e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(1); 1068-1072

Original Research Article

Changes in Corneal Curvature and Visual Acuity in South Indian Adults after Pterygium Excision with Modified Sutureless, Glueless Limbal-Conjunctival Autograft: A Retrospective Study

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Received: 28-11-2025 / Revised: 27-12-2025 / Accepted: 29-01-2026

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Conflict of interest: Nil

Abstract:

Background: Pterygium is a common ocular surface disorder in tropical regions and is known to cause visual impairment by inducing corneal astigmatism and altering corneal curvature. Surgical excision with conjunctival autografting has been shown to improve corneal morphology and visual outcomes.

Objectives: To evaluate changes in corneal curvature and visual acuity following pterygium excision using a modified sutureless, glueless limbal-conjunctival autograft technique.

Materials and Methods: A retrospective analysis of 55 South Indian adults who underwent pterygium excision at Rajarajeswari Medical College and Hospital, Bengaluru, over 18 months was performed. Preoperative and postoperative (1 month and 3 months) keratometric values and best-corrected visual acuity were compared statistically.

Results: There was a statistically significant reduction in corneal astigmatism and improvement in best-corrected visual acuity following surgery ($p = 0.0001$).

Conclusion: Modified sutureless, glueless limbal-conjunctival autograft is an effective technique for pterygium surgery with significant improvement in corneal curvature and visual acuity.

Keywords: Pterygium; Corneal astigmatism; Visual acuity; Limbal-conjunctival autograft; Sutureless technique; Keratometry.

DOI: 10.25258/ijcpr.18.1.178

Introduction

Pterygium is a degenerative fibrovascular growth of conjunctival tissue extending onto the cornea and is particularly prevalent in populations residing in tropical and subtropical regions [1]. Environmental factors such as ultraviolet radiation, wind, and dust exposure play a significant role in its pathogenesis [2].

Clinically, pterygium can lead to ocular irritation, cosmetic disfigurement, and visual impairment. Visual loss is primarily attributed to induced corneal astigmatism, irregular corneal surface, and, in advanced cases, encroachment onto the visual axis [3,4].

Pterygium alters corneal curvature by exerting tractional forces on the cornea, resulting in flattening along the horizontal meridian and causing with-the-rule or irregular astigmatism [5]. Several studies have demonstrated a direct correlation between pterygium size and the degree of corneal astigmatism induced [6,7].

Surgical excision remains the definitive treatment for pterygium. Bare sclera excision, though simple, is associated with high recurrence rates [8]. Conjunctival autograft transplantation has therefore become the preferred technique due to lower recurrence and better cosmetic outcomes [9].

Inclusion of limbal tissue in conjunctival autografts helps restore the limbal stem cell barrier, thereby further reducing recurrence [10]. Conventional fixation using sutures or fibrin glue is effective but may be associated with postoperative discomfort, inflammation, or increased cost [11].

Modified sutureless, glueless limbal-conjunctival autograft techniques rely on natural fibrin adhesion

and have shown encouraging results with reduced surgical time and postoperative morbidity [12]. However, data on corneal curvature and visual outcomes following this technique in South Indian populations remain limited, prompting the present study.

Materials and Methods

This retrospective study was conducted at the Department of Ophthalmology, Rajarajeswari Medical College and Hospital, Bengaluru, over a period of 18 months. Medical records of 55 patients who underwent primary pterygium excision with modified sutureless, glueless limbal-conjunctival autograft were reviewed.

Inclusion Criteria

- Adults aged ≥18 years
- Primary nasal pterygium
- Complete preoperative and postoperative records

Exclusion Criteria

- Recurrent pterygium
- Prior ocular surgery or trauma
- Corneal pathology affecting keratometry

Preoperative evaluation included best-corrected visual acuity (BCVA) using Snellen chart and corneal curvature assessment using automated keratometry. Postoperative assessments were performed at **1 month and 3 months**.

