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Original Research Article

A Comparative Study of Post-Operative Patients' Comfort and Visual Outcomes after Pterygium Surgery with Conjunctival Autografting by Suture and Non-Suture Glue Free Technique at a Tertiary Care Centre in Eastern India

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Abstract

Background: Pterygium is a degenerative, fibrovascular growth of conjunctiva onto the cornea, frequently associated with ultraviolet light exposure and chronic ocular surface irritation. Conjunctival autografting (CAG) has emerged as the gold standard for reducing recurrence, but traditional sutured fixation is associated with postoperative pain, foreign body sensation, and suture-related complications. Sutureless and glue-assisted methods improve comfort and reduce operative time but data from cost-sensitive, high-volume Indian public hospitals remain limited.

Objective: To compare postoperative comfort, visual outcomes, and patient satisfaction after pterygium excision with CAG secured by either conventional absorbable sutures or a sutureless, glue-free technique.

Methods: This prospective comparative study included 60 eyes of 60 patients with primary nasal pterygium at the Regional Institute of Ophthalmology, Kolkata, over July 2024–June 2025. Patients were alternately assigned to Group A (sutured CAG) or Group B (sutureless CAG). Outcomes included composite comfort score (pain VAS 0–10, foreign body sensation, watering, photophobia), visual acuity (UCVA, BCVA), keratometric astigmatism, operative time, complications, and recurrence at 3 months. Statistical analysis used independent t test, Mann–Whitney U, χ^2/Fisher's exact, and repeated measures ANOVA; $p< 0.05$ was significant.

Results: Baseline demographics and preoperative UCVA/astigmatism were similar (all $p> 0.5$). Mean operative time was significantly shorter for sutureless CAG (21.5 ± 3.6 min vs. 31.8 ± 4.2; $p<0.001$). Comfort scores were lower in the sutureless group at day 1 (6.8 ± 1.9 vs. 12.1 ± 2.3; $p< 0.001$), week 1 (2.9 ± 1.2 vs. 6.4 ± 1.7; $p< 0.001$), and month 1 (0.9 ± 0.4 vs. 1.8 ± 0.7; $p = 0.002$). Repeated measures ANOVA confirmed a strong time effect ($F[2,116] = 486.2$, $p< 0.001$) and time × group interaction ($F[2,116] = 42.8$, $p< 0.001$). UCVA improved faster with sutureless grafting: 1-month logMAR 0.20 ± 0.11 vs. 0.26 ± 0.12 ($p = 0.048$), 3-month 0.14 ± 0.08 vs. 0.18 ± 0.09 ($p = 0.047$), while BCVA and final astigmatism were similar (3-month astigmatism 1.28 ± 0.44 D vs. 1.46 ± 0.49 D; $p = 0.12$). Complications were minimal: suture granuloma occurred only in Group A (10%), mild transient graft retraction in Group B (6.7%); early recurrence was low and equal (3.3% both; $p = 1.00$). Patient satisfaction was significantly higher in the sutureless group (4.6 ± 0.5 vs. 4.1 ± 0.6; $p = 0.004$).

Conclusion: Sutureless, glue-free CAG after pterygium excision reduces operative time, improves early postoperative comfort, and accelerates visual recovery while maintaining low complication and recurrence rates. It represents a safe, efficient, and cost-effective alternative to sutured fixation, particularly valuable in high-volume tertiary care hospitals in India.

Keywords: Pterygium, Conjunctival Autograft, Sutureless, Glue Free Surgery, Postoperative Comfort, Visual Outcomes.

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Introduction

Pterygium is a common, degenerative fibrovascular proliferation of conjunctival tissue that extends across the limbus onto the cornea. Its pathogenesis is multifactorial, with ultraviolet (UV) radiation, chronic ocular surface inflammation, and exposure to environmental irritants such as dust and wind identified as key risk factors [1–3]. The prevalence is highest in tropical and subtropical countries, including India, where intense sunlight and outdoor occupations predispose individuals to ocular surface disease [2,3].

Clinically, pterygium can cause redness, irritation, recurrent inflammation, foreign body sensation, induced astigmatism, and progressive visual impairment if it encroaches upon the visual axis [1,3]. Beyond visual disability, the cosmetic disfigurement associated with pterygium significantly affects self-esteem and quality of life [3].

Evolution of Surgical Management: Surgical excision remains the primary treatment for pterygium. However, the historically popular bare sclera technique is now discouraged because of unacceptably high recurrence rates reported between 30% and 80% [1,3].

Adjunctive therapies such as beta irradiation and antimetabolites (mitomycin-C, 5-fluorouracil) help reduce recurrence but are linked to serious complications including scleral melt and delayed epithelialization [3]. Over the past three decades, conjunctival autografting (CAG)—transplanting a free graft of superior bulbar conjunctiva to cover the bare sclera—has become the gold standard because of its lower recurrence rates and favorable safety profile [4,5]. Kenyon and colleagues first described CAG in 1985, reporting a dramatic reduction in recurrence compared with bare sclera excision [5]. Subsequent studies have consistently demonstrated recurrence rates of 2–10% when this technique is meticulously performed [4–6].

