

Advancing Pterygium Surgery with the Reverse Striping Technique Using Locally Available Diamond Burr : A Prospective Cohort Study

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ABSTRACT

Objective: This prospective study aims to evaluate the efficacy and safety of the reverse striping technique using a locally available diamond burr, comparing it with conventional surgical methods.

Study Design: A Prospective Cohort Study

Place and Duration of Study: This study was conducted at the Eye Department of Fazaia Ruth Pfau Medical College, Karachi from November 2022 to November 2023.

Methods: After ethics approval and informed consent, patients underwent thorough pre-operative assessments. They randomized to receive either conventional surgery or the reverse striping technique. Post-operative follow-ups conducted to evaluate visual acuity, corneal astigmatism, recurrence rates, and patient satisfaction.

Results: The study cohort comprised 15 females (41.6%) and 25 males (58.3%) with a median age of 47.22 years. The mean visual acuity for the entire cohort was 0.62134 LogMAR preoperatively. Postoperative mean visual acuity was 0.4467 LogMAR in Group 3 and 0.795 LogMAR in Group 4, with no significant difference between preoperative and postoperative outcomes. The mean k1 and k2 readings showed a reduction of 1.5D in cylindrical numbers postoperatively. Recurrence rates were 10% (RT1) and 90% (RT0).

Conclusion: The reverse striping technique using a locally available diamond burr offers a promising alternative for pterygium surgery, with moderate visual acuity improvements, significant reduction in corneal astigmatism, and a low recurrence rate. Future research should focus on standardizing surgical methods and exploring additional treatments to enhance visual outcomes and further reduce recurrence rates.

Key Words: Pterygium, recurrence, astigmatism, Visual Acuity

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INTRODUCTION

Pterygium is a common ocular surface disorder that can cause discomfort and vision impairment^{1,2,3}. The abnormal tissue growth encroaching the cornea from the nasal side, a pterygium flattens the horizontal meridian of the cornea and consequently causes induced with the rule (WTR) astigmatism by mechanical traction^{4,5}.

Traditional surgical techniques for pterygium removal have been associated with a high rate of recurrence⁷,

leading to the development of innovative approaches such as the reverse striping technique using a locally available diamond burr. This prospective cohort study aims to examine the effectiveness and safety of this surgical method in comparison to conventional techniques⁸. By exploring the potential benefits of the reverse striping technique, we can contribute to the enhancement of pterygium surgery outcomes and ultimately improve the quality of patient care. The reverse striping technique using a locally available diamond burr offers a promising alternative for pterygium surgery augments with ant fibroblast drugs.

Through the rigorous collection and analysis of data, this prospective study aims to advance our understanding of pterygium surgery and contribute to the ongoing refinement of surgical techniques. By elucidating the potential benefits of the reverse striping technique using a locally available diamond burr, we aim to empower ophthalmologists with evidence-based insights to guide their clinical decision-making and ultimately enhance the standard of care for patients with pterygium.

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METHODS

This study was conducted at Eye department, Fazaia Ruth Pfau Medical College, Karachi from November 2022 to November 2023, on patients with primary pterygium after approval from Ethics and Research Committee (Ref no. IRB/03 dated 06.10.2020). After informed consent, a detailed history in relation to ocular and systemic disease was taken. A detailed ocular examination was recorded which includes visual acuity assessment (using Snellen’s visual acuity chart later converted to the logarithm of the minimal angle of resolution), Pinhole testing if V/A less than 6/12, Retinoscopy (objective and subjective), Keratometry using autokeratometer, distant direct ophthalmoscopy to assess the cornea, cataract, slit lamp examination to rule out conjunctival pathology, corneal assessment, anterior chamber angle and depth, intraocular pressure measurement (Goldmann applanation tonometer), retinal examination (using Volk 90D lens) to record optic disc and macular changes. All patients with unilaterally or bilaterally nasal pterygium were included in the study and patients with secondary pterygium or temporal pterygium were excluded. The pterygium was classified according to the thickness of the pterygium in to three grades as described by the researcher Grade T1 (When episcleral vessels clearly visible through the pterygium body); Grade T2 (when episcleral vessels underlying the pterygium body were partially obscured); and Grade T3 (when episcleral vessels underlying the pterygium body).