Statistical Analysis: Data were analyzed using SPSS software (version 22.0; IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation. Preoperative and postoperative values were compared using paired t-test. Exact p-values were calculated and reported. A p-value <0.05 was considered statistically significant.

Ethical approval was obtained from the Institutional Ethics Committee. Informed consent was waived due to the retrospective nature of the study.

Results

A total of 55 eyes of 55 patients who underwent primary pterygium excision with modified sutureless, glueless limbal-conjunctival autograft was included in the final analysis.

1. Demographic Characteristics

The mean age of the study population was 44.6 ± 9.8 years (range: 28–62 years). The majority of patients were male (63.6%, n = 35), while females constituted 36.4% (n = 20).

The demographic distribution is summarized in **Table 1**.

Table 1: Demographic Distribution of Study Participants (n = 55)

Gender	Number of Patients	Percentage (%)
Male	35	63.6
Female	20	36.4
Total	55	100

2. Changes in Corneal Astigmatism

Preoperative corneal astigmatism ranged from 1.5 to 3.8 diopters, with a mean value of 2.42 ± 0.76 D.

At **1-month** follow-up, mean corneal astigmatism reduced to 1.36 ± 0.55 D.

At 3-month follow-up, further reduction was observed, with mean astigmatism measuring 1.12 ± 0.48 D.

Comparison using paired t-test revealed:

- Preoperative vs 1 month: p = 0.0003
- Preoperative vs 3 months: p = 0.0001

These findings indicate statistically significant reduction in corneal astigmatism at both postoperative intervals.

The comparison across time points is shown in Table 2, and the trend of reduction is illustrated in Figure 1.

Table 2: Comparison of Corneal Astigmatism at Different Time Points

Parameter	Mean ± SD (Diopters)	p-value
Preoperative	2.42 ± 0.76	—
1 Month	1.36 ± 0.55	0.0003
3 Months	1.12 ± 0.48	0.0001

Paired t-test applied.

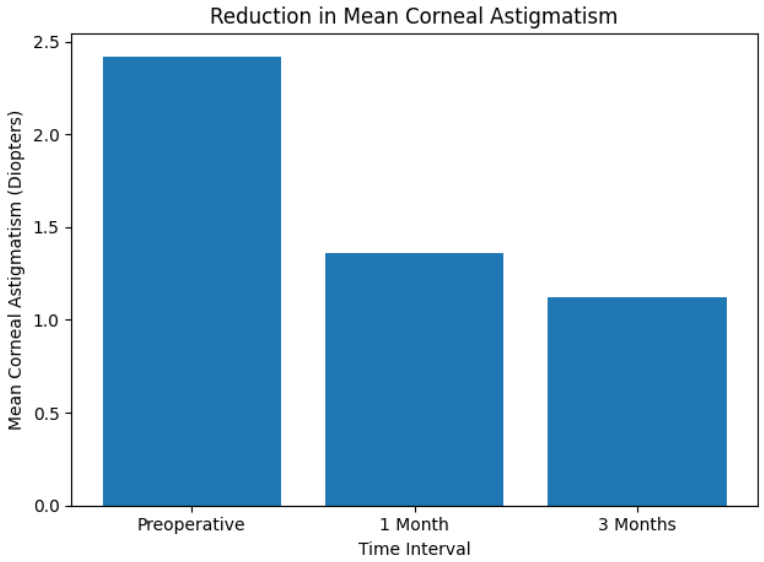

Figure 1

Bar diagram showing reduction in mean corneal astigmatism at preoperative, 1-month, and 3-month follow-up.

3. **Visual Acuity Outcomes**

Preoperative best-corrected visual acuity (BCVA) ranged from 0.2 to 0.8 logMAR, with a mean value of 0.42 ± 0.18 logMAR.

At 1 month, mean BCVA improved to 0.24 ± 0.14 logMAR.

At 3 months, further improvement was noted with mean BCVA of 0.18 ± 0.12 logMAR.