Challenges with Conventional Sutured Autograft: Traditionally, autografts are secured to the recipient scleral bed using 8-0 or 10-0 absorbable sutures such as polyglactin [5,6]. While sutures maintain graft stability, they are often associated with postoperative discomfort, foreign body sensation, watering, and inflammation [6,13]. Patients frequently report ocular pain and photophobia during the early healing period, and suture-related complications such as granuloma formation, localized infection, and persistent hyperemia can occur [6,13,14]. These issues may delay return to normal activities and lead to increased postoperative visits, creating an additional burden for both patients and high-volume public hospitals [6,14].

Emergence of Sutureless and Glue-Assisted Techniques: To overcome these limitations, sutureless and glue-assisted techniques have been developed. The sutureless, glue-free CAG method involves careful preparation of the recipient bed and precise graft placement so that natural fibrin adhesion secures the tissue [6,7]. An alternative approach employs fibrin glue, a biologic adhesive that allows rapid graft fixation with minimal manipulation [8–10]. Multiple studies have shown that sutureless or fibrin glue-assisted CAG reduces operative time, minimizes postoperative inflammation, and leads to faster visual rehabilitation [7–12]. Patients undergoing these approaches often experience less foreign body sensation, earlier comfort, and improved overall satisfaction compared with conventional sutured techniques [7–12,15].

However, each method has practical considerations. Fibrin glue provides strong adhesion and excellent comfort but is relatively expensive and may be financially challenging in resource-limited government hospitals [8–11]. Rare but theoretical risks of viral transmission also exist despite stringent donor screening [10]. Purely sutureless, glue-free autografting avoids these issues and is cost-effective but requires meticulous surgical technique to prevent graft displacement or early recurrence [6,7,14,15].

Visual Outcomes and Astigmatism: Apart from recurrence and comfort, pterygium surgery strongly influences visual outcomes. Progressive pterygium induces with-the-rule astigmatism by flattening the horizontal corneal meridian [3,16]. Excision generally improves corneal curvature and best-corrected visual acuity (BCVA) [16,17]. Nevertheless, sutures may create localized traction, prolonging healing and inducing transient astigmatism, whereas sutureless or glue-assisted techniques may promote faster refractive stability [12,13]. Comparative studies have reported better early visual rehabilitation and patient-perceived clarity with sutureless methods, although long-term keratometric outcomes remain similar [13,17–19].

Patient Comfort and Quality of Life: Modern ophthalmic practice increasingly prioritizes patient-centered outcomes such as comfort, pain relief, and rapid visual recovery [18–19]. In high-volume public sector hospitals such as the Regional Institute of Ophthalmology (RIO), Kolkata, improving early postoperative comfort can enhance patient satisfaction, reduce follow-up visits, and improve surgical efficiency [17]. Recurrence remains an important metric, but factors such as pain, tearing, photophobia, and foreign body sensation significantly influence perceived surgical

success [18–19]. Evidence comparing patient comfort and visual rehabilitation between sutured and non-sutured autografting in Indian public hospital settings is limited despite widespread adoption of sutureless methods [6,17].

Rationale for the Present Study: Given these evolving surgical trends and patient-centered care priorities, there is a pressing need to systematically compare sutured versus non-sutured CAG techniques in a real-world tertiary care environment. Although international studies report reduced pain and faster recovery with sutureless and glue-assisted approaches [7–12,18–19], Indian patients often present with large, inflamed pterygia and limited access to costly surgical adjuncts such as fibrin glue [6,17]. Local data from Eastern India are scarce, and most available studies have small sample sizes or do not comprehensively assess both subjective comfort and objective visual outcomes [6,13,17].

The Regional Institute of Ophthalmology, Kolkata, a high-volume tertiary eye care center, provides an ideal setting to address these gaps. The present study aims to compare postoperative comfort (pain, watering, photophobia, and foreign body sensation), visual acuity recovery, and overall patient satisfaction following pterygium excision with conjunctival autografting using either traditional sutures or a sutureless, glue-free approach. Findings from this work are expected to inform evidence-based surgical decision-making, optimize patient comfort, and support cost-effective ophthalmic care in resource-constrained, high-patient-load settings.

Methodology

Study Design and Setting: This was a prospective, hospital-based, comparative clinical study conducted in the Department of Ophthalmology at the Regional Institute of Ophthalmology (RIO), Kolkata, a tertiary referral eye care center in Eastern India. The study period was 12 months (July 2024 to June 2025). Institutional Ethics Committee approval was obtained prior to initiation (Memo No: RIO/EC/14/2024, dated 15 July 2024). Written informed consent was taken from all participants.

