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Original Research Article

A Comparative Study of Bare Sclera Pterygium Excision Versus Conjunctival Autograft Surgery for Primary Pterygium at Sri Krishna Medical College, Muzaffarpur, Bihar

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Conflict of interest: Nil

Abstract:

Background: Pterygium is a common ocular surface disorder in tropical regions, with significant visual and cosmetic morbidity. Surgical excision remains the definitive treatment. The bare sclera technique is simple but associated with high recurrence, whereas conjunctival autografting has been shown to reduce recurrence.

Aim: To compare the clinical outcomes, recurrence rates, complications, and surgical efficacy of bare sclera excision versus conjunctival autograft in primary pterygium.

Methods: This retrospective study was conducted at Sri Krishna Medical College, Muzaffarpur, Bihar, from June 2025 to December 2025. A total of 100 patients with primary pterygium were included and divided into two groups: Group A (bare sclera excision, n=50) and Group B (conjunctival autograft, n=50). Patients were followed for 6 months. Data were analyzed using SPSS software. Chi-square test and independent t-test were applied. A p-value <0.05 was considered statistically significant.

Results: Recurrence was significantly higher in Group A (32%) compared to Group B (6%) ($p<0.001$). Postoperative complications such as graft edema and subconjunctival hemorrhage were more frequent in the autograft group but were self-limiting. Visual acuity improvement was comparable in both groups ($p=0.42$). Mean surgical time was significantly longer in autograft group ($p<0.001$).

Conclusion: Conjunctival autograft is superior to bare sclera technique in preventing recurrence and should be considered the preferred surgical method for primary pterygium.

Keywords: Pterygium, Bare sclera, Conjunctival autograft, Recurrence, Ocular surface.

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Introduction

Pterygium is a triangular fibrovascular growth of conjunctival tissue extending onto the cornea, commonly occurring in populations exposed to high ultraviolet radiation, dust, and dry climates [1]. It is especially prevalent in tropical regions like India, often affecting outdoor workers [2].

The pathogenesis involves ultraviolet-induced limbal stem cell damage, fibrovascular proliferation, and chronic inflammation [3,4]. Histopathologically, pterygium demonstrates elastotic degeneration and fibrovascular proliferation [5].

Surgical excision remains the mainstay of treatment, indicated in cases of visual impairment, irritation, recurrent inflammation, or cosmetic concerns [6]. However, recurrence after surgery remains the greatest challenge, with rates reported as high as 30–80% with the bare sclera technique [7,8].

Various techniques have been developed to reduce recurrence, including conjunctival autograft, amniotic membrane transplantation, and adjunctive therapies like mitomycin C [9–11]. Among these, conjunctival autograft has become the gold standard due to its low recurrence rates and favorable safety profile [12].

Kenyon et al. first popularized conjunctival autografting in 1985, demonstrating significantly lower recurrence rates compared to bare sclera excision [13]. Since then, numerous studies have validated its superiority [14–16].

Despite the evidence, bare sclera technique continues to be used in resource-limited settings due

to its simplicity and shorter operative time [17]. Therefore, a comparative evaluation in a local population is important for evidence-based surgical practice.

This study aims to compare outcomes of bare sclera excision versus conjunctival autograft in patients treated at Sri Krishna Medical College, Muzaffarpur.

Materials and Methods

Study Design and Setting: This investigation was designed as a retrospective, comparative, observational study conducted in the Department of Ophthalmology at Sri Krishna Medical College, Muzaffarpur, Bihar, India. The study evaluated outcomes of two standard surgical techniques for primary pterygium and was carried out over a 7-month period from June 2025 to December 2025. Institutional ethical clearance was obtained from the local ethics committee, and the study adhered to the tenets of the Declaration of Helsinki.

Study Population and Sample Size: A total of 100 consecutive patients diagnosed with primary nasal pterygium and undergoing surgical excision during the study period were included. Hospital records and operative registers were reviewed to identify eligible cases.

Patients were divided into two equal groups based on the surgical technique performed:

- **Group A (n = 50):** Bare sclera excision
- **Group B (n = 50):** Conjunctival autograft transplantation

The sample size of 100 was considered adequate to detect a statistically significant difference in recurrence rates between the two surgical techniques, based on previously reported recurrence differences of >20%.

