ORIGINAL ARTICLE

What to Choose for Trabeculectomy, 10/0 Nylon Monofilament or 8/0 Virgin Silk?

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ABSTRACT

Purpose: To compare between 10/0 nylon monofilament and 8/0 virgin silk for conventional trabeculectomy in terms of rate of complications and bleb morphology.

Study Design: Quasi experimental study.

Place and Duration of Study: Abbasi Shaheed Hospital, Karachi, from January 2017 to December 2018.

Methods: Thirty six patients who underwent conventional trabeculectomy with 6 months follow-up were included. Trabeculectomy for congenital, neovascular, traumatic glaucoma, revised surgery and laser trabeculoplasty were excluded. In group A, scleral flap and conjunctiva were closed with 8/0 virgin silk and in group B, 10/0 nylon monofilament was used. Main outcome measure was complications.

Results: Group A had 13 (36%) and group B had 23 (63.9%) patients. Mean age was 55.5 ± 10.69. Pre-operative Intraocular pressure (IOP) was 33.4 ± 6.3 and 33.5 ± 12 mm Hg in group A & B respectively. Postoperatively at 3rd month IOP was 16.8 in group A and 15.0 in group B (p = 0.24).Shallow Anterior chamber was in 53% (n = 7) patients with 8/0 silk and 13% (n = 3) patients with 10/0 nylon with p value of < 0.05. Seidel test was positive in 38% (n = 5) patients in group A (p < 0.01). Re-suturing was done in 38% (n = 5) patients in group A with a p-value (p < 0.01).

Conclusion: Shallow anterior chamber, wound leak with positive seidel test and additional intervention for re-suturing were more common in group A than group B. Diffuse blebs were frequently seen with both suture materials. Suture material does not affect final intra ocular pressure and success of trabeculectomy.

Key Words: Bleb, Trabeculectomy, 10/0 Nylon, 8/0 silk.

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INTRODUCTION

Trabeculectomy is the gold standard and most commonly performed procedure for lowering intra ocular pressure in glaucoma not responding to medical or laser treatment.[1] Studies report superior results of trabeculectomy compared with medical treatment in lowering intra ocular pressure.[2] Most of the trabeculectomies achieve successful outcome and lower intra ocular pressure (IOP) in the long run thereby reducing progression of glaucoma.[1]

Surgical management of glaucoma is continuously evolving by the surgeons in recent years. There are a variety of new techniques including fornix versus limbus based flaps, adjustable sutures, trabeculectomy with antimetabolites, minimally invasive glaucoma surgery and non filtering glaucoma surgery. Diverse range of drainage devices and adjunct tools are now available to surgeons to improve the outcome of trabeculectomy.[3]

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Preservation of adequate aqueous outflow through the fistula formed by trabeculectomy is most important factor to prevent bleb failure. This includes size of scleral flap, internal sclerostomy and thickness of the flap. Excess aqueous drainage to lower intra ocular pressure will lead to ocular hypotony, maculopathy and choroidal detachment.[4,5] Correct tension of the scleral flap and the speed of aqueous filtration are regulated by the sutures. They sometimes require postoperative manipulations including suture adjustment, Argon laser suture lysis or manual suture release.[6,7]

Standard trabeculectomy results in 1 – 2% cases of ocular hypotony.[8] It can lead to complications including flat anterior chamber, corneal edema, maculopathy, cataract and loss of vision.[9]

Various studies have been conducted regarding mechanism of scleral flap and different techniques for wound closure.[3,6,7] In this study we have compared wound related complications and bleb morphology using 10/0 nylon monofilament with 8/0 virgin silk for closing scleral flap and conjunctival tenon closure. It will help us to understand the role of suture material in achieving desired bleb formation and associated complications after trabeculectomy.

METHODS

This was a quasi experimental study performed in the department of Ophthalmology, Abbasi Shaheed hospital, Karachi. The study adhered to the tenets of Declaration of Helsinki. Written informed consent was taken from every patient prior to the surgery. Patients above 18 year of age, both genders, without antimetabolites, minimum follow up of 6 months from January 2017 to December 2018 were included. Trabeculectomy for congenital, neovascular, traumatic glaucoma, revised trabeculectomy and anterior segment laser trabeculoplasty were excluded from the study. Trabeculectomies were performed under retrobulbar anaesthesia.

