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Original Research Article

A Comparative Study of Autologous Blood versus Conventional Conjunctival Autograft Surgery for Pterygium

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Abstract:

Background: Pterygium is a degenerative ocular surface disorder manifesting as fibrovascular overgrowth onto the cornea. While Conjunctival Autografting (CAG) is widely accepted as the gold standard for preventing recurrence, the optimal technique for graft fixation remains a point of contention among ophthalmic surgeons. Conventional suturing is effective but is often associated with longer surgical durations and postoperative patient discomfort.

Objective: The primary objective of this study is to compare the surgical efficiency, postoperative morbidity, complication rates, and recurrence outcomes of using autologous blood (AB) for graft fixation versus the conventional suture technique in a tertiary care setting.

Methods: The Department of Ophthalmology at Darbhanga Medical College in Bihar carried out this retrospective comparison analysis using data from January 2024 to January 2025. We examined 104 eyes (104 individuals) undergoing CAG-assisted primary pterygium excision. Patients were divided into two groups: Group B (n = 52) got fixation using 10-0 nylon sutures, while Group A (n = 52) received graft fixation using autologous blood. Operative time, Visual Analog Scale (VAS) pain levels, postoperative complications (granuloma, retraction, hemorrhage), and recurrence rates during a 6-month follow-up were important outcome markers.

Results: Group A demonstrated a significantly shorter mean operative time (18.4 ± 2.1 minutes) compared to Group B (34.2 ± 3.5 minutes) ($p<0.001$). Postoperative discomfort was markedly lower in the autologous blood group, particularly on Day 1. Suture-related granulomas were unique to Group B (7.7%), while graft retraction was a minor issue in Group A (3.8%). Recurrence rates were statistically comparable (1.9% in Group A vs. 3.8% in Group B; $p>0.05$).

Conclusion: Autologous blood fixation serves as a highly effective, time-saving, and economical alternative to suturing. It eliminates suture-related morbidity without compromising graft stability or increasing recurrence rates, suggesting it should be the preferred technique in resource-limited, high-volume surgical settings.

Introduction

A common ocular surface disorder called pterygium is characterized by a fibrovascular growth of the bulbar conjunctiva that encroaches upon the

cornea in the shape of a wing. It is especially endemic in the "pterygium belt," an area of tropical regions where populations are exposed to high UV radiation levels, hot weather, and environmental irritants including dust and dryness [1]. Due to the farming population's occupational exposure, this illness has a high impact in rural areas like North Bihar. Even if the disorder is benign, when the lesion poses a threat to the visual axis, creates substantial astigmatism, causes persistent discomfort, or presents cosmetic impairment, surgical intervention is sometimes recommended.

Evolution of Surgical Techniques

The surgical management of pterygium has undergone a significant evolution over the past few decades. The historical "bare sclera" technique, which involved simple excision of the lesion, has largely been abandoned due to unacceptably high recurrence rates, often reported to exceed 50% in some series [2]. The introduction of Conjunctival Autografting (CAG) by Kenyon et al. marked a pivotal turning point in management, establishing itself as the gold standard by restoring the limbal barrier and significantly reducing recurrence [3]. Classically, the harvested autograft is anchored to the episcleral bed using sutures, typically 10-0 nylon or absorbable Vicryl. Despite its efficacy in graft stabilization, suturing is technically demanding and inherently time-consuming. Furthermore, sutures act as foreign bodies, often leading to postoperative issues such as giant papillary conjunctivitis, suture abscesses, and the formation of pyogenic granulomas, all of which delay patient rehabilitation [4].

The Shift to Sutureless Techniques

In an effort to mitigate suture-related morbidity, ophthalmic surgeons have explored bio-adhesives. Commercial fibrin glue (e.g., Tisseel) was introduced as a suture replacement, offering excellent adhesion and reduced operative times. However, the widespread adoption of fibrin glue in developing nations is hindered by its high cost, the requisite cold-chain maintenance, and potential risks associated with anaphylaxis and viral transmission [5]. Consequently, the use of the patient's own blood termed "autologous blood" fixation has emerged as a physiological and cost-effective alternative. This technique leverages the natural extrinsic coagulation cascade, utilizing the conversion of the patient's own fibrinogen into a fibrin meshwork to act as a natural bio-sealant, securing the graft without external materials [6].