For our study we categorized the pterygium according to the length of the pterygium in to four categorize(Group 1 pterygium growth confined at conjunctiva, Group 2 pterygium touches the nasal limbus, Group 3 pterygium remained ≤ 2mm away from the pupillary zone at nasal cornea , Group 4 pterygium encroaching ≥ 2mm on the corneal touching or crossing the nasal pupillary zone. Only patients with Group 3and Group 4 were included in the study.

After informed consent for surgical procedure, 0.2 ml of xylocaine was injected at the center of the pterygium to raise the conjunctiva. A peritomy was done with blunt scissors, tenon capsule was separated from conjunctiva, 2.5mm of tenon capsule was removed and gentle cautery was done to maintain hemostasis. The abnormal conjunctival tissue was lifted and cutdown with scissors. A superior rectus holding forceps was used to lift the pterygium and pull (strip) towards the

corneal limbus, then using a diamond bur (a gentle touch on cornea) with continues irrigation was done to clear the attached remnant of pterygium debris from the cornea. Conjunctiva was secured using 8-0 absorbable sutures. At the end of the procedure, topical cyclopentolate drop installed to relieve the pain due to ciliary spasm along with a sub-conjunctival injection of antibiotic and steroid to reduce the inflammation.

Postoperatively, percentage of recurrent pterygium was the desired outcome. RT0 (no recurrent pterygium),RT1 (recurrent pterygium located only at sclera),RT2 (recurrent pterygium touches the limbus) and RT3(recurrent pterygium involving the cornea) . Statistically, we calculated our sample size keeping the following parameters in consideration, estimated efficiency rate of a standard treatment =60% P1, estimated efficiency rate of Pterygium removal using diamond burr was = 80% P2, Difference in efficiency of two treatments=20% P1-P2, Significant Level =5%, Power of the study= 90%, Sample size 40 subjects.

Table No. 1: Showing the Age, Sex, and Visual Acuity distributions of Study Participants.

Category 1 (Age)	Number of Patients
Group 1 - 20 to 30	19
Group 2 - 31 to 40	13
Group 3 - 41 to 45	8
Category 2 (Sex)	
Group 1 Male	25
Group 2 Female	15
Category 3 (VA)	
Group 1 - 6/9. to 6/12.	10
Group 2 - 6/18. to 6/24	13
Group 3 - 6/36 to 6/60.	17
Category 4 (Grade 3)	
Group 1 - 6/9. to 6/12.	10
Group 2 - 6/18. to 6/24	13
Group 3 - 6/36 to 6/60.	17

RESULTS

40 eyes of 35 patients (Five patients with bilateral pterygium) with primary pterygium were included in the study with a mean follow-up time of 12 months. The study population consisted of 15 females (41.6%) and 25 males (58.3%) with a median age of 47.22 years. The study cohort included 40 eyes with primary pterygium. Table 2 summarizes the baseline characteristics of our study sample.

Table No. 2: Descriptive Statistics of different variables

	Mean	Median	Mode	Standard Deviation
Age	47.23	48	40	4.90
Visual acuity Preoperative	0.63	0.60	1	0.33
Visual Acuity on Final Follow up	0.61	0.55	1	0.30
Group 3 K1/K2	43.35/45.85	42/46	43/46	0.13/0.26
Group 4 K1/K2	42.55/46.45	42/42	42/47	0.12/0.28

Visual Acuity: General (n=40): The mean visual acuity was 0.62134 Log MAR with 0.6020 Median, Mode 1 and 0.30831SD.

Visual Acuity: Group 3(n=20) and 4(n=20): The mean visual acuity on final postoperative follow-up was 0.4467,0.795 Log MAR with 0.477,1 Median, Mode 0.477 , 1 and 0.2458SD and 0.2655 in group 3 and 4 respectively with no significant difference between Preoperative and postoperative visual outcome.

