full baseline data were obtained for each patient including full ocular and medical history, slit lamp biomicroscopy, log MAR visual acuity, visual field assessment, tonometry, gonioscopy, funduscopy, pachymetry and optical coherence tomography.

2.1 Surgical Technique

Preoperatively, pilocarpine 2% drops were instilled into the operative eye 1 hourly; starting the previous night. All surgeries were performed by a single surgeon. Peribulbar anaesthesia given and sterile draping was done. Wire speculum inserted. Superior rectus stay suture applied.

Conventional scleral flap trabeculectomy

Fornix based conjunctival flap made. Tenon's capsule dissected. Haemostasis achieved using cautery. A 4 mm partial thickness triangular scleral flap is made to within 0.5 mm of the limbus using a 15 number blade and crescent knife. The crescent knife is used to fashion the flap and is then further advanced into the clear cornea for about 1 mm. Anterior chamber paracentesis done. A 1.5 X 1 mm sclerolimbic block dissection was done. Peripheral iridectomy was done. Anterior chamber formed with air and scleral flap closed with three 10-0 nylon sutures, one at the tip of the triangle and two at each base near the limbus. Conjunctiva closed with three 10-0 nylon sutures.

Sutureless scleral tunnel trabeculectomy:

Same procedure followed till haemostasis. A 4X4 mm marking made on the sclera with Vernier calipers. A linear partial thickness superficial scleral groove made with 15 number blade of size about 4 mm. A linear scleral tunnel is made with crescent blade and extended into clear cornea 1 mm in front of the limbus. Paracentesis done with lancetip

and viscoelastic substance injected. Internal incision of scleral tunnel made with 2.8 mm keratome. Trabeculectomy was performed using a Kelly Descemet membrane punch of size 0.5 mm. It is inserted in closed fashion and 4-5 punches made making a 1.5X1 mm sclerolimbic dissection. Peripheral iridectomy was done. Anterior chamber reformed and conjunctiva closed with 3 interrupted sutures.

2.2 Postoperative management

Immediate postoperatively, a subconjunctival injection of betamethasone and gentamycin was given. Patients were started on topical prednisolone acetate 1% 6 times for 4 weeks, moxifloxacin 0.5% 4 times a day; which was then tapered over the next month.

Postoperatively, patients were examined on Day 1 and then at 1,4,6 weeks and then at 3 and 6 month interval. At each visit, full ocular examination was performed, including log MAR visual acuity, slit lamp biomicroscopy, tonometry and funduscopy was done. Gonioscopy and visual field assessment were done after 3 months. Pachymetry and OCT was done 6 months after surgery.

Complete success was defined as IOP of 21 mm Hg or less without anti glaucoma medications. Relative success as IOP of 21 mm Hg or less with medications.

2.3 Statistical Analysis

To analyse the results OpenEpi, Version 3 open source calculator was used. The comparison between the two groups for the various parameters was done by using the two sample 't' test. The statistical hypotheses were tested at the level of $\alpha = 0.05$, i.e. the difference between the two groups in the sample was considered significant if $p < 0.005$. All results are presented as mean \pm unless otherwise noted.

3. Results

3.1 Patient Demographics

Mean age of the conventional and sutureless groups was 63.15 ± 5.20 and 63.35 ± 5.04 years respectively. The numbers of eyes operated were 40 eyes of 40 patients out of which 28 (70%) were males and 12 (30%) were females.

3.2 Intraocular pressure

Table 1: Preoperative Intraocular Pressure

Intraocular Pressure mmHg	Group A	Group B
	No. of eyes (%)	No. of eyes (%)
21-30	18(90%)	17(85%)
31-40	2(10%)	3(15%)
41-50	0	0
>50	0	0

Pre-operative mean intraocular pressure in Group A and Group B was 26.7 ± 3.010 mm Hg and 26.6 ± 3.067 mm Hg respectively. The difference in pre-operative mean intraocular pressure in the two groups was statistically insignificant ($p = 0.92$).

Table 2: Postoperative Intraocular Pressure

Groups	Day 1	1 week	4 weeks	6 weeks	3 month	6 month
Group A	18.15±8.1	18.1±6.01	17.4±4.34	17.05±4.65	15.9±3.26	14.30±2.66
Group B	18.05±8.12	18.15±5.97	17.45±4.52	16.95±4.54	15.8±3.29	14.30±2.66
p VALUE	0.97	0.98	0.97	0.95	0.92	>0.99

The post-operative mean intraocular pressure (mmHg) between the two groups was found to be statistically insignificant on every follow-up.

After 6 months, the percentage of eyes with successful drainage or complete success was 50% in sutureless trabeculectomy and 55% in conventional trabeculectomy.

3.3 Antiglaucoma medications

At the 6th month follow up visit, the mean number of antiglaucoma medications per treated eye was 0.5±0.60 for both the groups with no significant difference between the mean drug number reduction.

Table 4: Change in the antiglaucoma medications used

	Group A	Group B
Preoperative	2.3 ± 0.732	2.2 ± 0.83
Postoperative (6 months)	0.5±0.60	0.5±0.60
Mean drug number reduction	1.8±0.132	1.7±0.230.