All the trabeculectomies were fornix based conjunctival flap at superior temporal or superior nasal site. Bridle traction suture with silk 4/0 was used to stabilize the eye. Conjunctival incision was made 1mm posterior to the limbus with Westcott scissors. Conjunctiva and tenon's capsule was separated from sclera. Non-tooth corneal forceps was used to prevent from button-holing of conjunctiva. Bleeding was controlled with wet field cautery. A rectangular partial thickness scleral flap measuring 3 × 4 mm was created with surgical blade no 11. Full thickness window was made in sclera measuring 1 × 2 mm with help of surgical blade no 15. This was followed by iridectomy of prolapsed iris tissue with iris scissors. Scleral flap was closed at two ends with sutures. Paracentesis was made to check the patency of scleral flap and adequate flow of fluid through it. Conjunctiva and tenon were closed with interrupted sutures. Anterior chamber was completely packed with air bubble. Adequacy of wound closure, suture tension and absence of leakage was ensured after every surgery. Post operatively systemic antibiotics (tab ciprofloxacin 500 mg) and analgesics were prescribed for 5 days. Topical steroids (dexamethasone) and antibiotic (Moxifloxacin) were given for six weeks. Steroid was tapered in three months.

These cases were divided into 2 groups. Group A consisted of patients where scleral flap and conjunctiva were closed with 8/0virgin silk (Aurolab, Silk sutures, double arm).Group B had sclera and conjunctiva closed with 10/0 nylon monofilament (Aurolab, Nylon sutures double arm).Their wound was assessed on first post-operative day and on every follow up visit on slit lamp. These patients were examined for shallow anterior chamber (AC), wound leak, iritis, hyphema, suture abscess, striate keratopathy, malignant glaucoma, choroidal detachment, macular hypotony, endophthalmitis, block peripheral iridectomy (PI) and intra ocular pressure (IOP) measurement with help of applanation tonometer. Sutures were removed after 3 weeks.

Seidel test was performed in every patient on first postoperative day and subsequently. Topical anaesthesia was instilled in the conjunctival sac. Moistened fluorescein strip was directly applied on the potential site of leakage. This was observed with slit lamp under cobalt blue light. In case of aqueous leak fluorescein dye was diluted and green stream of aqueous was seen flowing from the wound. Seidel positive patients were managed with pressure bandage for 48 hours after a drop of atropine. Patients in whom anterior chamber failed to form were taken to operation theatre. Anterior chamber was reformed with air and wound reclosed with additional sutures. In case of high IOP due to drainage obstruction ocular massage was done with muscle hook.

Data was collected and analyzed using SPSS version 21. Mean with standard deviation (SD) was calculated for numerical variables like age, duration of

Table 1: *Percentage distribution of demographic features of trabeculectomy patients.*

Variables	Group A n = 13 (36.15)	Group B n = 23 (63.9%)	Total (%)
Mean age	52.6	57.0	
Minimum	33	45	55.5 ± 10.69 SD
maximum	70	74	
Gender			
Male	10 (77%)	11 (48%)	21 (58.3%)
Female	3 (23%)	12 (52%)	15 (41.7%)
Laterality			
Right eye	7(54%)	12 (52%)	19 (52.8%)
Left eye	6(46%)	11 (48%)	17 (47.2%)
Duration of glaucoma	2.3 years	3.4 years	3 years ± 3.6 SD
Mean Pre op IOP	33.46mmHg	33.5 mmHg	33.4 ± 10 SD mmHg
Type of glaucoma			
Open angle glaucoma	12 (92%)	14 (60%)	26 (72%)
Angle closure glaucoma	1 (8%)	9 (40%)	10 (28%)
Bleb morphology			
Thin polycystic	3 (8.3%)	3 (8.3%)	6 (16.6%)
Diffuse	9 (25%)	15 (41.6%)	24 (66.6%)
Flat avascular	0	5 (13.8%)	5 (13.8%)
Tenon cyst	1 (2.6%)	0	1 (2.6%)
Comorbidity			
Diabetes mellitus	3 (23%)	0	3 (8.3%)