Paired t-test analysis demonstrated:

- Preoperative vs 1 month: p = 0.0005
- Preoperative vs 3 months: p = 0.0001

The improvement in BCVA was statistically significant at both follow-up intervals.

These data are summarized in Table 3, and graphical representation is provided in Figure 2.

Table 3: Comparison of Best-Corrected Visual Acuity at Different Time Points

Parameter	Mean ± SD (logMAR)	p-value
Preoperative	0.42 ± 0.18	—
1 Month	0.24 ± 0.14	0.0005
3 Months	0.18 ± 0.12	0.0001

Paired t-test applied.

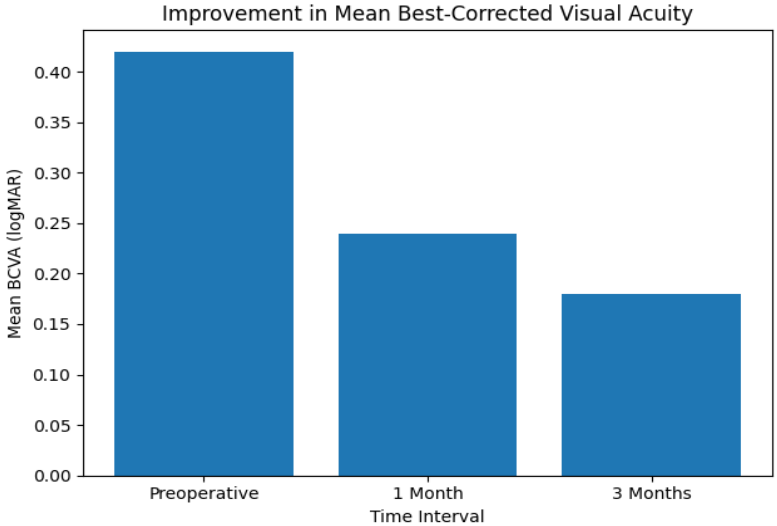

Figure 2:

Bar diagram showing improvement in mean best-corrected visual acuity (logMAR) at preoperative, 1-month, and 3-month follow-up.

4. **Overall Clinical Outcomes**

Overall, 49 patients (89.1%) demonstrated a measurable reduction in corneal astigmatism following surgery, while 46 patients (83.6%) showed improvement of at least one Snellen line in best-corrected visual acuity at follow-up. The improvements observed at both 1 month and 3 months were statistically significant. No intraoperative complications were recorded during the study period. Additionally, there were no cases of graft displacement, infection, or early recurrence noted within the 3-month follow-up period, indicating favorable short-term surgical outcomes.

Discussion

The present study demonstrates a statistically significant reduction in corneal astigmatism and improvement in visual acuity following pterygium excision using a modified sutureless, glueless limbal-conjunctival autograft technique. These findings are consistent with earlier reports evaluating postoperative corneal topographic changes after pterygium surgery [13,14].

The mechanism underlying corneal curvature improvement is attributed to the removal of tractional forces exerted by the pterygium on the corneal surface [15]. Several authors have reported greater astigmatic changes in larger and more advanced pterygia, which tend to normalize following excision [16,17].

Visual acuity improvement observed in this study correlates with the reduction in corneal astigmatism. Similar postoperative visual gains have been reported following conjunctival autograft techniques [18,19]. The sutureless, glueless approach further enhances patient comfort and reduces postoperative inflammation [20].

Inclusion of limbal tissue plays a crucial role in restoring the limbal stem cell barrier, thereby reducing recurrence rates and improving long-term outcomes [21,22]. The avoidance of sutures and fibrin glue also minimizes complications such as granuloma formation and foreign body sensation [23].

The retrospective design and short follow-up period are limitations of this study. Nevertheless, the results support the effectiveness of this technique in improving corneal curvature and visual acuity, particularly in high-prevalence regions such as South India [24,25].

Conclusion

Pterygium excision with modified sutureless, glueless limbal-conjunctival autograft results in significant improvement in corneal curvature and visual acuity. This technique is safe, effective, and suitable for routine clinical practice.

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