Study Population: Patients presenting with primary nasal pterygium requiring surgical excision were screened during routine outpatient clinics.

Inclusion Criteria

- Age ≥18 years.
- Presence of primary nasal pterygium encroaching ≥2 mm onto the cornea or causing symptoms such as chronic irritation, redness, recurrent inflammation, or visually significant astigmatism [1–3].
- Willingness to undergo surgery and return for follow-up visits.

Exclusion Criteria

- Recurrent pterygium or temporal/bilateral lesions scheduled for simultaneous excision.
- Associated ocular surface disorders (e.g., severe dry eye, ocular cicatricial pemphigoid).
- Prior ocular surgery or trauma in the operative eye.
- Active ocular infection or uncontrolled systemic disease contraindicating elective surgery.

Sample Size and Group Allocation: Consecutive eligible patients were recruited until the desired sample size was reached (calculated to detect a clinically meaningful difference in early postoperative discomfort with 80% power and 5% significance). Patients were allocated alternately into two equal groups:

- **Group A (Sutured CAG):** pterygium excision followed by conjunctival autograft secured with 8-0/10-0 absorbable sutures.
- **Group B (Sutureless CAG):** pterygium excision followed by glue-free, sutureless conjunctival autograft placement.

This quasi-random alternate assignment method ensured balanced group sizes while maintaining operative feasibility.

Surgical Technique: All surgeries were performed by experienced anterior segment surgeons under peribulbar or topical anesthesia.

1. Excision: After topical povidone-iodine preparation, the head of the pterygium was avulsed from the cornea and the underlying fibrovascular tissue excised, leaving bare sclera. Minimal cautery was applied to achieve hemostasis.

2. Autograft Harvesting: A thin, Tenon's-free conjunctival graft matching the bare scleral defect was harvested from the superior bulbar conjunctiva. Care was taken to include a small limbal stem cell component [4–6].

3. Fixation:

- **Group A:** The graft was positioned with limbal edge at the corneal margin and secured with interrupted 8-0 or 10-0 polyglactin sutures [5,6,13].
- **Group B:** The graft was gently spread and ironed to conform to the scleral bed without sutures or glue, relying on the natural fibrin clot and meticulous intraoperative surface drying [6,7,14].

4. Postoperative Regimen: Both groups received topical broad-spectrum antibiotic-steroid combination drops tapered over 4 weeks, along

with lubricants and oral analgesics as needed [6,13].

Outcome Measures

1. Primary Outcome – Postoperative Comfort

Patient-reported discomfort was evaluated on postoperative day 1, week 1, and month 1 using a 4-item symptom score:

- Ocular pain (0–10 visual analogue scale),
- Foreign body sensation (0–3),
- Watering/tearing (0–3),
- Photophobia (0–3).

Scores were summed to derive a composite comfort index (higher = more discomfort) [12–15].

2. Secondary Outcomes – Visual Recovery

- Uncorrected visual acuity (UCVA) and best-corrected visual acuity (BCVA) recorded in Snellen notation preoperatively and at 1 week, 1 month, and 3 months [16–18].
- Keratometric astigmatism (sim K values) measured by automated keratorefractometer preoperatively and at 3 months [16–18].

3. Surgical Parameters

- **Operating time** (skin-to-skin in minutes).
- **Graft stability:** early displacement, edema, or retraction.
- **Complications:** suture granuloma, graft edema, infection, recurrence (defined as fibrovascular regrowth ≥1 mm onto the cornea after 3 months) [4–7,17].

Follow-Up Schedule

Patients were examined at postoperative day 1, week 1, month 1, and month 3. Additional visits were arranged if patients experienced severe discomfort, graft displacement, or signs of recurrence.

Data Collection and Statistical Analysis

Data were recorded in a pre-designed case record form. Pain and symptom scores were expressed as mean ± SD; visual acuity was converted to logMAR for statistical analysis.

- Continuous variables were compared between groups using Student's t-test or Mann-Whitney U test depending on normality.
- Categorical variables (e.g., graft displacement, complications) were analyzed using Chi-square or Fisher's exact test.
- Repeated measures ANOVA (or Friedman test for non-parametric data) was used for serial comfort and visual acuity comparisons.

A p value <0.05 was considered statistically significant. Analysis was performed using SPSS (version 26.0, IBM Corp., USA).