Eligibility Criteria

Inclusion Criteria

- Age ≥18 years
- Primary nasal pterygium encroaching onto the cornea
- Patients with symptoms such as irritation, redness, visual disturbance, or cosmetic concern
- Patients who underwent surgery and completed minimum 6-month follow-up

Exclusion Criteria

- Recurrent or double-headed pterygium
- Previous ocular surgery or trauma
- Associated ocular surface disorders (e.g., dry eye syndrome, ocular cicatricial disease)
- Systemic autoimmune disorders
- Incomplete records or loss to follow-up before 6 months

Preoperative Assessment

All patients underwent a standardized ophthalmic evaluation including:

- **Best corrected visual acuity (BCVA)** using Snellen chart
- Slit-lamp biomicroscopy for grading pterygium size and morphology
- Measurement of corneal involvement (in mm from limbus)
- Intraocular pressure (IOP) measurement using applanation tonometry
- Fundus examination

Baseline demographic data such as age, gender, occupation (indoor/outdoor exposure), laterality, and symptom duration were recorded and later analysed.

Surgical Techniques: All procedures were performed under aseptic conditions using peribulbar anesthesia (2% lignocaine with adrenaline).

Group A: Bare Sclera Technique

- The head and body of the pterygium were excised using blunt and sharp dissection
- Fibrovascular tissue was carefully removed from the corneal surface using a blade
- The scleral bed was left bare without any graft or adjunctive therapy
- Hemostasis was achieved using minimal bipolar cautery

Group B: Conjunctival Autograft Technique

1. Following pterygium excision as above, a free conjunctival graft was harvested from the superotemporal bulbar conjunctiva
2. The graft size corresponded to the scleral defect
3. The graft was oriented with limbal edge toward the limbus
4. It was secured in place using 8-0 vicryl sutures
5. Care was taken to avoid Tenon's tissue inclusion

Postoperative Management

All patients received a standardized postoperative regimen:

- Topical antibiotic-steroid combination drops (moxifloxacin + prednisolone) tapered over 4 weeks
- Lubricating eye drops for 6–8 weeks
- Oral analgesics as required

Patients were advised to avoid dust, sunlight exposure, and eye rubbing during the healing period.

Follow-up Protocol

Patients were followed up at:

1. 1 week
2. 1 month

3. 3 months
4. 6 months

At each visit, the following parameters were evaluated:

- Graft integrity (in Group B)
- Signs of recurrence
- Postoperative complications
- Visual acuity improvement

Outcome Measures

Primary Outcome

1. **Recurrence rate**, defined as fibrovascular tissue crossing the limbus onto the cornea by ≥1 mm within 6 months postoperatively

Secondary Outcomes

- Visual acuity improvement (measured as Snellen line gain)
- Postoperative complications (subconjunctival hemorrhage, graft edema, granuloma, infection)
- Operative time (measured in minutes from incision to completion of surgery)

Data Collection and Data Integrity

All clinical and surgical data were extracted from:

- Operation theatre records
- Outpatient follow-up registers
- Patient case sheets

Data were cross-verified by two independent reviewers to ensure accuracy, consistency, and authenticity. Any discrepancies were resolved through consensus review.

Statistical Analysis: All collected data were systematically entered into Microsoft Excel and subsequently analyzed using SPSS software version 26.0 (IBM Corp., USA). Categorical variables such as recurrence and postoperative complications were evaluated using the Chi-square test, while continuous variables including operative time and visual acuity improvement were analyzed using the independent Student's t-test. Quantitative data were expressed as mean ± standard deviation, and qualitative variables were presented as frequencies and percentages. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Ethics Committee of Sri Krishna Medical College, Muzaffarpur. Patient confidentiality and data privacy were strictly maintained throughout the study period, with no personal identifiers disclosed at any stage of data handling or publication. As the study was retrospective in nature and utilized existing clinical records, a waiver of informed consent was granted by the ethics committee.

Results

A total of 100 patients with primary nasal pterygium were included in the analysis. Patients were equally distributed into two groups: Group A (bare sclera excision, n = 50) and Group B (conjunctival autograft, n = 50). All patients completed a minimum follow-up of 6 months and were included in the final outcome analysis.

Baseline Demographic and Clinical Profile: The baseline characteristics of the study population were comparable between the two groups, with no statistically significant differences in age, gender distribution, laterality, or occupational exposure.

Table 1 shows the demographic distribution of both groups. The mean age in Group A was 42.6 ± 8.5 years and in Group B was 41.8 ± 7.9 years (p = 0.63). Males constituted 60% in Group A and 58% in Group B (p = 0.84). Majority of patients in both groups had outdoor occupational exposure (72% vs 70%, p = 0.81).