glaucoma, preoperative and postoperative IOP. Frequencies and percentages were computed for categorical variables like gender, laterality of eye, wound leak, shallow anterior chamber, iritis, hyphema and suture abscess. Intra ocular pressure of less than 20 mmHg at 6 month after trabeculectomy without any medication was labeled as successful. Trabeculectomy was defined failed, if IOP was 20 mmHg or more in spite of maximum medical management.[10,11] Pearson chi square was used to compare categorical variables in two suture groups. Paired Student t test was used to compare pre and postoperative IOP in two groups. P value less than 0.05 was considered statistically significant.

RESULTS

Total number of patients in this study were 36. Mean age of the patients in group A was 52.6 ± 10.12 SD years and 57 ± 10.84 SD years in group B. Etiology of glaucoma, morphology of bleb type and details of other demographic features of both groups are given in Table 1.

Table 2 shows the comparison of means of IOP preoperatively and post operatively between two groups with help of paired t-test. There was no significant difference in post-operative IOP amongst suture 8/0 and 10/0 calculated by pair t test at 3rd and 6th month. Pearson chi square test showed statistically significant difference in Seidel positive test among two groups with p value ($p < 0.01$). Re-suturing was done in 3 patients in group A with statistically significant p value ($p < 0.01$).There was a significant difference in wound leak and re-suturing among two groups. Difference in frequency of ocular massage and pressure patching were statistically insignificant between two groups calculated by Pearson chi square test.

Pearson chi square test was used to compare the rate of complications between two groups including

Table 2: *Comparison of means between two groups.*

Variables	Group A (n = 13)	Group B (n = 23)	P value
Pre op IOP*	33.46	33.50	.992
Postoperative			
1 week IOP*	13.5 ± 7.4	12.7 ± 4.0	.678
1 month IOP*	16.2 ± 4.2	14.6 ± 4.2	.358
3 month IOP*	16.8 ± 4.5	15.0 ± 5.2	.239
6 month IOP*	16.3 ± 4.4	15.4 ± 4.1	.224
Functional bleb^	10 (77%)	18 (78%)	.926
Failed bleb^	3 (23%)	5 (21%)	.926
Seidel +ve^	5 (38%)	0	.001
Ocular massage^	1 (7.6%)	1 (4.3%)	.674
Pressure patching^	3(23%)	3 (13%)	.577
Re-suturing in theatre^	5 (38%)	1 (4.3%)	.008

*Pair t test ^chi square

Table 3: *Comparison of complications between two groups.*

Complications #	8/0 silk	10/0 Nylon	P value
Shallow Ac	7 (53%)	3 (13%)	.009*
High IOP	1 (7.6%)	3 (13%)	.624
Low IOP	7 (53%)	1 (4.3%)	.001*
Hyphema	1 (7.6%)	2 (9%)	.917
Uveitis	0	2 (9%)	.274
Block PI	0	1 (4.3%)	.446
Tenon cyst	1 (7.6%)	0	.177
Choroidal detachment	1 (7.6%)	0	.177
Cataract	4 (30%)	2 (9%)	.088
Wound leak	5 (38%)	0	.001*

#Pearson chi square test * Statistically Significant

hyphema, uveitis, block peripheral iridectomy, tenon cyst, cataract and choroidal fold. Details of the complications of trabeculectomy among two groups are given in Table 3.