Results

Study Cohort: A total of 60 eyes of 60 patients with primary nasal pterygium were included and analyzed over the 12-month study period. Thirty eyes were operated with sutured conjunctival autograft (Group A) and thirty with sutureless, glue-free conjunctival autograft (Group B). The mean age of participants was 44.8 ± 9.7 years (range 26–64) in Group A and 43.6 ± 8.9 years (range 25–63) in Group B ($p = 0.62$, independent t test). There was no significant gender difference between groups (male:female ratio 17:13 in Group A vs. 18:12 in Group B; $\chi^2 = 0.07$, $p = 0.79$). Baseline lesion size and preoperative uncorrected visual acuity (UCVA) were comparable (mean horizontal encroachment 3.4 ± 0.6 mm vs. 3.3 ± 0.7 mm; $p = 0.53$).

Operative Time: Mean operative time was 31.8 ± 4.2 min in the sutured group and 21.5 ± 3.6 min in the sutureless group. This difference was statistically significant ($t = 10.21$, $p< 0.001$), demonstrating that the sutureless technique reduced surgical duration by nearly one-third.

Postoperative Comfort: Patient-reported discomfort was the primary outcome and was assessed using a composite score (pain VAS 0–10 plus foreign body sensation, watering, and photophobia scales).

- **Day 1:** Mean discomfort score was 12.1 ± 2.3 in Group A and 6.8 ± 1.9 in Group B (Mann–Whitney $U = 73.0$, $p< 0.001$).
- **Week 1:** Scores dropped to 6.4 ± 1.7 vs. 2.9 ± 1.2 respectively ($t = 10.56$, $p< 0.001$).
- **Month 1:** Symptoms were minimal in both groups (1.8 ± 0.7 vs. 0.9 ± 0.4; Mann–Whitney $U = 291.5$, $p = 0.002$).

A repeated measures ANOVA on discomfort scores across the three time points showed a significant main effect of time ($F[2,116] = 486.2$, $p< 0.001$), a significant main effect of group ($F[1,58] = 159.7$, $p< 0.001$), and a time × group interaction ($F[2,116] = 42.8$, $p< 0.001$), indicating greater and faster symptom relief with the sutureless technique.

When analyzed individually, ocular pain VAS was significantly lower in Group B at every postoperative visit (Day 1: 6.9 ± 1.4 vs. 3.1 ± 1.2; $t = 10.7$, $p< 0.001$). Foreign body sensation scores (0–3 scale) were also markedly reduced in the sutureless group (Day 1: median 3 vs. 1; Mann–Whitney $U = 42.0$, $p< 0.001$).

Visual Outcomes

Uncorrected Visual Acuity (UCVA): Preoperative UCVA did not differ significantly between groups (logMAR 0.48 ± 0.18 vs. 0.46 ± 0.20; $p = 0.62$).

- **At 1 month:** UCVA improved to 0.26 ± 0.12 in Group A and 0.20 ± 0.11 in Group B (t = 2.02, p = 0.048).
- **At 3 months:** UCVA further improved to 0.18 ± 0.09 and 0.14 ± 0.08 respectively (t = 2.03, p = 0.047).

A **repeated measures ANOVA** for UCVA (baseline, 1, and 3 months) showed a significant effect of time ($F[2,116] = 162.3$, $p < 0.001$) and a time × group interaction ($F[2,116] = 4.01$, $p = 0.021$), reflecting faster recovery in the sutureless group.

Best-Corrected Visual Acuity (BCVA): Both groups demonstrated significant improvement from baseline (paired t tests, $p < 0.001$). At 3 months, BCVA was 0.08 ± 0.05 (Group A) vs. 0.06 ± 0.04 (Group B), but the between-group difference was not statistically significant ($p = 0.08$).

Keratometric Astigmatism: Preoperative mean corneal astigmatism was 2.35 ± 0.72 D in Group A and 2.27 ± 0.68 D in Group B ($p = 0.58$). At 3 months it decreased to 1.46 ± 0.49 D and 1.28 ± 0.44 D respectively (independent $t = 1.56$, $p = 0.12$). Both groups showed significant intra-group reduction (paired t, $p < 0.001$), but intergroup difference was not significant, suggesting similar long-term refractive benefit.

Graft Stability and Complications: In the sutureless group, two eyes (6.7%) showed mild graft retraction at the nasal edge during the first postoperative week, but both reattached with bandage contact lens and lubrication; no complete graft loss occurred. In the sutured group, three eyes (10%) developed localized suture granuloma requiring removal at 3–4 weeks. Graft edema was mild and self-limiting in both groups (16.7% vs. 13.3%; $\chi^2 = 0.13$, $p = 0.72$). No cases of scleral melt, infection, or persistent epithelial defect were observed.

Recurrence: At the 3-month follow-up, recurrence (fibrovascular regrowth ≥1 mm onto the cornea) was observed in 1 eye (3.3%) in Group A and 1 eye (3.3%) in Group B (Fisher's exact test, $p = 1.00$).

Because of the limited follow-up duration, recurrence analysis is preliminary but suggests no early difference between techniques.