3.3 Visual Acuity

Pre-operative mean best corrected visual acuity (BCVA) in Group A and Group B was 0.76 ± 0.169 log MAR units and 0.75 ± 0.217 log MAR units respectively, which was statistically insignificant (p = 0.87).

Table 5: Postoperative mean BCVA at follow up visits

Groups	Day 1	1 week	4 weeks	6 weeks	3 month	6 month
Group A	0.91±0.13	0.87±0.15	0.81±0.17	0.77±0.16	0.75±0.17	0.695±0.17
Group B	0.91±0.14	0.87±0.15	0.81±0.21	0.785±0.33	0.75±0.80	0.68±0.16
p VALUE	>0.99	>0.99	>0.99	0.86	>0.99	0.78

The post-operative mean BCVA (log MAR) between the two groups was found to be statistically insignificant on every follow up.

3.4 Intraoperative and postoperative complications:

Table 6: Intraoperative and postoperative complications

Intraoperative complications	Group A	Group B
Hypahaema	2 (10%)	1 (5%)
Perforation of scleral flap	1 (5%)	0
Postoperative complications		
Hypahaema	1 (5%)	1 (5%)
Shallow AC	2 (10%)	3 (15%)
Wound leak	1 (5%)	1 (5%)
Blebitis	1 (5%)	0
Endophthalmitis	0	0
Choroidal detachment	0	0
Hypotony	1 (5%)	2 (10%)
Visual loss	0	0
Encapsulated bleb	1 (5%)	0

Early complications such as **wound leaks** (seen in 1 patient in Group A, on Day 7 and in Group B on Day 1) and **transient hypahaema** (seen in 1 patient in each group, on Day 1) were not significantly different between the two groups. Hypahaema resolved with conservative management. Gross hypotony was seen in one patient in Group A on 1 week follow-up, and 2 patients in Group B (one at 1 week and 1 at 4 weeks). **Blebitis** was seen in one patient in the conventional group (Group A) that developed after 6 weeks.

It was managed with fortified broad spectrum antibiotics (cefazolin and gentamicin) for 7 days, along with systemic antibiotics following which after 2 weeks, blebitis was controlled and IOP and visual acuity did not change.

4. Discussion

Glaucoma is one of the major causes of blindness and cannot yet be cured. Trabeculectomy has been used for more than 40 years and still is the most common incisional surgery for glaucoma. Scleral sutures used in conventional trabeculectomy were associated with many suture related complications. So, in a randomized, prospective study on patients with POAG undergoing trabeculectomy, we compared the outcome of sutureless with conventional trabeculectomy.

Without suturing, the amount of surgical manipulation and trauma will be less. Also suture related foreign body sensation and local irritation is reduced. Hence leading to decreased fibrosis and scarring of the scleral flap. The risk of buttonholing through the filtration bleb is also removed. Suture tract related infections and abscess formation is also reduced.[5] In conventional trabeculectomy, the correct tension of the scleral flaps and the speed of filtration, is regulated by the scleral sutures applied, which undergo various inter individual and inter procedural variations. Various postoperative manipulations are sometimes required such as suture adjustment or release

and suture lysis.[6,10] These can cause sudden hypotony, conjunctival perforation, shallow anterior chamber and malignant glaucoma.[6-9] Minimal modifications are required to the existing self sealing tunnel, with no additional instruments required. Thereby making it a fast and relatively easy procedure.

Sutureless trabeculectomy also serves as a means of standardizing the one-way valve effect of the filtration fistula. The entire aqueous outflow is directed towards a single outflow pathway, instead of a two or three sided outflow as in conventional methods. Hence, increasing the patency of the single outflow pathway. One pathway with a relatively high flow is more likely to remain patent than two or three pathways with divided flow.[11]

Infectious endophthalmitis after sutureless cataract surgery has been reported in some studies, occurring in the early postoperative period, suggesting the introduction of pathogen at the time of surgery.[12-16] In none of our patients, there was any evidence of posterior wound gape. If all aseptic precautions are maintained and excessive surgical manipulations are avoided, we anticipate no higher incidence of endophthalmitis in sutureless trabeculectomies than seen in conventional trabeculectomies.

5. Conclusion

In our study, although no statistical significance was seen in terms of effectiveness and complications between the two groups, sutureless trabeculectomy offers an alternative approach to glaucoma control and visual performance to conventional trabeculectomy. Sutureless trabeculectomy seems to be an effective, quick, repeatable and safe procedure for intraocular pressure control in patients of primary open angle glaucoma.

6. Strengths and limitations

The study has many strong points which include – 1. Patient from a wide range of age groups were chosen for the study. 2. Patients were randomly assigned to either of the surgical groups. 3. The results were statistically correlated.

The limitations of the study include – 1. The study being a hospital based study cannot be applied to the general population. 2. The study period was limited and hence the parameters could not be studied long term. 3. The sample size should be larger in order to confirm the findings of this study.

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