Rationale for the Study

Regional differences in patient demographics, environmental circumstances, and surgical expertise can affect results, even if the effectiveness of sutureless procedures is supported by global research. In high-volume, resource-constrained government settings where cost and surgical turnover time are crucial considerations, there is an ongoing need to test these methods. The purpose of this study is to compare the surgical results, safety profile, and effectiveness of autologous blood fixation vs traditional suture fixation in pterygium surgery at a Darbhanga tertiary care facility.

Methodology

Study Design and Setting

The Department of Ophthalmology at Darbhanga Medical College and Hospital (DMCH), Bihar, was the site of this retrospective comparative study. Medical records and surgery logs from January 2024 to January 2025 were used in the study. DMCH is a tertiary care government hospital that caters to a wide range of patients, mostly from different socioeconomic backgrounds in the nearby rural areas. The institutional ethical review board approved the study plan since it complied with the Declaration of Helsinki's ethical guidelines.

Sample Size and Selection Criteria

104 eyes from 104 patients who had conjunctival autografting and pterygium excision during the study period made up the study population. Patients with primary nasal pterygium who were between the ages of 20 and 70 were the only ones who could be included in the study. Only patients with a documented follow-up time of at least six months were included in order to guarantee the authenticity of the recurrence data.

Cases with double-head pterygium, pseudopterygium, or recurrent pterygium were eliminated. In order to avoid confounding variables regarding operational time and bleeding complications, patients having a history of prior ocular injuries, concomitant ocular surface infections, or any systemic bleeding disorders (or those on anticoagulant therapy) were excluded from the analysis.

Surgical Groups

The patients were divided into two distinct groups based on the surgical technique recorded in their operative notes:

- **Group A (Autologous Blood):** Consisted of 52 patients who underwent graft fixation using the patient's own blood as a bioadhesive.
- **Group B (Sutures):** Consisted of 52 patients who underwent graft fixation using 10-0 nylon sutures.

Surgical Techniques

Every surgical procedure was carried out under peribulbar anesthesia using 0.5% Bupivacaine and 2% Lignocaine with Adrenaline (1:200,000). The surgical field was exposed using a wire lid speculum, and standard sterilizing and draping procedures were followed.

The excision phase was identical for both groups. The pterygium head was carefully avulsed from the corneal surface, and the body was dissected from the underlying sclera and excised. The subconjunctival fibrovascular tissue was extensively cleared to reduce the risk of recurrence. Hemostasis was managed judiciously; in Group A specifically, cautery was used sparingly to preserve a thin film of blood on the scleral bed, which is the cornerstone of the autologous fixation technique.

For **Group A (Autologous Blood)**, the surgeon harvested a thin conjunctival graft from the superior bulbar conjunctiva, matching the dimensions of the bare sclera defect. The graft was slid onto the recipient bed, ensuring the limbal orientation was maintained. The surgeon utilized the natural oozing of blood from the episcleral vessels beneath the graft. The graft was spread evenly, and firm pressure was applied using smooth forceps for approximately 8 to 10 minutes. This waiting period allowed the natural fibrin coagulum to form. The edges were inspected for adherence using a "stretch test" before the speculum was carefully removed.

For **Group B (Sutures)**, the harvested graft was transferred to the recipient site in a similar manner. However, fixation was achieved by securing the graft to the episclera and adjacent conjunctiva using interrupted 10-0 nylon sutures. Typically, sutures were placed at the four corners of the graft, with additional sutures placed along the margins as required to ensure stability. The knots were buried to minimize postoperative irritation.