DISCUSSION

The main outcome of our study was rate of complications related to different sutures used between two groups. Shallow anterior chamber with low intraocular pressure was more frequent in group A 53% (n = 7) where 8/0 silk was used to close the wound as compared to 10/0 nylon 13% (n = 3). A review of trabeculectomies closed with silk 8/0, done by Adegbehingbe in Nigeria, consisting of 53 patients had reported shallow anterior chamber and hypotony in 5.5% (n = 4) of cases with hyphema being most common 15.3%.[10]They had managed all of their cases conservatively.[10] Hyphema was not frequently encountered in our patients, since at the end of surgery anterior chamber was washed and fully packed with air. A study with 10 year review of trabeculectomies on 433 patients had reported shallow anterior chamber in 4.2% (n = 18) of cases followed by uveitis in 2.3% (n = 10) cases.[11] These surgeries were closed with 8/0 silk but included both fornix and limbal based flaps.[11]

In group B, with 10/0 nylon closure, shallow anterior chamber was seen in 13% (n = 3), low IOP in 4.3% (n = 1), hyphema and uveitis in 9% (n = 2) each. Tulay Simsek had used 10/0 nylon for conventional trabeculectomy, observed shallow anterior chamber in 34.3% (n = 11), patients with iridocorneal touch in 15.6% (n = 5) patients.[12] Anand et al had reported shallow anterior chamber in 22.5% (n = 32), hyphema in 12.7% (n = 18), transient wound leak and choroidal detachment in 2.8% (n = 4), blebitis 0.7% (n = 1) and malignant glaucoma in 1.4% (n = 2) in patients with wound closure with 10/0 nylon.[13] Only one of his patients required re-suturing. Alwitry et al, had reported 25.8% wound leaks after fornix based trabeculectomy and 2.7% required re-suturing.[14] Fortunately we did not encounter blebitis and endophthalmitis within 6 months follow-up time. The difference in frequencies of complication is possibly due to the small sample size that included both angle closure and open angle glaucoma. We had 28% angle closure glaucoma patients as history of angle closure glaucoma predisposes to postoperative flattening of anterior chamber.[15]

In group A where 8/0 virgin silk was used seidel test was positive in 38% (n = 5) patients and all of them required re-suturing. In group B, none of the patients had positive seidel test but one patient had to undergo anterior chamber reformation. Frequency of ocular massage and pressure patching was not associated with any specific suture type. In an early postoperative period, there was change in the dynamics of aqueous outflow drainage. Equilibrium fluctuated between the two extremes resulting in over or under filtration. Over-filtering blebs must be managed urgently to avoid complications of ocular hypotony and flat anterior chamber. Whereas under-filtering blebs are initially managed conservatively.[16] Their further management depends on level of IOP, bleb type, anterior chamber depth and time since surgery.[17]

Cataract was seen in 30% (n = 4) cases in group A with silk 8/0 and 9% (n = 2) in group B with nylon 10/0 within 6 month duration. In a national survey of trabeculectomy in UK cataract was the commonest late complication and was reported in 20% (n = 251) cases but they had large sample size.[18] Development of cataract soon after trabeculectomy has been associated with postoperative hypotony and flat or shallow anterior chamber.[19] Since the frequency of shallow anterior chamber was predominant in group A, more frequent is the development of cataract in that group. But the development of cataract is not related to the type of sutures as indicated by the p value.

Intra ocular pressure was a secondary outcome in this study. Mean Pre-operative IOP was 33.4 ± 10 SD mm Hg in our study. Post-operatively at first week IOP was 13.5 ± 7.4 mm Hg in group A and 12.7 ± 4.0 mm Hg in group B. By 3rd month IOP was 16.8 ± 4.5 mm and 15.0 ± 5.2 mm in group A and B respectively. Mean pre op IOP by Adegbehingbe was 32.5 +/- 6.2 mmHg.[10] Their mean post op IOP on 1st post op day

was 10.6 +/- 2.3 mmHg and at 3rd month was 16.8 +/- 7.2 mmHg.[10] Post-operative control of IOP is similar to the above study. At sixth month, IOP was 16.3 ± 4.4 in group A and 15.4 ± 4.1 in group B. There was statistically no significant difference among the two groups in our study. Sutures did not affect post operative IOP.