Corneal Astigmatism k1/k2: The mean k1 and k2 reading in group 3 sample unit with primary pterygium was k1=43.35,k2=45.85, mode k143,k246, median k142, k246,SDk1=0.1312891,SD k2=0.812727, range k1=2, k2=3. The mean k1 and k2 reading in group 4 sample unit with primary pterygium was k1=42.55,k2=46.45,mode k1=42,k2=47,median 42

Recurrence Rate: Out of 40 patients, 90% (36 patients) remained in RT0 (no recurrent) and 10% (4 patients) in RT1 (recurrent pterygium at sclera). On final postoperative follow up with one line impotent in Visual acuity on Snellen's chart (preoperative mean V/A 0.63 and postoperative 0.61) and reduction of 1.5D of Cylindrical number on K1/K2 readings.

DISCUSSION

Patient Demographics and Study Cohort: This study evaluated the outcomes of pterygium surgery in a cohort of 35 patients (40 eyes) with primary pterygium, including five patients with bilateral cases. With a mean follow-up period of 12 months, our study population comprised 15 females (41.6%) and 25 males (58.3%), with a median age of 47.22 years. This demographic distribution indicates a slightly higher prevalence of primary pterygium among males in our sample.

Visual Acuity: Visual acuity is a vital measure of the success of pterygium surgery. In our study, the mean visual acuity for the entire cohort (n=40) was 0.62134 LogMAR, with a median of 0.6020 and a standard deviation of 0.30831. Analyzing the outcomes by group, the mean postoperative visual acuity in Group 3 (n=20) was 0.4467 LogMAR and 0.795 LogMAR in Group 4 (n=20), with medians of 0.477 and 1, respectively, and standard deviations of 0.2458 and 0.2655. Importantly, there was no significant difference between preoperative and postoperative visual outcomes. Our study results show a lesser degree of visual acuity improvement compared to these studies⁹. The discrepancy could be due to variations in surgical techniques, patient demographics, or the initial severity of the pterygium.

Corneal Astigmatism: Corneal astigmatism, assessed through k1 and k2 readings, provides additional insight into the impact of pterygium surgery on corneal shape. In Group 3, the mean k1 and k2 readings were 43.35 and 45.85, respectively, with standard deviations of 0.1312891 and 0.812727. In Group 4, the mean k1 and k2 readings were 42.55 and 46.45, with standard

deviations of 0.2655. Both groups showed a reduction of 1.5D in cylindrical number on k1/k2 readings postoperatively. Salih Sharif^{10,11}, Observed a significant reduction in corneal astigmatism postoperatively, with the mean k2 decreasing from 45.72 to 43.12 diopters^{10,11} and Kheirkhah et al¹⁴ reported significant improvements in corneal astigmatism, with mean k2 values decreasing from 46.00 preoperatively to 44.50 diopters postoperatively.

Our study demonstrates a notable reduction in corneal astigmatism, aligning with findings from other studies, although the degree of improvement varies. This variation may be attributed to differences in surgical techniques or patient selection criteria.

Recurrence Rate: Recurrence of pterygium is a crucial concern following surgery. In our study, 90% of patients (36 out of 40) showed no recurrence (RT0), while 10% (4 patients) had recurrence limited to the sclera (RT1). Despite these recurrences, there was only a slight improvement in visual acuity on the Snellen chart (preoperative mean V/A 0.63 to postoperative 0.61) and a reduction of 1.5D in cylindrical number on k1/k2 readings.

Researcher reported a lower recurrence rate of 15% at the one-year follow-up using conjunctival auto-graft transplantation.¹⁴ Clearfield et al¹⁵ found recurrence rates ranging from 5% to 39%, depending on the surgical technique used, with lower rates associated with the use of mitomycin C and conjunctival auto-graft.¹⁶

Our study's recurrence rate is comparatively lower, suggesting the effectiveness of our surgical approach in reducing recurrence. However, it still emphasizes the need for exploring adjunctive treatments or refined surgical techniques for further minimize recurrence.

CONCLUSION

In summary, our study indicates moderate improvements in visual acuity and corneal astigmatism following pterygium surgery, with a relatively low recurrence rate. Compared to other studies, our results show a lesser degree of improvement in visual acuity but a more favorable recurrence rate. These discrepancies highlight the variability in surgical outcomes and underscore the importance of optimizing surgical techniques and considering adjunctive therapies to enhance patient outcomes and reduce recurrence rates in the management of primary pterygium. Future research should focus on standardizing surgical methods and exploring additional treatments to improve visual outcomes and further reduce recurrence rates.

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