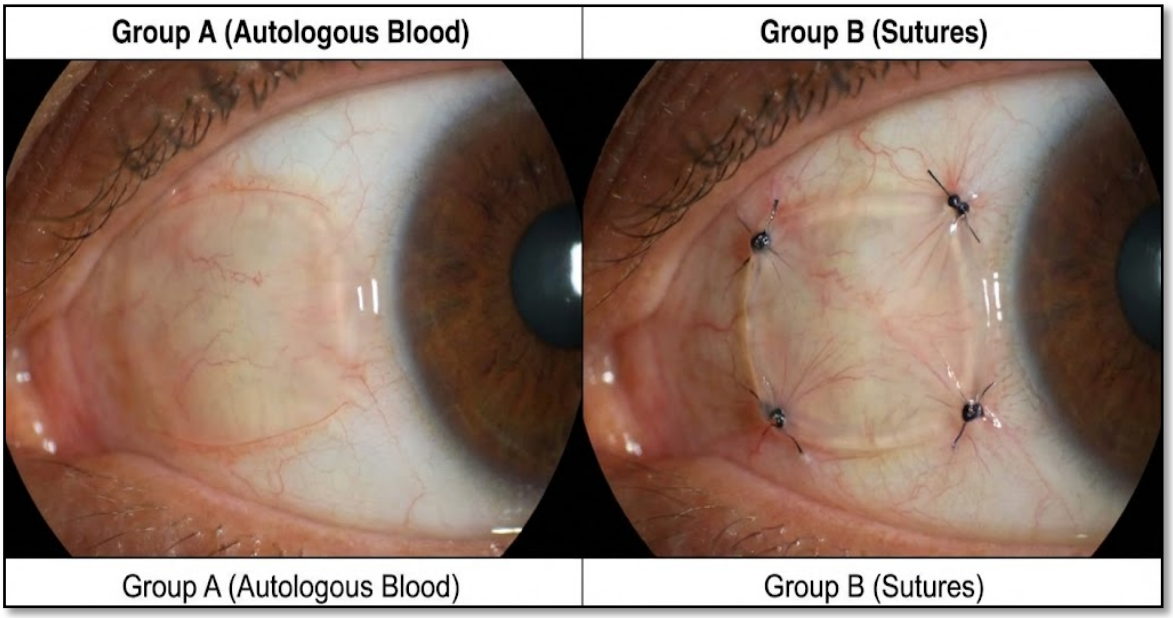

Figure 1: **Immediate Postoperative Appearance of Autologous Blood vs. Suture Fixation**

Postoperative Regimen

To prevent bias in healing outcomes, postoperative care was standardized for both groups. Topical Moxifloxacin (0.5%) and Prednisolone acetate (1%) were administered to patients four times a day, tapered over a six-week period. Additionally, lubricating eye drops (0.5% carboxymethylcellulose) were recommended. Following surgery, patients were assessed on Day 1, Day 7, 1 month, 3 months, and 6 months.

Outcome Measures

Operative time, which is the amount of time between inserting and removing the speculum, was the main efficiency metric. On Days 1 and 7, postoperative discomfort scores on a Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (intolerable agony) were used to measure patient morbidity. The frequency of problems such bleeding, granuloma development, and graft retraction were among the clinical outcomes. The rigorous definition of recurrence was the fibrovascular proliferation of conjunctival tissue that crossed the corneoscleral limbus by more than one millimeter.

Statistical Analysis

SPSS software (Version 22.0) was used to compile and analyze the data. The independent Student's t-test was used to compare continuous variables like age and operating time, which were reported as mean ± standard deviation. The Chi-square test was used to compare categorical variables such as recurrence, complication rates, and gender distribution. Statistical significance was defined as a p-value of less than 0.05.

Results

Demographic Profile

The study population included 104 patients evenly distributed between the two surgical groups. The demographic analysis revealed no statistically significant differences between the groups, ensuring that baseline characteristics did not influence the surgical outcomes. The mean age was 44.5 ± 8.2 years in Group A and 46.1 ± 7.5 years in Group B. As expected with pterygium cases in this region, there was a higher prevalence among males, likely due to greater outdoor occupational exposure.

Table 1: **Demographic Characteristics of the Study Population**

Parameter	Group A (Autologous Blood) (n=52)	Group B (Sutures) (n=52)	p-value
Mean Age (Years)	44.5 ± 8.2	46.1 ± 7.5	0.42
Gender (Male/Female)	34 / 18	31 / 21	0.55
Eye Laterality (RE/LE)	28 / 24	26 / 26	0.69
Occupation (Outdoor/Indoor)	38 / 14	35 / 17	0.58

Operative Time

A highly significant difference was observed regarding the duration of the surgery. The autologous blood technique proved to be substantially faster. The mean operative time for Group A was 18.4 ± 2.1 minutes, whereas Group B required 34.2 ± 3.5 minutes. The elimination of suturing saved an average of approximately 15 minutes per case ($p<0.001$), a crucial factor for surgical workflow in a high-volume hospital.