Diffuse blebs were more common after trabeculectomy with 10/0 nylon 41.6% (n = 15) and 8/0 silk i.e. 25% (n = 9).Avascular blebs in 8.3% (n = 3) in both groups. Diffuse blebs were seen in 72.7% (n = 40) and cystic in 10.9% (n = 6) in Nigerian study.[10] Suture materials did not affect the bleb morphology. An ideal bleb should be a low-lying diffuse bleb with reduced vascularity, cystic changes, IOP towards low teens, well-formed AC with tight conjunctival closure.[20] Trabeculectomy was functional in 77% (n = 10) and 78% (n = 18) in group A and group B respectively. Therefore, successful trabeculectomy and an ideal bleb did not depend on the material of suture used in our study.

Nylon 10/0 suture has an advantage of high elasticity, low antigenicity, negligible tissue inflammation and prolong tensile strength.[21] These factors help to make a water tight closure and avoid early shallow anterior chamber due to leakage. However, they can lead to a number of complications after long periods, like vascularization, astigmatism, loosening, mucous accumulation, suture break down causing giant papillary conjunctivitis, limbitis, conjunctivitis, and suppurative keratitis.[22] Silk is associated with greater amount of tissue inflammation but it is easy to handle and tie, well tolerated by patients in terms of comfort.[22] Polyglactin 9/0 sutures were used by Tyler et al for wound closure after trabeculectomy. He had proposed a needle should be minimally spatulated, micropoint, with diameter of the needle similar to the diameter of suture to minimize leakage through suture track.[23] Nylon 10/0 has specific feature of being minimally spatulated micropoint needle as compared to 8/0 silk to reduce postoperative leakage.

In the literature, comparisons have been done between Limbal based and fornix based trabeculectomies, with or without antimetabolites.[24] Not only Limbal based, fornix based, thickness, shape and size of scleral flap, suturing technique are important but type of suture material is equally important validated by this study, to maintain wound integrity and making a successful trabeculectomy.

Limitation of the study is small sample size, being retrospective in nature and single-centered.

CONCLUSION

Shallow anterior chamber, wound leak and low IOP with positive seidel test were more common with 8/0 virgin silk as compared to nylon 10/0 monofilament. Additional intervention where patients were taken back to operation theatre for re-suturing and reforming anterior chamber was more common where 8/0 virgin silk was used to close the wound as compared to nylon 10/0 monofilament. Bleb morphology is not affected by suture material. Suture material does not affect final intra ocular pressure and success of trabeculectomy. Suture selected for trabeculectomy does play a significant role to maintain wound integrity and final outcome.

Ethical Approval

The study was approved by the Institutional review board/ Ethical review board. **(OSP-IRB/2021/002)**

Conflict of Interest

Authors declared no conflict of interest.

REFRENCES

1. **Radhakrishnan S, Quigley HA, Jampel HD, Friedman DS, Ahmad SI, Congdon NG, et al.** Outcomes of surgical bleb revision for complications of trabeculectomy. Ophthalmology, 2009; **116 (9):** 1713-1718.
2. **Lichter PR, Musch DC, Gillespie BW, Guire KE, Janz NK, Wren PA, et al.** CIGTS Study Group. Interim clinical outcomes in the Collaborative Initial Glaucoma Treatment Study comparing initial treatment randomized to medications or surgery. Ophthalmology, 2001; **108 (11):** 1943-1953.
3. **Tse KM, Lee HP, Shabana N, Loon SC, Watson PG, Thean SY.** Do shapes and dimensions of scleral flap and sclerostomy influence aqueous outflow in trabeculectomy? A finite element simulation approach. British Journal of Ophthalmology, 2012; **96 (3):** 432-437.
4. **Matlach J, Hoffmann N, Freiberg FJ, Grehn F, Klink T.** Comparative study of trabeculectomy using single sutures versus releasable sutures. Clin Ophthalmol. (Auckland, NZ). 2012; **6:** 1019.
5. **Lu LJ, Hall L, Liu J.** Improving Glaucoma Surgical Outcomes with Adjunct Tools. J Curr Glauc Prac. 2018; **12 (1):** 19.