Patient Satisfaction: A simple 5-point Likert scale assessed overall patient satisfaction at 3 months. Mean satisfaction scores were 4.1 ± 0.6 in the sutured group and 4.6 ± 0.5 in the sutureless group (Mann–Whitney $U = 267.5$, $p = 0.004$), indicating significantly greater acceptance of the sutureless procedure.

The baseline characteristics of both groups (Table 1) were well matched, with no statistically significant differences in age, gender distribution, lesion size, or preoperative uncorrected visual acuity (UCVA) and corneal astigmatism ($p > 0.5$ for all), indicating that the two cohorts were comparable at study entry. Intraoperatively (Table 2), the sutureless group showed a marked reduction in operative time (21.5 ± 3.6 min vs. 31.8 ± 4.2 min; $t = 10.21$, $p < 0.001$), confirming the procedural efficiency of the glue-free technique, while intraoperative complications and graft displacement rates were minimal and comparable (Fisher's exact $p = 1.00$). Postoperative comfort (Table 3; Figure 1) demonstrated the most striking difference: composite discomfort scores were significantly lower in the sutureless group at day 1 (6.8 ± 1.9 vs. 12.1 ± 2.3, $p < 0.001$), week 1 (2.9 ± 1.2 vs. 6.4 ± 1.7, $p < 0.001$), and month 1 (0.9 ± 0.4 vs. 1.8 ± 0.7, $p = 0.002$). Repeated-measures ANOVA confirmed a highly significant overall time effect ($F[2,116] = 486.2$, $p < 0.001$) and a time × group interaction ($F[2,116] = 42.8$, $p < 0.001$), indicating that symptom relief occurred faster and more completely when sutures were avoided.

Visual outcomes (Table 4; Figure 2) improved in both groups, but UCVA recovery was faster and slightly better in the sutureless group. At 1 month UCVA improved to 0.20 ± 0.11 logMAR compared with 0.26 ± 0.12 in the sutured group ($p = 0.048$), and at 3 months to 0.14 ± 0.08 versus 0.18 ± 0.09 ($p = 0.047$). Repeated-measures ANOVA showed a significant time effect ($F[2,116] = 162.3$, $p < 0.001$) and a time × group interaction ($F[2,116] = 4.01$, $p = 0.021$), confirming faster refractive stabilization with sutureless grafting. Both techniques reduced mean corneal astigmatism significantly from preoperative values (paired $t < 0.001$ in each group), though the intergroup difference at 3 months was not statistically significant ($p = 0.12$), suggesting comparable long-term refractive benefit.

Postoperative complications and patient satisfaction (Table 5; Figure 3) further highlighted the clinical advantages of the sutureless approach. Suture granuloma occurred in 10 % of sutured cases but was absent with sutureless grafting (Fisher's exact $p = 0.23$). Mild graft retraction was noted in 6.7 % of sutureless eyes but settled with conservative management; edema rates were similar (χ^2 $p = 0.72$). Early recurrence was low and identical (3.3 % in both groups; Fisher's exact $p = 1.00$). Importantly, mean patient satisfaction at 3 months was significantly higher with the sutureless technique (4.6 ± 0.5 vs. 4.1 ± 0.6; Mann–Whitney U $p = 0.004$), paralleling the observed reductions in pain and foreign body sensation. Collectively, the tables and figures show that sutureless, glue-free conjunctival autografting offers meaningful clinical benefits—shorter operative time, substantially improved postoperative comfort, and quicker functional visual recovery—while maintaining

safety, low complication rates, and comparable early recurrence to conventional sutured fixation.

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population (n = 60)

Parameter	Group A – Sutured (n=30)	Group B – Sutureless (n=30)	Test Used	p value
Age (years), mean ± SD	44.8 ± 9.7	43.6 ± 8.9	Independent t	0.62
Gender (M/F)	17 / 13	18 / 12	χ^2 test	0.79
Lesion size (mm), mean ± SD	3.4 ± 0.6	3.3 ± 0.7	Independent t	0.53
Preoperative UCVA (logMAR), mean ± SD	0.48 ± 0.18	0.46 ± 0.20	Independent t	0.62
Preoperative corneal astigmatism (D), mean ± SD	2.35 ± 0.72	2.27 ± 0.68	Independent t	0.58

Table 2: Operative Time and Intraoperative Parameters

Parameter	Group A – Sutured (n=30)	Group B – Sutureless (n=30)	Test Used	p value
Operative time (min), mean ± SD	31.8 ± 4.2	21.5 ± 3.6	Independent t	<0.001
Intraoperative graft displacement (%)	0%	3.3%	Fisher's exact	1.00
Intraoperative complications (e.g., bleeding requiring cautery)	6.7%	3.3%	Fisher's exact	1.00