Postoperative Discomfort

Patient comfort was significantly superior in the autologous blood group. On the first postoperative day, patients in Group B reported higher mean VAS scores, citing foreign body sensation, watering, and photophobia. By Day 7, while pain scores decreased in both groups, Group A remained significantly more comfortable.

Table 2: **Comparison of Postoperative Discomfort (VAS Score 0-10)**

Follow-up Day	Group A (Autologous Blood)	Group B (Sutures)	p-value
Day 1	2.1 ± 0.8	6.4 ± 1.2	< 0.001
Day 7	0.5 ± 0.3	3.2 ± 0.9	< 0.001

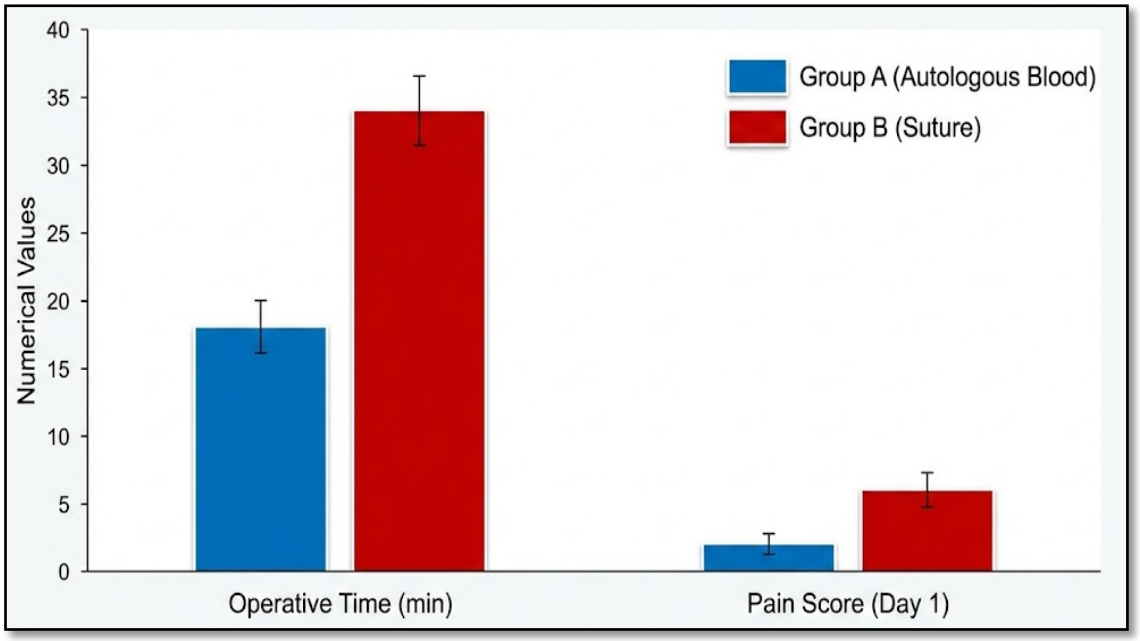

Figure 2: **Operative Time and Postoperative Pain Comparison**

Complications

The complication profile differed distinctly between the two techniques. Group A experienced minor complications related to the initial adherence of the graft, such as graft retraction in 2 eyes (3.8%) and

subgraft hemorrhage in 4 eyes (7.7%). In contrast, Group B complications were directly related to the presence of sutures. Pyogenic granulomas were observed in 4 eyes (7.7%) in the suture group, requiring pharmacological or surgical management. No granulomas occurred in the autologous blood group. Importantly, no cases of graft infection or scleral necrosis were noted in either group.

Table 3 Distribution of Postoperative Complications

Complication	Group A (Autologous Blood) n (%)	Group B (Sutures) n (%)	p-value
Graft Retraction	2 (3.8%)	0 (0.0%)	0.15
Subgraft Hemorrhage	4 (7.7%)	1 (1.9%)	0.17
Pyogenic Granuloma	0 (0.0%)	4 (7.7%)	0.04
Graft Dehiscence/Loss	0 (0.0%)	0 (0.0%)	–
Suture Abscess	N/A	2 (3.8%)	–
Total Complications	6 (11.5%)	7 (13.5%)	0.76

Recurrence

Recurrence rates, the most critical long-term outcome metric, were low and comparable in both groups. At the end of the 6-month follow-up, recurrence was noted in 1 eye (1.9%) in Group A and 2 eyes (3.8%) in Group B. Statistical analysis (p=0.67) indicated that the autologous blood technique is non-inferior to suturing regarding the prevention of recurrence.

