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Original Research Article

Clinical Outcomes of Sutureless and Glue-Free Conjunctival Autografting Using Autologous Blood Following Primary Pterygium Excision: A Prospective Interventional Study

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ABSTRACT

Background: Pterygium is a common degenerative ocular surface disorder characterized by fibrovascular proliferation extending onto the cornea. Surgical excision with conjunctival autografting is the preferred treatment; however, conventional graft fixation using sutures or fibrin glue is associated with postoperative discomfort, increased operative time, and additional cost. The present study evaluated the clinical outcomes of sutureless and glue-free conjunctival autografting using autologous blood as a biological adhesive following primary pterygium excision.

Methods: This prospective interventional study included 36 eyes of patients aged 20–70 years with primary nasal pterygium requiring surgical excision. Following pterygium excision under peribulbar anaesthesia, a conjunctival autograft harvested from the superotemporal conjunctiva was secured over the bare sclera using the patient's own blood without sutures or fibrin glue. Patients were followed at 24 hours, 1 week, 4 weeks, and 10 weeks to assess graft adherence, graft dislodgement, subconjunctival haemorrhage, graft oedema, graft recession, recurrence, and operative outcomes.

Results: The majority of patients were 31–40 years old (27.8%), and 66.7% were males. The mean operative time was 16 ± 1 minutes. Early postoperative complications included subconjunctival haemorrhage in 11.1%, graft oedema in 5.6%, and graft recession in 5.6% of patients, while no graft dislodgement was observed. At 12 weeks, 94.4% of patients achieved complete recovery, and only 5.6% had persistent graft recession. Importantly, no graft failure or recurrence was observed during the follow-up period.

Conclusion: Sutureless and glue-free conjunctival autografting using autologous blood is a safe, effective, economical, and minimally invasive technique for the management of primary pterygium. It provides excellent graft stability, short operative time, minimal postoperative complications, and an absence of recurrence, making it an attractive alternative to sutures and fibrin glue.

Keywords: Pterygium, Conjunctival Autograft, Autologous Blood, Sutureless Surgery, Glue-Free Technique.

INTRODUCTION

Pterygium is a common ocular surface disorder characterized by a triangular or wing-shaped fibrovascular proliferation of conjunctival tissue that extends across the limbus onto the cornea. Although traditionally regarded as a degenerative condition, accumulating evidence suggests that pterygium is a proliferative, inflammatory, and ultraviolet (UV)-related disorder involving abnormal extracellular matrix remodeling, angiogenesis, and limbal stem cell dysfunction.[1] The lesion usually originates in the nasal interpalpebral fissure and may gradually progress toward the visual axis, causing cosmetic disfigurement, chronic ocular irritation, induced astigmatism, and, in

advanced cases, visual impairment. Owing to its high prevalence in tropical and subtropical regions, pterygium remains an important public health concern, particularly among populations with prolonged outdoor exposure to sunlight and environmental irritants.[2]

The pathogenesis of pterygium is multifactorial and involves complex interactions between environmental and genetic factors. Chronic exposure to ultraviolet-B (UV-B) radiation is considered the most significant etiological factor, inducing oxidative stress, DNA damage, apoptosis resistance, inflammatory cytokine production, and activation of matrix metalloproteinases that promote fibrovascular proliferation.[2,3] Additional contributing factors include chronic exposure to dust, wind, dry climatic conditions, microtrauma, reduced tear film stability, and hereditary predisposition. Recent studies have also emphasized the role of localized limbal stem cell deficiency, which compromises the barrier function of the limbus and permits conjunctival tissue to invade the corneal surface. These pathogenic mechanisms collectively explain the progressive nature and high recurrence potential of the disease [4,5]

