

## Research Article

# Outcomes of Suturing Triangular Shaped Trabeculectomy Flap Using Single Versus Double Suture Techniques

Zeeshan Kamil<sup>1</sup>, Qirat Qurban<sup>2</sup>, Shehla Dareshani<sup>3</sup>

<sup>1-3</sup>B.H.Y Hospital, Karachi

### Abstract

**Background:** A gold standard surgical technique, trabeculectomy is used in the management of glaucoma which is not controlled medically to lower the intraocular pressure (IOP) by creating a conduit via the sclera via which aqueous humor passes into the subconjunctival space through the anterior chamber.

**Objective:** This study assesses the reduction in intraocular pressure (IOP) with two suturing techniques during trabeculectomy with a triangular shaped scleral flap.

**Method:** This study was carried out from January 2019 to June 2019 at BHY Hospital, Karachi and engaged patients belonging to either gender between 40 to 60 years of age. Patients included had primary open angle glaucoma with IOP > 24 mmHg despite full medical treatment. Patients having other types of glaucoma or previous history of undergoing trabeculectomy were excluded from the study. Trabeculectomy with triangular shaped scleral flap was performed on patients of both the groups with the difference being the number of sutures placed and their site. In group A, flap was approximated using a single suture, applied at the apex of the triangular tip, whereas two sutures were passed in group B on each side of the triangle close to the flap apex.

**Results:** The study comprised a total of twenty-four patients divided in two equal groups. Mean age was  $49.3 \pm 3.61$  years. Mean pre-operative IOP in all the patients was  $26.9 \pm 1.48$  mmHg whereas post-operative mean IOP at the end of follow up was  $14.0 \pm 2.08$  mmHg in group A and  $15.1 \pm 1.67$  mmHg in group B patients ( $p = 0.181$ ). Two patients of group A reported hypotony in the immediate postoperative period which was managed conservatively where as one patient from group A and one patient from group B required revision surgery owing to episcleral fibrosis.

**Conclusion:** Both techniques were found to be equally effective for lowering the IOP with similar minimal risk profile.

**Corresponding Author | Dr. Zeeshan Kamil**, Consultant Ophthalmologist, B.H.Y Hospital, Karachi **Email:** dr.zeeshankamil@yahoo.com

**Keywords:** Trabeculectomy, scleral flap, open angle glaucoma

### Introduction:

A gold standard surgical technique, trabeculectomy is used in the management of glaucoma which is not controlled medically to lower the intraocular pressure (IOP) by creating a conduit via the sclera via which aqueous humor passes into the subconjunctival space through the anterior chamber<sup>1</sup>. Long-term success rate of performing trabeculectomy in medically uncontrolled glaucoma varied from 48% to 98% in the long duration<sup>2,3</sup>. Owing to the difficulties associated with the ini-

tial post-operative IOP management through full thickness glaucoma surgeries, modified non-penetrating filtration surgery via formation of scleral flaps was designed during trabeculectomy to evade the incidence of surgical complications<sup>4</sup>. Scheming of partial thickness scleral flaps over the internal sclerostomy assist in enhancing the flow of aqueous by superior IOP results subsequent to reduced likelihood of hypotony development and consequences such as loss of depth of the anterior chamber, blood aqueous barrier subsidence, anterior chamber haemorrhage, suprachoroidal haemo-

rrhage, hypotony maculopathy, choroidal effusion, cataract development and aqueous misdirection in the initial post operative days<sup>5</sup>. Crafting of the original scleral flap during trabeculectomy procedure encompassed structuring a partial thickness rectangle shaped scleral flap together with the removal of a lengthened wedge of trabecular tissue, tailored in an attempt to conserve an adequate echelon of IOP over a period of time and avert the occurrence of complications<sup>6,7</sup>. The revisions included limbal-based or fornix-based conjunctival flaps, use of adjunct anti-metabolite treatment, altering the form and extent of the scleral flap and internal sclerostomy, level of scleral flap closure approximation with the aid of amount of sutures passed through, the location and suture tension which can be attuned or lysed and facilitate in the dependable management of aqueous flow thus dipping the hazard of premature post-operative hypotony formation<sup>8,9</sup>. In addition to the alterations to aid in preserving an acceptable IOP over an extended period of time, IOP management is also chiefly reliant on the sub-conjunctival healing response<sup>10</sup>. In spite of the existence of a diversity of modified procedures, there is a dearth of literature which compares the efficacy and advantage amongst scleral flaps using diverse suture techniques. Owing to the shortage of relative literature, this study was conducted to evaluate the results in relation to IOP management and risk of complications after using single suture versus double suture technique to approximate triangular shaped scleral flaps among patients enduring trabeculectomy.