Discussion

The transition from "bare sclera" excision to conjunctival autografting was a monumental step in pterygium surgery. However, the method of attaching that graft has remained a subject of refinement. Our study at Darbhanga Medical College provides compelling evidence that using the patient's own blood as a bioadhesive is not only a viable alternative to sutures but surpasses them in terms of patient comfort and surgical efficiency.

Surgical Efficiency and Operative Time

The most immediate benefit observed in our study was the reduction in operative time. The autologous blood technique was, on average, 16 minutes faster than suturing. This aligns with findings by Choudhury et al. and Kurian et al., who reported similar time efficiency [7, 8]. In the context of a government hospital in India, where patient load is immense and resources are finite, a 45% reduction in surgical time allows for a significant increase in the number of surgeries performed per list, optimizing the utilization of theatre time and personnel.

Postoperative Morbidity and Patient Comfort

Postoperative comfort is a major determinant of patient satisfaction. Sutures, even when knots are buried, often protrude and irritate the tarsal conjunctiva during blinking, leading to significant foreign body sensation and reflex tearing. Our results showed a stark contrast in VAS scores, with the autologous blood group reporting minimal pain. This observation is consistent with the study by Foroutan et al., which demonstrated that sutureless techniques result in significantly lower Ocular Surface Disease Index (OSDI) scores in the early postoperative period [9]. The absence of sutures essentially eliminates the inflammatory stimulus, leading to a "quieter" eye and faster return to daily activities for the patient.

Complication Profile

The autologous blood technique demonstrated a distinct safety profile. The primary concern with this technique is graft stability; however, our study showed a low retraction rate of 3.8%. This suggests that if adequate time (8-10 minutes) is allowed for

the fibrin clot to mature intraoperatively, the adhesion is robust enough to withstand eyelid movements. Conversely, the suture group suffered from pyogenic granulomas (7.7%), a well-documented complication caused by the chronic inflammatory response to the suture material [10, 11]. The management of granulomas often requires prolonged steroid use or secondary excision, adding to the treatment burden.

Recurrence and Biological Outcomes

Recurrence remains the ultimate benchmark for success in pterygium surgery. Our study found no statistically significant difference in recurrence rates between the two groups (1.9% vs. 3.8%). This reinforces the concept that the barrier effect of the limbal stem cells contained within the graft is the primary factor in preventing recurrence, rather than the method of fixation [12]. As long as the graft remains in situ during the initial healing phase, the long-term biological outcome remains favorable. This non-inferiority is supported by multiple comparative studies, including those by Bada et al. and Boucher et al., which confirm that sutureless techniques do not compromise recurrence rates [13, 14].

Economic and Practical Implications

Finally, the economic implications cannot be overlooked. While fibrin glue is an excellent alternative, its high cost makes it prohibitive for routine use in charitable or government settings in developing countries [15]. Autologous blood incurs zero additional cost, requires no consumables (needles or glue), and avoids the potential viral risks associated with pooled blood products. It represents a "zero-cost" innovation that democratizes high-quality eye care [16, 17].

Conclusion

The present retrospective analysis of 104 eyes at Darbhanga Medical College provides robust evidence supporting the shift toward sutureless pterygium surgery. The study confirms that using autologous blood for conjunctival autograft fixation is superior to conventional suturing in terms of operative efficiency and postoperative patient comfort. The technique significantly reduces surgical time, allowing for better resource allocation in high-volume centers, and drastically minimizes postoperative pain, leading to higher patient satisfaction.

Furthermore, the autologous blood technique eliminates suture-related complications such as granulomas and abscesses without compromising graft stability or increasing the risk of recurrence. While it requires a brief learning curve and patience during the intraoperative coagulation phase, the benefits far outweigh the technical demands. Given its safety, efficacy, and zero-cost advantage, we strongly recommend the adoption of autologous blood fixation as the standard of care for primary pterygium surgery, particularly in developing regions where economic constraints and high surgical volumes are prevalent.

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