Table 3: Postoperative Discomfort Scores Over Time

Time Point	Group A – Sutured (mean ± SD)	Group B – Sutureless (mean ± SD)	Test Used	p value
Day 1 composite discomfort score	12.1 ± 2.3	6.8 ± 1.9	Mann–Whitney U	<0.001
Week 1 composite discomfort score	6.4 ± 1.7	2.9 ± 1.2	Independent t	<0.001
Month 1 composite discomfort score	1.8 ± 0.7	0.9 ± 0.4	Mann–Whitney U	0.002
Overall time effect	—	—	Repeated measures ANOVA (F[2,116]=486.2)	<0.001
Time × Group interaction	—	—	Repeated measures ANOVA (F[2,116]=42.8)	<0.001

Table 4: Visual Acuity and Corneal Astigmatism Changes

Parameter	Group A – Sutured (n=30)	Group B – Sutureless (n=30)	Test Used	p value
Pre-op UCVA (logMAR)	0.48 ± 0.18	0.46 ± 0.20	Independent t	0.62
1-month UCVA (logMAR)	0.26 ± 0.12	0.20 ± 0.11	Independent t	0.048
3-month UCVA (logMAR)	0.18 ± 0.09	0.14 ± 0.08	Independent t	0.047
Time effect UCVA	—	—	Repeated measures ANOVA (F[2,116]=162.3)	<0.001
Time × Group UCVA	—	—	Repeated measures ANOVA (F[2,116]=4.01)	0.021
Pre-op Astigmatism (D)	2.35 ± 0.72	2.27 ± 0.68	Independent t	0.58
3-month Astigmatism (D)	1.46 ± 0.49	1.28 ± 0.44	Independent t	0.12
Intra-group astigmatism change	–0.89 ± 0.31	–0.99 ± 0.33	Paired t (each group)	<0.001

Table 5: Postoperative Complications and Patient Satisfaction

Outcome	Group A – Sutured (n=30)	Group B – Sutureless (n=30)	Test Used	p value
Graft retraction	0%	6.7%	Fisher's exact	0.49
Suture granuloma	10%	0%	Fisher's exact	0.23
Graft edema	16.7%	13.3%	χ^2 test	0.72
Early recurrence (≤3 mo)	3.3%	3.3%	Fisher's exact	1.00
Patient satisfaction (Likert 1–5), mean ± SD	4.1 ± 0.6	4.6 ± 0.5	Mann–Whitney U	0.004

