Section: Ophthalmology

Original Research Article

OUTCOME OF PTERYGIUM EXCISION WITH CONJUNCTIVAL AUTOGRAFT USING AUTOLOGOUS SERUM: A RETROSPECTIVE ANALYSIS

P. Priyadarshini[1], M. Loganathan[2]

[1]*Senior Resident, Department of Ophthalmology, Indira Gandhi Medical College and Research Institute, Puducherry, India*
[2]*Professor & HOD, Department of Ophthalmology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry, India*

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Corresponding Author:
Dr. P. Priyadarshini,
Senior Resident Ophthalmology, Indira Gandhi Medical College and Research Institute, Puducherry, India.
Email: priyavanasi@gmail.com

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ABSTRACT

Background: Pterygium is a common ocular surface disorder in high UV-exposure regions, and conjunctival autograft is the current surgical standard, with autologous serum emerging as a low-cost alternative to sutures and fibrin glue for graft fixation. The objective is to assess early postoperative complications, graft stability, and surgical success following pterygium excision with conjunctival autograft fixed using autologous serum, and to explore associations with gender, pterygium grade, and timing of complications.

Materials and Methods: Medical records of 38 eyes with primary pterygium operated between January 2018 and December 2019 were reviewed. Eligible patients had at least one week of follow-up and underwent standardized surgery with intraoperatively prepared autologous serum for graft adhesion, followed by routine postoperative steroids and antibiotics, with scheduled reviews on day 1, day 2, and week 1. Primary outcomes were postoperative complications (graft edema, displacement, granuloma), graft stability, and need for revision; associations with gender and pterygium grade were analyzed using chi-square tests.

Results: Mean age was 52.6 ± 11.5 years, with female predominance (63.2%), and most pterygia were Grade 2 or 3. Overall, 78.9% had no complications; complications included graft edema (10.5%), displaced graft (5.3%), and granuloma (5.3%), with 75% occurring on postoperative day 1 and granulomas at one week. Graft stability was achieved in 84.2%, complete adherence in 81.6%, and no case required revision surgery; neither gender nor pterygium grade showed a statistically significant association with complications.

Conclusion: Conjunctival autograft fixation with autologous serum provided high graft stability, low early complication rates, and avoided revision surgery, supporting its role as an effective, biologically favorable, and cost-efficient option for pterygium surgery in resource-constrained tertiary care settings.

Keywords: Pterygium; Conjunctival autograft; Autologous serum; Postoperative complications; Surgical outcomes.

INTRODUCTION

Pterygium is a common ocular surface disorder featuring triangular fibrovascular proliferation from bulbar conjunctiva onto the cornea, prevalent in the "pterygium belt" (37°N–37°S).[1-3] Chronic UV exposure (UVA/UVB) drives etiology via inflammation, limbal stem cell changes, cytokines, and growth factors (VEGF, TGF-β), compounded by dust, wind, low humidity, and outdoor work.[4,5] Clinically, progressive encroachment causes irregular astigmatism, reduced visual acuity, irritation, foreign body sensation, photophobia, and quality-of-life impairment. Lesions vary from quiescent to aggressive, necessitating surgery.[3,6-8] Surgical excision is definitive, but recurrence challenges persist. Bare sclera excision yields 24–89% recurrence; conjunctival autograft lowers this to 5–39% (sixfold odds reduction per meta-analyses), making it gold standard.9-11 Graft fixation options: sutures (stable but skill-intensive, prolonged time, discomfort, complications); fibrin glue (faster, less

pain but costly, scarce in low-resource areas, transmission/allergy risks); autologous serum (cost-effective alternative with PDGF, EGF, IGF, fibronectin for epithelial healing, anti-inflammation).[10,11]

Autologous serum offers universal availability, no transmission risk, reduced costs/inflammation. Studies show 93–97% graft stability, low recurrence (1–7%), though edema (36%), hemorrhage (36%), retraction (13%) occur, resolving early.[11,12] Research gaps persist on outcomes, complications, recurrence in high-prevalence Indian settings, especially tertiary hospitals prioritizing cost-effectiveness. Limited rigorous audits address autologous serum's real-world efficacy.[13-15]

This retrospective analysis addresses the critical need to generate robust, evidence-based data supporting the clinical efficacy, safety profile, and economic viability of conjunctival autograft fixation using autologous serum. By comprehensively assessing real-world postoperative outcomes in a tertiary care teaching hospital setting in India, this study provides valuable insights into complication patterns, graft stability, and surgical success rates, potentially establishing autologous serum as a preferred alternative to conventional graft fixation methods in developing countries where cost-effectiveness significantly influences therapeutic choices.