### Methods:

The quasi-experimental study was conducted at BHY Hospital, Karachi from January 2019 to June 2019 and recruited twenty four patients comprising of both males and females between the ages of 40 to 60 years. The inclusion criteria incorporated patients having primary open angle glaucoma (POAG) with IOP greater than 24 mmHg despite full medical treatment (on three anti glaucoma topical IOP lowering drugs i.e carbonic anhydrase inhibitors, beta blockers & prostaglandin analogues). IOP was measured once using the Goldmann applanation tonometer (GAT) straddled on a slit lamp. Patients having other types of glaucoma or those who underwent previous trabeculectomy surgery, co-

morbidities (diabetes, hypertension, hyperlipidemia, respiratory and cardiovascular disease), and presence of eyelid deformity were excluded from the study. Data of every patient was collected and documented. Patients were recruited using convenience-based sampling and were divided at random into two groups, Group A and Group B. The surgical procedure was clarified to the patients and verbal informed consent was taken from each patient. Study was approved by the Ethical Review Committee. Surgery was done **under local anaesthesia**. Trabeculectomy surgery with triangle-shaped scleral flap was performed on patients of both groups with the difference being the number of sutures placed and their site. A limbal based incision was constructed among all the patients. Over-lying conjunctiva and episclera was detached in one quadrant and location was cleaned off for the surgical procedure. A partial-thickness incision in the sclera in a triangular way (3 mm each side) was made, in all the patients of both the groups, behind the limbal region tangentially via Baeyer blade followed by formation of the scleral tunnel using a crescent blade. The sides of the flap of the sclera were cut up-to the limbal region using a blade. A slit was made centrally in the outlying cornea was made using a blade underneath the base of the scleral flap to enter the anterior chamber. An extended block of trabecular was removed and scissors were used to create a peripheral iridectomy. In group A, flap was approximated and positioned over the sclera bed using a single suture, applied at the apex of the triangular scleral flap tip, whereas in group B patients, dual sutures were passed on either side of the triangle adjacent to the tip of the scleral flap. Paracentesis of the anterior chamber was carried out to guarantee the patency of the scleral tunnel. Conjunctiva was then sewed back over the flap of the sclera ensuring no free space persisted in between the adjacent sutures. All the surgeries were performed by a sole surgeon. To ensure the reliability of each surgery in the construction and placement and subsequent suturing of scleral flaps, following subjective criteria was ensured; scleral flap thickness between half and two thirds, centrally positioned sclerostomy with a span of up to 1 millimeter and next to suture ligature, a proportionally situated flap of the sclera with individual corner securely into the matching scleral bed angle with adequate and equivalent tautness of the

sutures among all the surgical procedures. Key conclusion measure was post operative reduction in intraocular pressure and related problems. All the patients were followed for a period of up to two months after the surgery (1<sup>st</sup> post op day, 3<sup>rd</sup> post op day, 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 8<sup>th</sup> week). IOP measurements were taken at each visit and observed for the presence of any complications such as scarring, bleb leak, hypotony, infection, hyphema or choroidal detachment. The entire post-operative follow-up and results of the surgeries were evaluated by another co-author.

### Results:

The study comprised of twenty four patients divided among two groups with twelve patients in each group. Mean age was  $49.3 \pm 3.61$  years (group A =  $48.9 \pm 3.61$  years, group B =  $49.8 \pm 3.73$  years). There were fourteen (58.3%) males and ten (41.6%) females (group A had 6 males and 6 females; group B had 8 males and 4 females). The right eye was involved in eleven (45.8%) patients whereas the left eye was involved in thirteen (54.2%) patients (group A had 6 right eyes and 6 left eyes; group B had 5 right eyes and 7 left eyes involved). Mean pre operative intraocular pressure was  $27.2 \pm 1.63$  in group A while it was  $26.7 \pm 1.35$  mmHg in group B (p-value = 0.461). Post-operative mean intraocular pressure at the end of follow up period of two months was  $14.0 \pm 2.08$  mmHg in group A and  $15.1 \pm 1.67$  mmHg in group B patients, p-value = 0.181 by Independent sample T test. Data were stratified according to age, gender and laterality and the T test was applied but the results were statistically insignificant in all cases. (Table 1)

A total of two patients from group A established hypotony (IOP < 6mmHg) on postoperative day 1 which was managed with conservative treatment. One patient

of each group developed episcleral fibrosis and was advised revision surgery. Another patient from group A and two patients from group B required continuation of a single topical antiglaucoma therapy. Patients from neither group developed infection or endophthalmitis. Mean follow up period was  $58.9 \pm 5.17$  days.