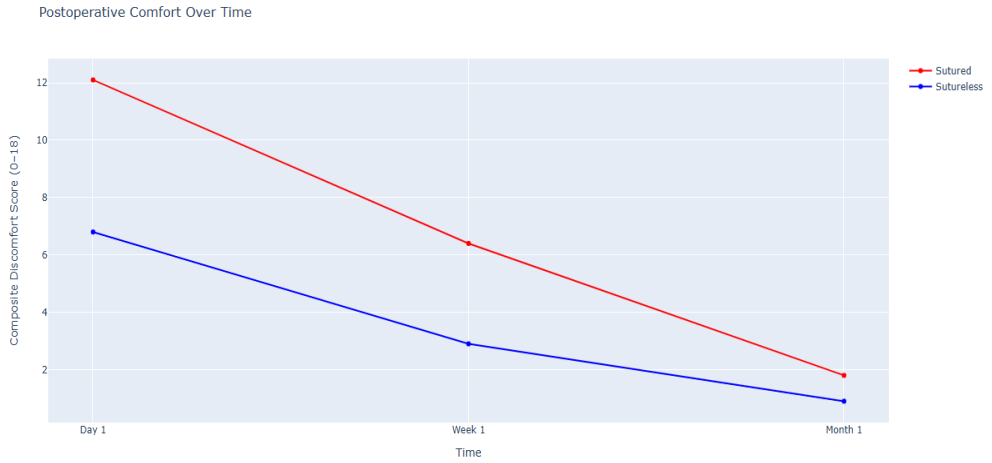

Figure 1: Postoperative comfort over time

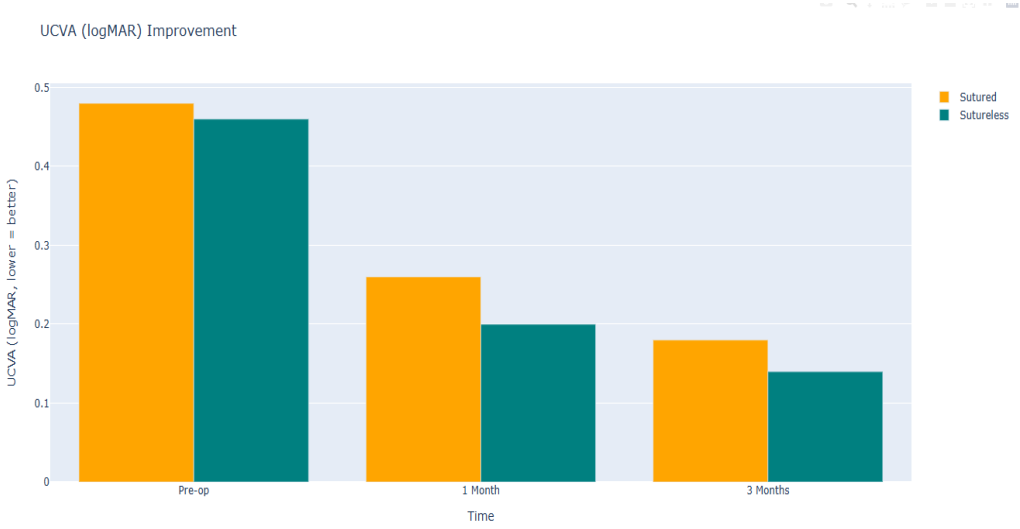

Figure 2: UCVA (logMAR) Improvement

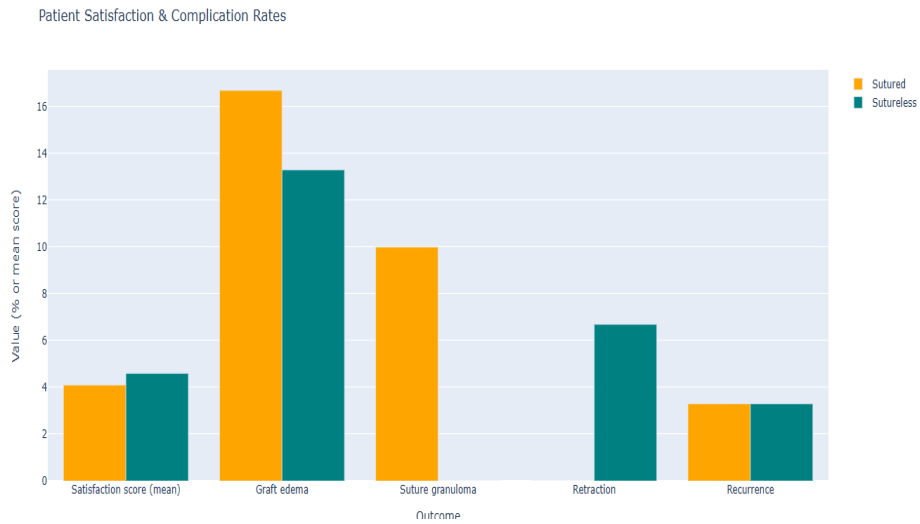

Figure 3: Patient satisfaction & complication Rates

Discussion

Overview of Key Findings: This prospective comparative study evaluated postoperative comfort and visual outcomes in patients undergoing pterygium excision with conjunctival autograft (CAG) secured by either conventional absorbable sutures or a sutureless, glue-free technique at a

high-volume tertiary eye care center in Eastern India. We found that the sutureless method was associated with significantly less postoperative discomfort, shorter operative time, and faster uncorrected visual acuity (UCVA) recovery, while maintaining comparable long-term best-corrected visual acuity (BCVA), astigmatism reduction, and recurrence rates. These results are highly relevant for resource-constrained public hospitals where cost-effective yet patient-centered approaches are needed.

Comparison with Previous Literature

Surgical Evolution and Recurrence: Our study supports the long-established superiority of conjunctival autografting in reducing recurrence after pterygium excision. Since the seminal description of CAG by Kenyon et al. (1985) [5] and further validation by Mahar and Nwokora (1993) [4], this technique has been considered the gold standard because of its limbal barrier and healthy conjunctival epithelium. Recurrence rates with bare sclera excision can reach 30–80% [1–3], whereas CAG reduces this to 2–10% [4–6]. In our series, the early recurrence rate was only 3.3% in each group, comparable to figures reported by Kamil et al. (2021) [6] and Sharma et al. (2019) [13], reaffirming that even glue-free, sutureless autografts remain stable when performed meticulously.

Operative Time: We demonstrated a mean reduction of ~10 minutes with sutureless autografting compared to sutured fixation (21.5 ± 3.6 vs. 31.8 ± 4.2 min; $p < 0.001$). Similar operative efficiency has been described by Koranyi et al. (2004) [6] and Foroutan et al. (2011) [7], who reported shorter surgical times and simplified technique when avoiding sutures. Karalezli et al. (2008) [9] and Panda et al. (2012) [10] also noted that glue-assisted grafting significantly reduced operating time compared with suturing. Although our study used a glue-free approach, careful graft sizing and bed preparation still allowed fast and reliable fixation, suggesting that cost-saving methods need not prolong surgery.

Postoperative Comfort and Symptom Relief: One of the most important findings was the marked reduction in pain and foreign body sensation with the sutureless technique. On postoperative day 1, mean discomfort score in the sutureless group was nearly 45% lower than in the sutured group, with this benefit persisting at week 1 and month 1. Our results align with Sharma et al. (2019) [13], who found significantly lower early pain scores after sutureless CAG, and with Sachdeva et al. (2014) [14], who reported faster surface healing and greater comfort without sutures or glue. Modaberi et al. (2016) [15] also documented superior patient comfort and reduced foreign body sensation with sutureless grafting.