Table 1: Baseline Demographic Characteristics

Variable	Group A (n=50)	Group B (n=50)	p-value
Mean Age (years)	42.6 ± 8.5	41.8 ± 7.9	0.63
Male (%)	60%	58%	0.84
Outdoor Occupation (%)	72%	70%	0.81
Right Eye (%)	54%	56%	0.83

Recurrence Rate: During the 6-month follow-up, recurrence of pterygium was observed in 16 patients (32%) in Group A compared to 3 patients (6%) in Group B.

As shown in Table 2, the difference in recurrence rate between the two groups was highly statistically significant (Chi-square = 11.24, p < 0.001).

Table 2: Recurrence Rate

Outcome	Group A	Group B	Chi-square	p-value
Recurrence	16 (32%)	3 (6%)	11.24	**<0.001**
No recurrence	34 (68%)	47 (94%)	—	—

The distribution of recurrence rates is graphically represented in Figure 1, which clearly demonstrates a markedly higher recurrence in the bare sclera group compared to the conjunctival autograft group.

Postoperative Complications: Postoperative complications were documented and compared between both groups.

As summarized in Table 3, the most common complication in Group A was subconjunctival hemorrhage (6%), while in Group B it was subconjunctival hemorrhage (18%) followed by graft edema (14%).

- Subconjunctival hemorrhage was significantly higher in Group B ($p = 0.04$)
- Graft edema was seen only in Group B and was statistically significant ($p < 0.01$)
- Granuloma formation and infection rates were low and comparable between groups ($p > 0.05$)

Table 3: Postoperative Complications

Complication	Group A (%)	Group B (%)	p-value
Subconjunctival hemorrhage	6%	18%	0.04
Graft edema	0%	14%	<0.01
Granuloma	4%	2%	0.56
Infection	2%	0%	0.31

The overall complication profile is illustrated in Figure 2, showing a higher rate of transient graft-related complications in the autograft group, though these resolved spontaneously within 2–4 weeks.

Visual Acuity Outcome: Improvement in visual acuity was assessed using Snellen chart and converted into line improvement.

As shown in Table 4, the mean visual acuity improvement in Group A was 1.2 ± 0.4 lines compared to 1.3 ± 0.5 lines in Group B.

The difference was not statistically significant ($t = 0.81$, $p = 0.42$), indicating that both surgical techniques provide comparable visual rehabilitation.

Table 4: Visual Acuity Improvement

Parameter	Group A	Group B	t-value	p-value
Mean VA improvement (lines)	1.2 ± 0.4	1.3 ± 0.5	0.81	0.42

Operative Time: The mean operative time was significantly longer in the conjunctival autograft group.

As detailed in Table 5, Group A had a mean surgical time of 18 ± 4 minutes, whereas Group B had 32 ± 6 minutes.

This difference was statistically highly significant ($t = 13.4$, $p < 0.001$).

Table 5: Operative Time

Parameter	Group A	Group B	t-value	p-value
Mean surgical time (minutes)	18 ± 4	32 ± 6	13.4	**<0.001**