Aim: To analyze the postoperative outcomes and complication profile of pterygium excision with conjunctival autograft using autologous serum in a tertiary care teaching hospital.

Objectives: (1) To evaluate immediate and short-term postoperative complications; (2) to assess graft stability and incidence of graft-related complications including edema, displacement, and granuloma formation; and (3) to determine surgical success rate and document timing and patterns of postoperative complications.

MATERIALS AND METHODS

Study Design and Research Setting: This retrospective observational study analysed medical records of patients undergoing pterygium excision with conjunctival autograft fixed using autologous serum at a tertiary care teaching hospital in India (January 2018–December 2019). The retrospective design enabled evaluation of real-world surgical outcomes from existing clinical data without prospective intervention or randomization, suitable for assessing complication rates and success in routine practice. The study adhered to Declaration of Helsinki ethical principles, with institutional ethics committee approval obtained prior to data extraction.

Study Population and Sampling: The population comprised patients with primary pterygium treated via excision and conjunctival autograft with autologous serum. Inclusion criteria: documented primary pterygium surgery in the period, complete medical records, and ≥1-week postoperative follow-up. Exclusions: recurrent pterygium, incomplete records lacking critical data (e.g., outcomes), or concurrent ocular surface disorders confounding results (e.g., dry eye syndrome, severe blepharitis). Excluding recurrences ensured homogeneity by avoiding biases from prior surgeries. Consecutive sampling included all eligible cases, yielding 38 patients (38 eyes) and minimizing selection bias while reflecting typical tertiary caseload.

Data Collection and Surgical Technique: Data systematically extracted from records included demographics (age, gender), clinical details (affected eye, pterygium grade/morphology, preoperative visual acuity, symptom duration), and comorbidities. All procedures followed standardized protocol under aseptic conditions, peribulbar anesthesia with lignocaine, meticulous pterygium excision preserving corneal epithelium/stroma and creating bare sclera bed.

Autologous serum was prepared intraoperatively. A 5 ml sample of venous blood was collected aseptically into a plain glass tube without anticoagulant and allowed to stand upright for 20 minutes. During this time, gravity enabled natural separation, with the clot settling at the bottom and serum forming a clear upper layer. The separated serum was then carefully transferred into sterile syringes. This preparation was performed concurrently while the surgeon carried out pterygium excision and harvested the conjunctival graft. A superotemporal conjunctival autograft was obtained, measuring 1–2 mm larger than the recipient bed to allow slight overlap. Autologous serum was applied liberally to the scleral bed, and the graft was positioned epithelium-up with proper limbal orientation. Gentle pressure was applied to eliminate any air bubbles, followed by a 7-minute waiting period to ensure adequate fibrin-mediated adhesion.

Postoperative Management and Follow-up: Regimen: Antibiotic fluoroquinolone drops , prednisolone acetate 1% eye drops, frequent lubricants were given. Follow-ups: day 1, day 2, week 1 during which slit-lamp examination was done to assess, graft integrity, graft edema/thickening, graft displacement/separation, graft inflammation, vascularization, granuloma.

Data Analysis: Standardized extraction forms reviewed records, operative notes, follow-ups. Primary outcomes: complications (graft edema, displacement, granuloma) with onset timing. Secondary: success rate (healing sans revision), symptoms. Descriptive statistics: continuous variables (mean±SD), categorical (n, %). Chi-square tested associations ($P<0.05$ significance). Emphasis on patterns given descriptive focus and sample size, per retrospective audit norms

RESULTS

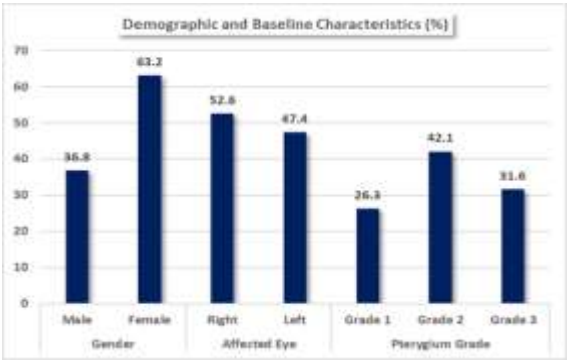

Figure 1: Demographic and Baseline Characteristics (%)