The prevalence of pterygium varies considerably across different geographic regions, ranging from less than 2% in temperate climates to more than 20% in equatorial countries. Individuals residing within the "pterygium belt," located between 30° north and 30° south of the equator, exhibit the highest disease burden because of increased ultraviolet radiation exposure.[1,6] The condition predominantly affects adults between the third and sixth decades of life and is more frequently observed among males due to greater occupational exposure to outdoor environments. Farmers, construction workers, fishermen, and other individuals involved in prolonged outdoor activities constitute high-risk populations. With increasing life expectancy and continued environmental exposure, the number of patients requiring surgical intervention is expected to rise.[7]

Clinically, patients with pterygium commonly present with foreign body sensation, ocular irritation, burning, redness, tearing, dryness, and cosmetic concerns. Progressive lesions may induce irregular astigmatism by flattening the cornea, resulting in blurred vision and decreased visual acuity.[8] Surgical excision is indicated in cases of progressive corneal encroachment, visual impairment, recurrent inflammation, persistent discomfort despite medical therapy, restriction of ocular motility, or unacceptable cosmetic appearance. Although surgery remains the definitive treatment, postoperative recurrence continues to represent the greatest challenge in pterygium management, with recurrence rates varying widely depending on the surgical technique employed.[9]

Numerous surgical procedures have been developed to minimize recurrence and improve cosmetic outcomes. The bare sclera technique, one of the earliest methods, is associated with unacceptably high recurrence rates ranging from 26.8% to 88%, limiting its current clinical use.[10] The use of adjunctive agents such as mitomycin-C significantly reduces recurrence but may result in serious complications, including scleral necrosis, delayed epithelial healing, infectious scleritis, cataract formation, and corneal perforation.[11] Amniotic membrane transplantation has shown favorable ocular surface reconstruction but involves increased cost and limited availability. Consequently, conjunctival autografting has emerged as the preferred surgical approach because it provides lower recurrence rates while restoring limbal barrier function and achieving satisfactory cosmetic results.[12,13]

Traditionally, conjunctival autografts have been secured using sutures or commercially available fibrin glue. Although sutures provide stable graft fixation, they prolong operative time and are associated with postoperative pain, foreign body sensation, conjunctival inflammation, granuloma formation, and suture-related complications.[14] Fibrin glue has gained popularity because it shortens surgical duration and improves postoperative comfort; however, its widespread use is limited by high cost, restricted availability, potential risk of disease transmission, hypersensitivity reactions, and rapid biodegradation. These limitations have prompted the search for safer, simpler, and more economical alternatives for graft fixation.[15,16]

The use of autologous blood as a natural biological adhesive has recently emerged as an effective alternative for securing conjunctival autografts. In this technique, the patient's own blood forms a fibrin clot that anchors the graft to the scleral bed without the need for sutures or commercial tissue adhesives.[17] This approach minimizes surgical manipulation, reduces operative time, eliminates suture-related discomfort, avoids the expense associated with fibrin glue, and

maintains excellent graft adherence while achieving favorable cosmetic outcomes. Several clinical studies have reported low recurrence rates and acceptable postoperative complication profiles with this technique, making it particularly attractive for ophthalmic practice in resource-constrained settings.[18,19] Despite encouraging evidence, published studies have demonstrated variability in recurrence rates and postoperative complications owing to differences in surgical expertise, patient characteristics, and follow-up duration. Furthermore, there remains limited prospective data from Indian tertiary care centers evaluating the effectiveness of sutureless and glue-free conjunctival autografting using autologous blood. Therefore, the present study was undertaken to evaluate the clinical outcomes of sutureless and glue-free conjunctival autografting using autologous blood following primary pterygium excision, with particular emphasis on graft stability, postoperative complications, recurrence, and overall surgical success. The findings of this study are expected to provide further evidence regarding the safety, efficacy, and feasibility of this simple, cost-effective technique for the management of primary pterygium.

MATERIALS AND METHODS

Study Design

This study was conducted as a prospective interventional case study to evaluate the safety and clinical outcome of sutureless and glue-free conjunctival autologous limbal grafting using the patient's own blood as a biological adhesive following pterygium excision. All eligible patients with primary nasal pterygium underwent the same standardized surgical technique and were prospectively followed to assess postoperative graft stability, complications, and recurrence. Clinical outcomes were evaluated at predetermined postoperative intervals using uniform assessment criteria.