6. **Cohen JS.** Releasable scleral flap suture. Ophthalmol Clin North Am. 1988; **1:** 187-197.
7. **Melamed S, Ashkenazi I, Glovinsky J, Blumenthal M.** Tight scleral flap trabeculectomy with postoperative laser suture lysis. Am J Ophthalmol. 1990; **109:** 303-309.
8. **Watson PG, Jakeman C, Ozturk M, Barnett MF, Barnett F, Khaw KT.** The complications of trabeculectomy (a 20-year follow-up). Eye, 1990; **4 (3):** 425.
9. **Fourman S.** Management of cornea-lens touch after filtering surgery for glaucoma. Ophthalmology, 1990; **97 (4):** 424-428.
10. **Adegbehingbe BO, Majemgbasan T.** A review of trabeculectomies at a Nigerian teaching hospital. Ghana Med J. 2007; **41 (4)**.
11. **Agbeja-Baiyeroju AM, Omoruyi M, Owoaje ET.** Effectiveness of trabeculectomy on glaucoma patients in Ibadan. Afr J Med Med Sci. 2001; **30:** 39-42.
12. **Simsek T, Citirik M, Batman A, Mutevelli S, Zilelioglu O.** Efficacy and complications of releasable suture trabeculectomy and standard trabeculectomy. Inter Ophthalmol. 2005; **26 (1-2):** 9-14.
13. **Anand N, Mielke C, Dawda VK.** Trabeculectomy outcomes in advanced glaucoma in Nigeria. Eye. 2001; **15 (3):** 274.
14. **Alwitry A, Rotchford A, Patel V, Abedin A, Moodie J, King AJ.** Early bleb leak after trabeculectomy and prognosis for bleb failure. Eye, 2009; **23 (4):** 858-863.
15. **Austin MW, Wishart PK.** Reformation of the anterior chamber following trabeculectomy. Ophthalmic Surg. 1993; **24:** 461–466.
16. **Dorcs BJ, Sultan M, Tajammul A.** Trabeculectomy: a comparison between pressure patching and bleb repair in management of early onset leaking bleb. Professional Med J. 2006; **13:** 676-679.
17. **Shetty RK, Wartluft L, Moster MR.** Slit-lamp needle revision of failed filtering blebs using high-dose mitomycin C. J Glaucoma, 2005; **14 (1):** 52-56.
18. **Edmunds B, Thompson JR, Salmon JF, Wormald RP.** The national survey of trabeculectomy. II. Variations in operative technique and outcome. Eye, 2001; **15:** 441–448.
19. **Vuori ML, Viitanen T.** "Scleral tunnel incision" - trabeculectomy with one releasable suture. Acta Ophthalmologica Scandinavica. 2001; **79 (3):** 301-304.
20. **Sawchyn AK, Slabaugh MA.** Innovations and adaptations in trabeculectomy. Curr Opin Ophthalmol. 2016; **27 (2):** 158-163.
21. **Hutz W, Ullerich K.** Microsurgical suture material in ophthalmic microsurgery; instrumentation, microscopes and technique. Basel: Karger. 1987: 136-141.
22. **Acheson JF, Lyons CJ.** Ocular morbidity due to monofilament nylon corneal sutures. Eye, 1991; **5 (1):** 106.
23. **Smith JH, Macsai MS.** Needles, Sutures, and Instruments. In Ophthalmic Microsurgical Suturing Techniques. Springer, Berlin, Heidelberg. 2007: pp 9-20.
24. **Kirk TQ, Condon GP.** Modified Wise closure of the conjunctival fornix-based trabeculectomy flap. J Cataract Refract Surg. 2014; **40 (3):** 349-3s53.

Authors' Designation and Contribution

Erum Shahid; Assistant Professor: *Concepts, Design, Literature search, Data acquisition, Data analysis, Statistical analyses, Manuscript preparation, Manuscript review.*

Uzma Fasih; Associate Professor*: Concepts, Design, Data acquisition, Manuscript review.*

Arshad Shaikh; Professor: *Concepts, Design, Manuscript review.*