### Discussion:

Post trabeculectomy surgery, the scleral flap is secured by the help of sutures which provide ample strain to hamper the outflow of aqueous humor. The strain provided by the scleral flap and sutures is the chief controller of the IOP especially in the early post operative period until considerable healing occurs to prevent the formation of hypotony. The strain is also useful in cases of angle closure glaucoma in order to maintain an adequate resistance to the aqueous outflow and prevent anterior chamber flattening<sup>11</sup>. The drainage of aqueous humor via the flap of the sclera hinges on several influences like the construction of the tunneled sclera, appropriate approximation of the flap of the sclera to the underlying bed of the sclera and its capability to rise in order to assist in the drainage which in turn is dependent upon its pliability as prejudiced by the thickness of the scleral flap, tautness and placement of the sutures. Based on the aforementioned, this study was conducted to witness the consequences of using two different suture techniques for the approximation of triangular shaped scleral flap and their consequence on lowering post-operative IOP and risk of related complications. Scleral flap of adequate size and thickness was created in all the patients of both the groups, since a thicker or thinner flap would as a consequence lead to hinderance of the aqueous drainage and dehiscence of the flap leading to uncontrolled IOP<sup>12</sup>.

A model study was performed to evaluate the result of scleral flap proportions, number and location of sutures on postoperative IOP. It established that IOP dip was larger across thinner flaps owing to lesser firmness and resistance. It also demonstrated that a lower number of suture placement from 5 to 3 or 2 resulted in greater IOP lowering effect. The aqueous humor outflow course was affected mostly by the number and position of sutures and was found to be less in the direction of the sutures and more toward the adjacent free margin of the flap hence showing that the posterior outflow of

**Table 1:** Post stratification Statistics

	Gender	N	Mean	Std. Deviation	P value
Pre-op IOP	Male	14	26.436	1.2119	0.571
	Female	10	27.600	1.6138	
Post-op IOP	Male	14	14.329	2.0386	0.510
	Female	10	14.920	1.8042	
Pre-op IOP	Right	11	26.909	1.2243	0.113
	Left	13	26.931	1.7187	
Post-op IOP	Right	11	14.309	1.8839	0.857
	Left	13	14.800	2.0091	
Pre-op IOP	≥ 50	13	26.915	1.4229	0.881
	< 50	11	26.927	1.6168	
Post-op IOP	≥ 50	13	14.508	1.8558	0.273
	< 50	11	14.655	2.0954	

aqueous humor was enhanced by introducing the sutures along the sides while leaving the posterior edge free<sup>6</sup>. A study observed that triangular shaped scleral flaps showed considerably higher immediate post operative intra ocular pressures if greater number of sutures were used (3 or more) as compared to a single suture since as the number of sutures placement was increased, the post operative pressure reduction decreased<sup>13</sup>. Similarly, another study conducted among Indian eyes using single scleral flap suture technique in trabeculectomy showed a 97% successful reduction in intraocular pressure with complications such as bleb leak in two patients which was achieved therapeutically with the aid of large sized bandage soft contact lens (BCL) and topical antibiotics; shallow anterior chamber (AC) in a single patient and hypotony among three patients out of ninety eight patients which was accomplished medically via topical and oral steroid<sup>14</sup>.