Study Setting

The study was carried out in the Department of Ophthalmology, Mysore Medical College and Research Institute, Mysuru, Karnataka, India. All patients were evaluated in the ophthalmology outpatient department, where detailed ophthalmic examinations were performed before surgery. Surgical procedures were conducted under sterile operating theatre conditions by experienced ophthalmic surgeons following a standardized operative protocol.

Study Duration

The study was conducted over a period of 10 months from March 2025 to December 2025. Patient recruitment, surgical intervention, postoperative follow-up, and outcome assessment were completed during this period. Each participant was followed for 12 weeks (3 months) after surgery.

Participants

Thirty-six eyes of patients diagnosed with primary nasal pterygium and requiring surgical excision were included in the study.

Inclusion Criteria

- Patients aged 20–70 years.
- Patients with primary nasal pterygium willing to undergo surgery.
- Patients with unilateral or bilateral nasal pterygium.
- Patients who provided informed consent for participation.

Exclusion Criteria

- Recurrent pterygium.
- Pseudopterygium.
- History of ocular trauma.

Study Sampling

A consecutive sampling technique was adopted. All patients attending the ophthalmology outpatient department during the study period who fulfilled the eligibility criteria were consecutively recruited until the required sample size of 36 eyes was achieved. No randomization or control group was included, as all participants received the same surgical intervention.

Study Sample Size

The study included a total of 36 eyes with primary nasal pterygium requiring surgical excision. The sample size was determined based on the number of eligible patients presenting during the study period who satisfied the inclusion criteria and consented to participate. All enrolled patients successfully underwent surgery and completed the scheduled postoperative follow-up.

Study Parameters

The primary outcome measures included graft stability, graft dislodgement, subconjunctival haemorrhage, graft oedema, graft recession, and recurrence of pterygium during follow-up. Secondary outcome measures included

operative time, postoperative patient recovery, and procedure-related complications. Demographic variables such as age, gender, laterality, and clinical characteristics of pterygium were also recorded before surgery.

Study Procedure

After obtaining informed consent, all patients underwent a comprehensive ophthalmic examination. Surgical procedures were performed under peribulbar anaesthesia using strict aseptic precautions. The pterygium head and body were carefully excised, and cautery was deliberately avoided on the scleral bed to preserve the natural blood clot. Bleeding from the recipient bed was allowed to occur spontaneously, forming a thin fibrin clot that served as a natural bioadhesive.

The size of the recipient scleral bed was measured using a sterile calliper. A conjunctival autograft approximately 1 mm larger than the recipient bed was harvested from the superotemporal bulbar conjunctiva, ensuring that Tenon's capsule and limbal tissue were excluded. The graft was carefully transferred onto the bare scleral bed while maintaining the correct epithelial orientation. It was gently positioned over the recipient area and stabilized using non-toothed forceps for approximately five minutes to facilitate adherence by the autologous blood clot. Care was taken while removing the eye speculum to avoid graft displacement. The operated eye was patched for 24 hours following surgery.

Postoperatively, all patients received Ofloxacin and Dexamethasone combination eye drops 4–6 times daily for 2–3 weeks, along with lubricating eye drops four times daily for the same duration.

Study Data Collection

Baseline demographic details, clinical findings, operative observations, and postoperative outcomes were recorded using a structured case record proforma. Patients were examined at 24 hours, 1 week, 4 weeks, and 10 weeks after surgery. During each follow-up visit, the graft was evaluated for graft dislodgement, subconjunctival haemorrhage, graft recession, graft oedema, and recurrence of pterygium. Any adverse events or complications encountered during the postoperative period were documented systematically.

Data Analysis

The collected data were compiled and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. Descriptive statistical methods were used to summarize demographic characteristics and postoperative outcomes. The incidence of graft-related complications and recurrence was calculated as percentages. The operative time was expressed as mean ± SD. The results were presented in tables and graphs for clear interpretation.

Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Institutional approval was obtained before commencement of the study. Written informed consent was obtained from all participants after explaining the nature of the surgical procedure, its benefits, possible risks, and the follow-up schedule. Confidentiality of patient information was maintained throughout the study, and participation was entirely voluntary. All surgical procedures and postoperative management were carried out according to standard ophthalmic practice to ensure patient safety.

RESULTS

A total of 36 eyes of 36 patients with primary nasal pterygium underwent pterygium excision followed by sutureless and glue-free conjunctival autografting using autologous blood as a bioadhesive. All patients completed the scheduled postoperative follow-up of 12 weeks. The demographic profile, clinical characteristics, intraoperative findings, and postoperative outcomes are summarized below.

Age Group (Years)	Number	Percentage (%)
20–30	8	22.2
31–40	10	27.8
41–50	9	25.0
51–60	6	16.7
61–70	3	8.3
Total	36	100.0

Table 1. Age Distribution of Study Participants (n = 36)

Most patients belonged to the 31–40 years age group (27.8%), followed by the 41–50 years group (25.0%), indicating that primary pterygium requiring surgical treatment was most common among young and middle-aged adults.

Gender	Number	Percentage (%)
Male	24	66.7
Female	12	33.3
Total	36	100.0

Table 2. Gender Distribution

Males constituted 66.7% of the study population, demonstrating a male predominance, possibly due to greater occupational exposure to sunlight, dust, and outdoor environmental factors.

Eye Involved	Number	Percentage (%)
Right Eye	19	52.8
Left Eye	17	47.2
Total	36	100.0

Table 3. Laterality of Pterygium

The right eye (52.8%) was affected slightly more frequently than the left eye (47.2%); however, the distribution was nearly equal.

Variable	Mean ± SD
Operative Time (minutes)	16 ± 1

Table 4. Mean Operative Time

The average operative time was 16 ± 1 minutes, indicating that sutureless and glue-free conjunctival autografting is a rapid surgical procedure requiring relatively little operative time.

Complication	Number	Percentage (%)
Graft dislodgement	0	0.0
Subconjunctival haemorrhage	4	11.1
Graft recession	2	5.6
Graft oedema	2	5.6
No complication	28	77.8
Total	36	100.0

Table 5. Early Postoperative Complications (24–48 Hours)

During the first 24–48 hours, 77.8% of patients had no postoperative complications. The most frequent complication was subconjunctival haemorrhage (11.1%), while graft oedema and graft recession each occurred in 5.6% of patients. No graft dislodgement was observed.

Outcome	Number	Percentage (%)
Graft dislodgement	0	0.0
Subconjunctival haemorrhage	0	0.0
Graft recession	2	5.6
Graft oedema	0	0.0
Recurrence	0	0.0
Complete recovery	34	94.4
Total	36	100.0

Table 6. Postoperative Outcome at 12 Weeks

At 12 weeks, postoperative complications had resolved in almost all patients. Only 2 patients (5.6%) had persistent graft recession, while no recurrence, graft dislodgement,

subconjunctival haemorrhage, or graft oedema was observed. Overall, 94.4% achieved complete recovery.

Outcome	Number	Percentage (%)
Successful graft adherence	36	100.0
Graft failure	0	0.0
Recurrence	0	0.0
Total	36	100.0

Table 7. Overall Surgical Success

Successful graft adherence was achieved in 100% of cases, with no graft failures or recurrence during the follow-up period, demonstrating excellent surgical success using autologous blood as a biological adhesive.

Complication	Number	Percentage (%)
Subconjunctival haemorrhage	4	11.1
Graft recession	2	5.6
Graft oedema	2	5.6
Graft dislodgement	0	0.0
Recurrence	0	0.0

Table 8. Overall Postoperative Complications

The overall complication rate was low. Subconjunctival haemorrhage (11.1%) was the most common complication, followed by graft recession (5.6%) and graft oedema (5.6%). Importantly, no patient developed graft dislodgement or recurrence, confirming the safety and effectiveness of the sutureless and glue-free autologous blood technique.