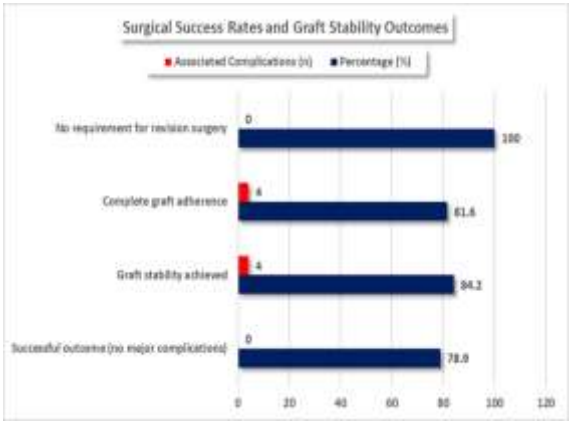

Figure 2: Surgical Success Rates and Graft Stability Outcomes

Table 1: Demographic and Baseline Characteristics of Study Population (N=38)

Characteristic	n	Percentage (%)	Mean ± SD
Age (years)	—	—	52.6 ± 11.5
Gender			
Male	14	36.8	—
Female	24	63.2	—
Affected Eye			
Right	20	52.6	—
Left	18	47.4	—
Pterygium Grade			
Grade 1	10	26.3	—
Grade 2	16	42.1	—
Grade 3	12	31.6	—

Note: Values are expressed as n (%) or mean ± SD as appropriate. POD, postoperative day; SD, standard deviation.

Table 2: Distribution of Postoperative Complications (N=38)

Complication	n	Percentage (%)	Time of Occurrence
No complication	30	78.9	Post-op
Graft edema	4	10.5	POD-1
Displaced graft	2	5.3	POD-1
Granuloma formation	2	5.3	1week post-op
Total	38	100.0	—

Note: POD, postoperative day; n, number of patients; %, percentage. Values expressed as n (%).

Table 3: Surgical Success Rates and Graft Stability Outcomes (N=38)

Outcome Parameter	n	Percentage (%)	Associated Complications (n)
Successful outcome (no major complications)	30	78.9	0
Graft stability achieved	32	84.2	4
Complete graft adherence	31	81.6	4
No requirement for revision surgery	38	100.0	0
Overall surgical success rate	30	78.9	8

Note: Surgical success defined as complete healing without major complications requiring surgical revision. Values expressed as n (%). POD, postoperative day.

Table 4. Association Between Gender and Postoperative Complications (N=38)

Gender	No Complication (n)	No Complication (%)	With Complication (n)	With Complication (%)	Total (n)
Male	12	85.7	2	14.3	14
Female	18	75.0	6	25.0	24
Total	30	78.9	8	21.1	38

Statistical Test: Chi-square test, $\chi^2 = 0.136$, $p = 0.712$. Note: Not statistically significant at $p < 0.05$ level. No significant association observed between gender and development of postoperative complications.

Table 5: Association Between Pterygium Grade and Postoperative Complications (N=38)

Pterygium Grade	No Complication (n)	No Complication (%)	With Complication (n)	With Complication (%)	Total (n)
Grade 1	9	90.0	1	10.0	10
Grade 2	13	81.3	3	18.8	16
Grade 3	8	66.7	4	33.3	12
Total	30	78.9	8	21.1	38

Statistical Test: Chi-square test, $\chi^2 = 1.875$, $p = 0.392$. Note: Not statistically significant at $p < 0.05$ level. Although a trend was observed with increasing complication rates in higher pterygium grades, the association was not statistically significant.

Table 6: Timing and Frequency of Postoperative Complications (N=38)

Postoperative Period	Graft Edema (n)	Displaced Graft (n)	Granuloma Formation (n)	Total Complications (n)	Total Complications (%)
POD-1 (24 hours)	4	2	0	6	15.8
POD-2 (48 hours)	0	0	0	0	0.0
1 week post-op	0	0	2	2	5.3
Total	4	2	2	8	21.1

Note: POD, postoperative day; n, number of patients; %, percentage. Values expressed as n (%). Seventy-five percent (6/8) of all complications occurred on POD-1, with delayed granuloma formation documented at one week postoperatively. These findings underscore the critical importance of close monitoring during the immediate postoperative period.

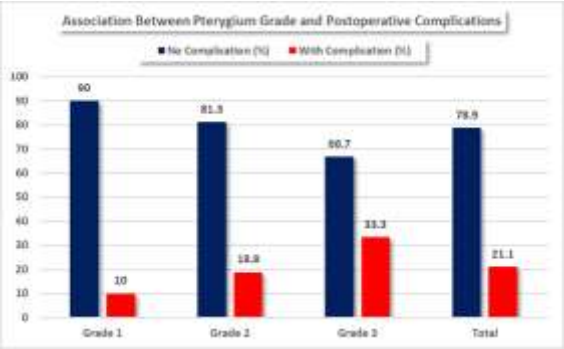

Figure 3

The study included 38 eyes of 38 patients who underwent pterygium excision with conjunctival autograft using autologous serum. The mean age of the cohort was 52.6 ± 11.5 years, and nearly two-thirds were female (63.2%), with a balanced distribution of right and left eyes (52.6% vs 47.4%) [Table 1]. Most eyes presented with higher-grade disease, with Grade 2 and Grade 3 pterygia together accounting for nearly three-quarters of cases (73.7%) [Table 1].