The conclusions of the above-mentioned literature associated with the explanations made in the present study. Different types of suture techniques have been previously used for flap closure in trabeculectomy. In this study, the patients of both the groups A and B endured trabeculectomy with triangle shaped scleral flap using single suture at the apex and double suture on each side close to the apex technique. The decrease in IOP amongst both the groups was not considerably substantial and both the techniques showed to be equally effective in the noteworthy decrease of IOP. The depth of the triangular scleral flap was also reserved as similar among every patient of either group between half to two third with the amount and tension of sutures being similar among each patient of both groups. All the patients were followed up for a two month period as compared with the extended intervals among prior studies<sup>6,11,14,15</sup>. A total of two patients of Group A ended up with Hypotony (IOP < 6 mmHg) one day post operatively which was managed with conservative treatment. This was possibly due to the inaccurate design, depth of the flap of the sclera or inadequate tightening of the suture leading to increased outflow. One patient of each group developed episcleral fibrosis and was advised revision surgery. Another patient from group A and two patients from group B required continuation of a single topical antiglaucoma therapy. No infection or endophthalmitis was reported

by patients from either group.

The study comprised of comparison between two suture techniques thus helping ophthalmologists to decide and undertake convenient suture manipulation if needed postoperatively with either single or double sutures as well as easier revision surgeries. However, this was a small sample study and larger trials are required to further establish the significance of the suture techniques.

### Conclusion:

Both the suturing techniques were found to be almost equally effective in terms of significantly lowering the intraocular pressure with similar minimal risk profile. Further large scale studies are required to bridge the lack of comparative literature.

**Ethical Approval:** Given

**Conflict of Interest:** The authors declare no conflict of interest.

**Funding Source:** None

### References:

1. Bin Ibrahim IH, Bergström AK. The role of trabeculectomy in enhancing glaucoma patient's quality of life. *Oman J Ophthalmol.* 2017;10(3):150-154.
2. Sood, D, Rathore, A, Sood, I. Long-term outcome of combined trabeculotomy–trabeculectomy by a single surgeon in patients with primary congenital glaucoma. *Eye* 2018;32(6):426–432.
3. Tabassum G, Ghayoor I, Ahmed R. The Effectiveness of Conventional Trabeculectomy in Controlling Intraocular Pressure in Our Population. *Pak J Ophthalmol* 2013;29(1):26-30.
4. Sousa D, Pinto LA. Trabeculectomy – Prevention and Management of Complications. *European Ophthalmic Review* 2018;12(2):98.
5. Samsudin A, Eames I, Brocchini S, Khaw PT. The Influence of Scleral Flap Thickness, Shape, and Sutures on Intraocular Pressure (IOP) and Aqueous Humor Flow Direction in a Trabeculectomy Model. *J Glaucoma.* 2016;25(7):704-712.
6. Xiahou L, Liu C, Zhou W, Yang S. Microsurgical scleral drainage and trabeculectomy-scleral flap adjustable suture combination technique in the treat-

- ment of primary glaucoma. *Pak J Med Sci.* 2020; 36(2):234-239.
7. Rowlands MA, Maharaj ASR. A review of sclera flap shape on trabeculectomy outcomes. *Vis Pan-Am.* 2016;15(3):70-74.
  8. Jeong LM, Rohan BP, Aleksandra M. Outcomes of a Modified Trabeculectomy Closure Technique, *Journal of Glaucoma.* 2019;28(7):584-587.
  9. Matlach J, Hipp M, Wagner M, Heuschmann P, Klink T, Grehn F. A comparative study of a modified filtering trabeculotomy and conventional trabeculectomy. *Clin Ophthalmol.* 2015;9(2):483-492.
  10. Khaw PT, Chang L, Wong TT, Mead A, Daniels JT, Cordeiro MF. Modulation of wound healing after glaucoma surgery. *Curr Opin Ophthalmol* 2001; 12(3):143–148.
  11. Tse KM, Lee HP, Shabana N. Do shapes and dimensions of scleral flap and sclerostomy influence aqueous outflow in trabeculectomy? A finite element simulation approach. *Br J Ophthalmol.* 2012;96(4): 432–37.
  12. Dhingra S, Khaw PT. The Moorfields Safer Surgery System. *Middle East Afr J Ophthalmol.* 2009;16(3): 112–15.
  13. Megan A, Maharaj ASR. A Review of Scleral Flap Shape on Trabeculectomy Outcomes. *Vis. Pan-Am.* 2016;15(3):70-74.
  14. Kumar M, Parveen S, Chauhan L. Midterm outcome of single scleral suture technique in trabeculectomy and phacotrabeculectomy: a simplified approach. *Ther Adv Ophthalmol* 2019;11(2):1–8.
  15. Grehn F, Klink T. A new 6 o'clock traction suture technique for glaucoma filtration surgery. *J Glaucoma.* 2011;20(1):28–29.