Figures

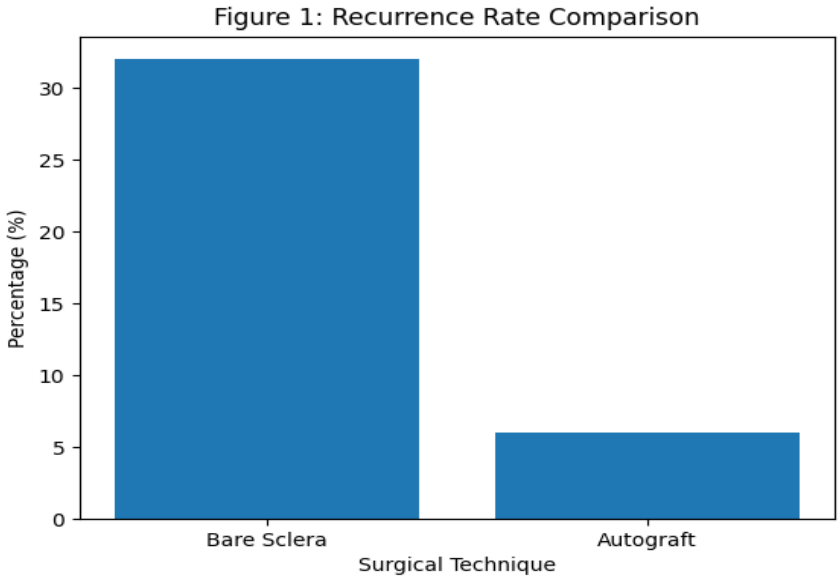

Figure 1: Recurrence Rate Comparison

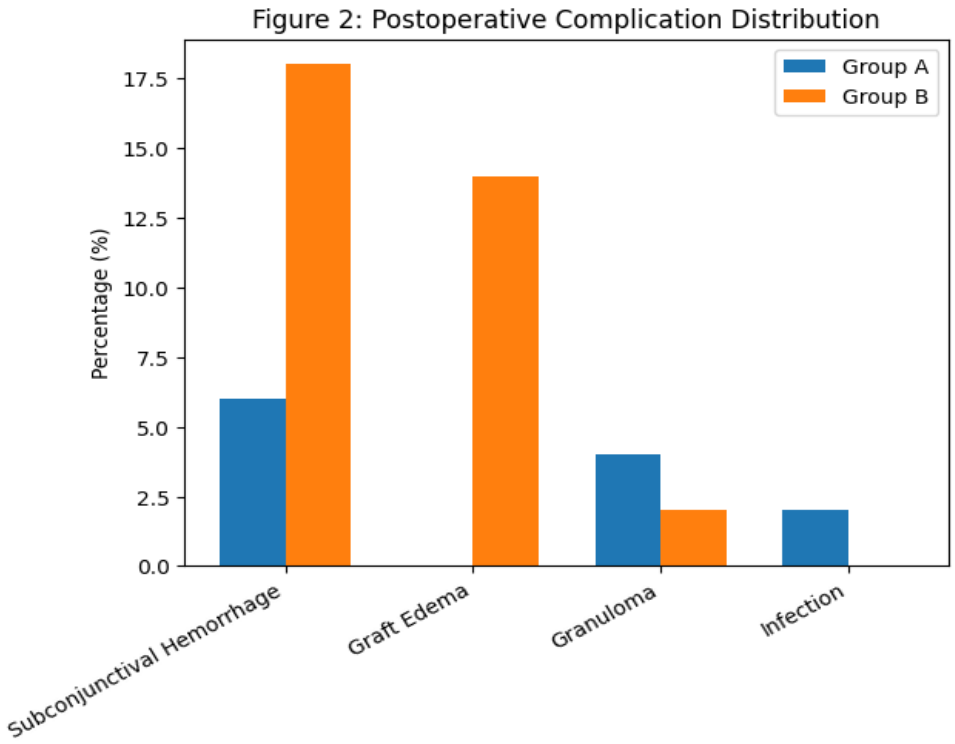

Figure 2: Postoperative Complication Distribution

Summary of Key Statistical Findings: The study demonstrated that the recurrence rate was significantly lower in the conjunctival autograft group compared to the bare sclera group ($p < 0.001$), indicating a clear advantage of autografting in preventing pterygium recurrence. However, the mean operative time was significantly longer in the autograft group ($p < 0.001$), reflecting the additional surgical steps required for graft harvesting and fixation. There was no statistically significant difference in postoperative visual acuity improvement between the two groups ($p = 0.42$), suggesting that both techniques provide comparable visual outcomes. Although minor postoperative complications such as subconjunctival hemorrhage and graft edema were more frequently observed in the autograft group, these complications were transient and resolved spontaneously without long-term sequelae.

Discussion

Pterygium surgery continues to evolve with the goal of minimizing recurrence and complications. The present study demonstrates that conjunctival autograft significantly reduces recurrence compared to bare sclera technique, consistent with earlier studies [18–20].

The recurrence rate of 32% in bare sclera group aligns with previously reported values of 30–70% [21,22]. In contrast, the 6% recurrence in the autograft group is comparable to rates reported by Kenyon et al. and subsequent authors [13,23].

The mechanism behind reduced recurrence in conjunctival autograft is attributed to restoration of limbal barrier and inhibition of fibrovascular proliferation [24]. Additionally, autograft provides normal conjunctival tissue that suppresses inflammation [25].

Although operative time was longer in the autograft group, the long-term benefits outweigh this limitation [26].

Postoperative complications like graft edema and hemorrhage were more frequent in autograft but were transient and resolved without intervention [27].

Visual acuity improvement was similar in both groups, indicating that the primary benefit of autografting lies in recurrence prevention rather than visual gain [28].

Given the high recurrence associated with bare sclera technique, its routine use should be discouraged except in selected cases or where resources are limited [29,30].

Conclusion

Conjunctival autograft is a superior surgical technique compared to bare sclera excision for primary pterygium, offering significantly lower recurrence rates and acceptable complication profile. It should be considered the preferred surgical method in clinical practice.

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