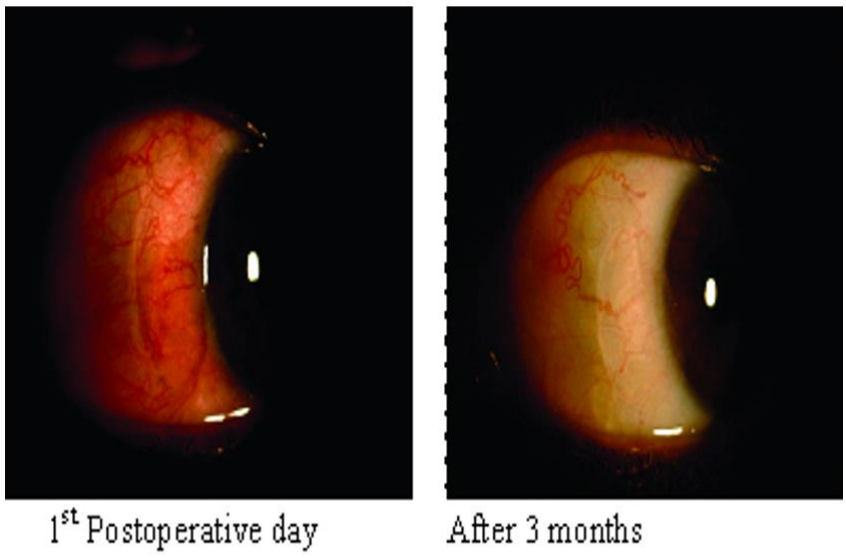

Image 1

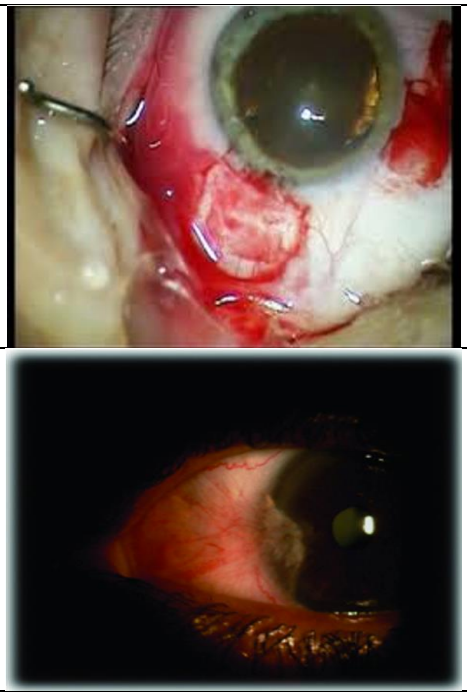

Image 2

DISCUSSION

The present prospective interventional study evaluated the clinical outcomes of sutureless and glue-free conjunctival autografting using autologous blood as a bioadhesive following primary pterygium excision in 36 eyes. The technique demonstrated excellent graft adherence, minimal postoperative complications, and no recurrence during the 12-week follow-up period, suggesting that autologous blood is an effective and economical alternative to sutures and fibrin glue for graft fixation. The majority of the study participants belonged to the 31–40 years age group (27.8%), followed by the 41–50 years age group (25.0%), indicating that pterygium predominantly affected young and middle-aged adults. Males constituted 66.7% of the study population, while females accounted for 33.3%, reflecting the higher prevalence of pterygium among males, possibly due to greater occupational exposure to sunlight and environmental irritants. The right eye was affected in 52.8% of patients and the left eye in 47.2%, demonstrating an almost equal distribution between both eyes.