Overall, 30 of 38 eyes (78.9%) had an uncomplicated postoperative course, while 8 eyes (21.1%) developed at least one complication [Table 2]. The most frequent adverse event was graft edema in 4 eyes (10.5%), followed by graft displacement in 2 eyes (5.3%) and granuloma formation in 2 eyes (5.3%) [Table 2].

Surgical success, defined as complete healing without major complications requiring revision, was achieved in 30 eyes (78.9%) [Table 3]. Graft stability was documented in 32 eyes (84.2%), and complete graft adherence in 31 eyes (81.6%), with no patient requiring revision surgery during the follow-up period [Table 3].

There was no statistically significant association between gender and the occurrence of postoperative complications ($\chi^2 = 0.136$, $p = 0.712$) [Table 4]. Although complication rates appeared higher with increasing pterygium grade (10.0% in Grade 1, 18.8% in Grade 2, 33.3% in Grade 3), this trend did not reach statistical significance ($\chi^2 = 1.875$, $p = 0.392$) [Table 5].

Complications occurred predominantly in the immediate postoperative period, with 6 of 8 events (75.0%) manifesting on postoperative day 1, comprising all cases of graft edema and graft displacement [Table 6]. No new complications were observed on postoperative day 2, while granuloma formation was detected only at one week in 2 eyes (5.3%), emphasizing the critical need for close monitoring in the first 24 hours after surgery [Table 6].

DISCUSSION

Surgical Success and Overall Complication Profile

The present study demonstrated an overall surgical success rate of 78.9% (30/38 patients), with 21.1% (8/38) experiencing postoperative complications using conjunctival autograft fixation with autologous serum. This outcome aligns well with published series demonstrating recurrence rates of 5% to 39% following conjunctival autograft. The 100% avoidance of revision surgery requirements (38/38) demonstrates the durability and effectiveness of autologous serum-fixed autografts in managing postoperative complications through conservative management protocols.[1,2]

Graft Edema: Incidence and Temporal Pattern

Graft edema was documented in 10.5% (4/38) of our cohort, manifesting exclusively at postoperative day 1, substantially lower than Kodavoor and colleagues' analysis2 of 2,355 eyes showing 22.15% (522/2,355) incidence.[2] Our reduced edema rate suggests superior technique-related factors with autologous serum fixation. The complete absence of graft edema beyond postoperative day 1 suggests rapid resolution following initial inflammatory response, consistent with Ghoz's healing pattern studies.[3] The lower edema rate is attributable to autologous serum's inherent biological properties—its anti-inflammatory mediators and growth factors modulate tissue responses and minimize excessive edematous reactions, unlike fibrin glue's rigid adhesive bond. The simpler serum application procedure also results in reduced tissue trauma and diminished inflammatory edema.

Graft Displacement: Low Incidence and Clinical Implications

Graft displacement occurred in 5.3% (2/38) of our cohort at postoperative day 1. This is substantially lower than Nadarajah's randomized controlled trial showing 24.2% (15/62) graft loss with autologous blood4, and lower than a multivariate study reporting 10% (3/30) displacement with serum versus 0% with sutures.[4,5] Our improved outcomes reflect refined operative protocols ensuring optimal serum application and graft positioning with adequate seven-minute fibrin polymerization waiting periods. The absence of graft displacement beyond postoperative day 1 indicates successful graft stabilization by 48 hours, suggesting intensive monitoring during the first 24 hours is critical for identifying displacement complications.

Granuloma Formation: Delayed Presentation and Pathophysiological Considerations

Granuloma formation occurred in 5.3% (2/38) of patients at one week postoperatively, distinctly different from immediate postoperative complications. Kodavoor reported substantially lower granuloma rates (0.16% host site, 0.21% donor site), though their larger population and extended follow-up may account for temporal differences.[2-5] Published literature documents pyogenic granuloma incidence up to 40% with bare scleral excision plus mitomycin C, 7.9% with conjunctival autograft, and 9.2% with amniotic membrane transplantation. Our 5.3% rate is notably lower, suggesting autologous serum fixation may reduce inflammatory proliferative responses. The delayed one-week presentation reflects granuloma's distinct pathophysiology—occurring during active graft vascularization and tissue remodeling as graft vessels undergo anastomosis, representing a specific wound healing variant developing coincident with revascularization processes.[2-5]