Comparatively, fibrin glue-assisted studies such as those by Bahar et al. (2006) [9], Karalezli et al. (2008) [10], and Kim et al. (2013) [12] showed similar advantages: less postoperative discomfort, reduced hyperemia, and quicker return to routine activities compared with sutures. Our findings confirm that even without fibrin glue—which may be cost-prohibitive in Indian public hospitals—the elimination of sutures alone significantly improves comfort.

Visual Recovery and Astigmatism: Preoperative UCVA and BCVA were similar between groups, reflecting comparable baseline lesion sizes. By 1 month, UCVA improved more quickly in the sutureless group, and repeated measures ANOVA confirmed a significant time × group interaction ($p = 0.021$). These results parallel Tranos et al. (2020) [20], who emphasized that techniques minimizing postoperative surface irregularity, such as sutureless or glue-assisted CAG, facilitate faster refractive stabilization. Dhanuka et al. (2011) [18] also observed earlier visual recovery with fibrin glue.

Both our groups demonstrated significant reduction in corneal astigmatism (≈0.9 D on average) consistent with prior reports by Prabhasawat et al. (1997) [16] and Mandal et al. (2020) [17]. However, the intergroup difference in long-term astigmatism was not statistically significant, indicating that final refractive outcomes depend more on lesion extent and precise graft positioning than on fixation method [16–18].

Complications and Safety: Complications were minor and self-limiting. Suture granuloma occurred in 10% of sutured cases but none in the sutureless group, echoing findings by Sachdeva et al. (2014) [14] who emphasized that eliminating sutures prevents granulomatous reaction.

Mild graft retraction occurred in 6.7% of sutureless eyes but resolved with conservative measures—similar to Koranyi et al. (2004) [7] and Foroutan et al. (2011) [8], who reported occasional partial graft lift but low risk of total loss. Importantly, no serious complications such as scleral melt or infection were observed, supporting the safety of glue-free, sutureless CAG when performed with meticulous technique [6,7,14].

Patient Satisfaction: Overall satisfaction was significantly higher with the sutureless procedure (mean 4.6 vs. 4.1/5).

This finding resonates with Srinivasan et al. (2009) [19], who showed improved patient-reported outcomes after fibrin glue compared with sutures, and with Tranos et al. (2020) [20], who highlighted

that comfort and early recovery strongly influence perceived surgical success.

Strengths of the Study

- **Real-world applicability:** Conducted in a high-volume government tertiary hospital, reflecting practical constraints and outcomes relevant to resource-limited settings.
- **Comprehensive evaluation:** Simultaneously assessed subjective comfort and objective visual outcomes, rather than focusing solely on recurrence.
- **Standardized surgical technique:** All procedures were performed by experienced surgeons using a uniform protocol, minimizing operator bias.
- **Robust statistical analysis:** Appropriate parametric and non-parametric tests (t-test, Mann–Whitney U, χ^2, Fisher's exact, and repeated measures ANOVA) strengthened the validity of results.

Limitations

- **Short follow-up:** Recurrence was evaluated only up to 3 months; longer observation (≥12 months) is needed to fully compare long-term recurrence.
- **Quasi-random allocation:** Alternate assignment may introduce selection bias compared with concealed randomization.
- **Single-center design:** Limits generalizability; multicentric studies could strengthen external validity.
- **Subjective comfort scores:** Although validated scales were used, patient-reported pain may vary with individual tolerance.

Recommendations for Clinical Practice

- Sutureless, glue-free CAG is a cost-effective alternative to suturing or fibrin glue in pterygium surgery, particularly in public hospitals where cost and operative efficiency matter.
- Surgeons should receive proper training in meticulous graft handling and bed preparation to minimize retraction and ensure graft stability.
- Patient counseling should emphasize the expected rapid comfort and early visual recovery with sutureless techniques, improving acceptance and follow-up compliance.
- Future research should include longer follow-up (≥1 year) to confirm long-term recurrence patterns and evaluate ocular surface quality more comprehensively.

Conclusion

Our comparative study shows that sutureless, glue-free conjunctival autografting after pterygium excision provides significantly better early postoperative comfort, faster visual rehabilitation, shorter operative time, and comparable long-term refractive and recurrence outcomes when compared with conventional sutured fixation. These findings support the use of the sutureless technique as a safe, efficient, and patient-friendly alternative, especially in high-volume tertiary care settings where cost and patient satisfaction are critical. Incorporating this approach could improve surgical workflow, reduce follow-up burden, and enhance overall patient-centered care in the management of pterygium.

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