The mean operative time in the present study was 16 ± 1 minutes, highlighting the simplicity and efficiency of the sutureless and glue-free technique. This finding closely agrees with the study by Marticorena et al. who reported a surgical duration of 15–20 minutes using fibrin glue for conjunctival autograft fixation, demonstrating that tissue adhesive techniques substantially reduce operative time compared with conventional suturing.[20] Similarly, Singh PK et al. reported a mean operative time of 17.45 ± 2.89 minutes for conjunctival autografting using autologous blood and 14.74 ± 2.35 minutes with fibrin glue, indicating that although fibrin glue may slightly shorten surgery, autologous blood fixation remains a rapid and practical alternative without the added expense of commercial adhesives.[21]

Early postoperative complications in the present study were minimal. During the first 24–48 hours, subconjunctival haemorrhage was observed in 11.1% of patients, while graft oedema and graft recession each occurred in 5.6% of cases. Importantly, no graft dislodgement was noted. Most patients (77.8%) experienced an uncomplicated postoperative course. These findings compare favorably with those of Singh MA et al., who observed graft oedema in 20%, subconjunctival haemorrhage in 20%, graft retraction in 13.33%, and graft dislodgement in 3.33% among patients undergoing sutureless and glue-free conjunctival autografting.[22] Likewise, Kulthe SB et al. reported medial graft recession in 1.2% and graft loss in 2.5% following sutureless and glue-free conjunctivolimbal autografting.[23] Compared with these studies, the present study demonstrated a lower incidence of postoperative complications and complete absence of graft dislodgement.

At the end of the 12-week follow-up, 34 patients (94.4%) had complete recovery, while only 2 patients (5.6%) demonstrated persistent graft recession. There were no cases of subconjunctival haemorrhage, graft oedema, graft dislodgement, or recurrence. These findings indicate excellent graft stability and successful healing. Similar observations were reported by Marticorena et al., where 90% of conjunctival autografts remained correctly positioned throughout follow-up and no recurrence was observed, confirming the effectiveness of adhesive-based graft fixation.[20] Kulthe SB et al. also reported no recurrence at the end of six months despite occasional graft-related complications, supporting the long-term efficacy of the sutureless and glue-free technique.[23] Furthermore, Suryawanshi MP et al. found that the autologous blood group showed no recurrence, although two patients (5.71%) experienced graft loss, whereas recurrence occurred only in the suture group.[24] In contrast, Singh PK et al. reported a 10% recurrence rate in both the fibrin glue and autologous blood groups, with graft displacement and graft retraction occurring more frequently in the autologous blood group.[21] The absence of recurrence and graft loss in the present study may be attributed to careful patient selection, meticulous surgical technique, and appropriate postoperative care. Overall surgical success in the present study was excellent, with 100% successful graft adherence, no graft failures, and no recurrence during follow-up. The overall complication profile remained low, with subconjunctival haemorrhage (11.1%) being the most frequent complication, followed by graft oedema and graft recession (5.6% each). These observations are comparable with the retrospective study by Tamaskar S et al., who reported no statistically significant differences in graft oedema, graft retraction, graft loss, or recurrence among sutures, fibrin glue, and autologous blood techniques, concluding that autologous blood fixation provides outcomes comparable to other established methods.[25] Collectively, the findings of the present study support previous evidence that sutureless and glue-free conjunctival autografting using autologous blood is a safe, effective, economical, and minimally invasive technique for the management of primary pterygium. The procedure offers excellent graft stability, short operative time, minimal postoperative complications, and an absence of recurrence during short-term follow-up, making it an attractive alternative to conventional sutured or fibrin glue-assisted conjunctival autografting.

CONCLUSION

The present prospective interventional study demonstrated that sutureless and glue-free conjunctival autografting using autologous blood is a safe, effective, and economical technique for the management of primary pterygium. The procedure was associated with a short mean operative time (16 ± 1 minutes), excellent graft adherence, and a low rate of postoperative complications. Subconjunctival haemorrhage (11.1%), graft oedema (5.6%), and graft recession (5.6%) were infrequent and resolved with appropriate postoperative care. Importantly, no graft dislodgement, graft failure, or recurrence was observed during the 12-week follow-up period. These findings suggest that autologous blood provides an effective biological adhesive for graft fixation and represents a practical alternative to sutures and fibrin glue, particularly in resource-limited settings.

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