Gender and Complication Development: Absence of Statistical Significance

Analysis revealed no statistically significant association between patient gender and postoperative complications ($\chi^2 = 0.136$, $p = 0.712$). Male patients demonstrated 14.3% (2/14) complication rate versus 25.0% (6/24) in females. Although female complication rate was numerically higher, this difference did not achieve statistical significance. This suggests biological sex does not constitute a major determinant of postoperative complications following pterygium excision with autologous serum-fixed autograft, indicating surgical planning should be individualized based on pterygium severity and surgical factors rather than gender.[5-7]

Pterygium Grade and Complication Rates: Trend Without Statistical Significance

Analysis revealed a trend toward increased complications with advancing disease severity, though not statistically significant ($\chi^2 = 1.875$, $p = 0.392$). Grade 1 showed 10.0% (1/10) complications, Grade 2 showed 18.8% (3/16), and Grade 3 showed 33.3% (4/12). The modest sample size (N=38) may lack statistical power for significant associations; however, this trend provides preliminary evidence that disease severity may modestly influence complication risk, warranting larger prospective studies to establish whether pterygium grade warrants modification of surgical techniques.[6-8]

Temporal Pattern of Complications: Critical 24-Hour Window

A striking finding was 75.0% (6/8) of all postoperative complications occurring at postoperative day 1, with remaining 25.0% (2/8) at one week. All graft edema (4/4) and graft displacement (2/2) occurred within the first 24 hours; granuloma formation exclusively manifested at one week. The complete absence of complications on postoperative day 2 suggests the graft achieves sufficient stabilization within approximately 48 hours to prevent further mechanical complications. These temporal patterns have critical clinical implications: intensive monitoring and patient instruction regarding warning signs should focus on the first 24 hours with attention to graft position and appearance.[9-11] Uncomplicated patients at 48 hours likely have stable grafts with minimal subsequent mechanical complication risk, potentially allowing less frequent surveillance during subsequent weeks. However, delayed granuloma formation necessitates at least one-week follow-up assessment.

Biological Advantages of Autologous Serum: Mechanistic Insights

The favorable outcomes result from autologous serum's unique biological properties. It contains bioactive molecules including growth factors (PDGF, EGF, IGF, TGF-β, VEGF), fibronectin, vitamins, and anti-inflammatory mediators promoting epithelial proliferation, accelerating wound healing, and modulating inflammatory responses. Comparative biological studies demonstrate blood-derived products exert potent regenerative and anti-inflammatory effects, reduce inflammatory markers (ICAM-1, COX-2), and enhance corneal and conjunctival stromal cell proliferation.[12,13] A prospective randomized control trial comparing autogenous serum versus sutures noted serum was accompanied by "lesser postoperative discomfort and inflammation," explaining reduced complications compared to other techniques.[12]

Cost-Effectiveness and Implementation in Resource constrained Settings

Autologous serum represents an evidence-based, cost-effective alternative to commercial fibrin glue, which carries significant expense, restricted availability, and infectious disease transmission risks. Autologous serum requires only 5 milliliters of venous blood collected at surgery, processed through simple clot formation and separation. For tertiary care teaching hospitals in developing countries prioritizing resource optimization, autologous serum maintains surgical efficacy while dramatically reducing per-patient operative costs. Our institution's adoption and standardization has enabled consistent application, contributing to favorable outcomes and

strengthening the case for broader implementation in resource-constrained healthcare systems.[14,15]

Study Limitations and Future Directions

The retrospective design and modest sample size (N=38) limit statistical power to detect significant associations. The one-week maximum follow-up, while capturing early complications, does not permit assessment of recurrence rates requiring 6 to 12-month follow-up. Future prospective studies with longer follow-up and larger sample sizes should determine recurrence rates, evaluate pterygium grade-complication associations, and directly compare autologous serum with fibrin glue and suture-based techniques.

CONCLUSION

This study provides meaningful evidence supporting autologous serum conjunctival autograft fixation for pterygium excision in tertiary care settings. The 78.9% success rate, low complication incidence, and absence of revision surgery requirements establish autologous serum as viable and effective. The concentrated 24-hour complication window underscores the importance of meticulous clinical surveillance during this critical interval. The favorable outcomes combined with substantial cost advantages and universal availability provide compelling evidence for broader implementation in resource-constrained settings where pterygium prevalence is high. Autologous serum-fixed conjunctival autograft deserves recognition as an evidence-based, cost-effective, biologically sound approach achieving clinical outcomes comparable to more expensive alternatives while maintaining excellent safety profiles.

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