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Pterygium Excision with Conjunctival Autograft: Sutures Vs Sutureless Technique

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ABSTRACT

Background: Pterygium is a common eye condition marked by the abnormal growth of fibrovascular tissue from the conjunctiva onto the cornea, often resulting in visual impairment and discomfort. This condition typically presents as a triangular lesion that varies in severity and is linked to environmental factors like UV radiation. Effective management of pterygium, including surgical removal and autografting, is crucial for maintaining ocular health.

Methods: A retrospective study was conducted at the Shree Balaji Institute of Medical Science, involving 120 patients with pterygium who underwent surgery between January 2022 and January 2024. Three groups were formed based on surgical technique: sutures, fibrin glue, and autologous blood. Patient outcomes, including recurrence and complications, were compared across these groups using one-way ANOVA and Pearson's Chi-square test, with p-values indicating statistical significance.

Results: The mean age differed significantly across procedures ($p<0.001$), with 61.69 years in the suture group, 50.17 years in the glue group, and 50.13 years in the blood group. Gender and eye distribution were not significantly different ($p>0.05$). No significant differences in complications such as graft edema ($p=0.456$), graft retraction ($p=0.372$), granuloma ($p=0.344$), graft loss ($p=0.248$), and recurrence ($p=0.613$) were observed among the techniques.

Conclusion: The main conclusion of this study is that there are no significant differences in the rates of complications, including graft edema, graft retraction, granuloma formation, graft loss, and recurrence, among the three techniques.

Key-words: Pterygium, Suture, Radiation, surgery, Conjunctival Autograft, Sutureless Technique

INTRODUCTION

Pterygium is a common ophthalmic condition characterized by the growth of fibrovascular tissue from the conjunctiva onto the cornea [1]. This condition involves the degeneration and proliferation of sub-conjunctival tissue that extends over the cornea, destroying superficial layers, including the stroma and Bowman's membrane.

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Pterygium typically presents as a triangular or wing-shaped growth that can vary in severity, affecting vision and causing discomfort. The lesion is traditionally divided into three distinct parts: the apex or head, which is the invading portion; the neck, which serves as the transitional zone between the head and the body; and the body itself, which is the more prominent, more stable component of the growth [2].

Patients with pterygium often experience recurrent symptoms such as redness, foreign body sensation, and irritation primarily caused by mechanical friction, inflammation, and tear film instability. In advanced stages, pterygium can extend further onto the cornea, encroaching upon the pupillary area. This progression can lead to significant visual impairment, including the development of astigmatism due to alterations in the

corneal surface. Understanding the etiology, risk factors, and effective treatment methods for pterygium is crucial for mitigating its impact on patient's quality of life [3].

Fig. 1: Patient having Pterygium Right eye

Etiology and Risk Factors- The development of pterygium is closely linked to environmental factors, particularly prolonged exposure to ultraviolet (UV) radiation, dust, and pollutants. Chronic UV exposure, especially UV-B rays, is thought to induce oxidative stress and subsequent damage to the conjunctival and corneal epithelium, leading to the formation of pterygium [1,2]. This process is believed to involve UV-induced elastotic degeneration, where the elastic fibers in the conjunctiva undergo structural changes, becoming thickened and disorganised. Additional contributing factors include genetic predisposition, trauma, and altered cytokine expression, all of which can accelerate the degenerative changes associated with pterygium development [4].

Pterygium is graded based on its extent of corneal involvement. Grade 1 pterygium is limited to the limbus, where the conjunctiva meets the cornea. Grade 2 extends to a point midway between the limbus and the pupil. Grade 3 reaches the pupillary margin, and Grade 4 crosses over the pupillary margin, significantly threatening visual acuity. The grading system is essential for guiding treatment decisions and evaluating the risk of recurrence after surgical removal [5].

Epidemiological studies suggest a prevalence rate of around 6.9%, with a higher incidence among individuals aged 30 to 60, particularly males and those residing in rural areas. This demographic trend is largely attributed to increased exposure to sunlight and outdoor work, leading to greater UV light exposure. Rural populations often lack adequate protective measures such as UV-blocking eyewear, making them more susceptible to developing pterygium [6].

Prevalence and Demographic Factors- Pterygium is a relatively common ocular condition, with a prevalence rate of approximately 6.9% in the general population. It is more frequently observed in people aged 30 to 60, with a higher incidence among males than females. This gender disparity is partly because men are more likely to work outdoors and thus have greater exposure to UV radiation. Moreover, pterygium is particularly prevalent among rural populations, who often engage in outdoor activities without adequate protection from UV light [7].

Current Management Strategies- The management of pterygium depends on the severity of the condition and the presence of symptoms. For mild cases, particularly those classified as Grade 1 or 2, conservative treatment with nonsteroidal anti-inflammatory drugs (NSAIDs) and ocular lubricants is typically sufficient to alleviate symptoms. However, surgical intervention becomes necessary when these measures fail to control symptoms or when the pterygium progresses to the extent that it threatens vision by obstructing the visual axis or inducing significant astigmatism [4,5].

Surgical treatment for pterygium generally involves the excision of the lesion, followed by covering the exposed sclera with a conjunctival autograft to prevent recurrence. The graft can be secured using techniques, including sutures, fibrin glue, or autologous blood. Each method has its unique advantages and disadvantages, and the choice of technique depends on various factors, such as the surgeon's expertise, patient preference, and cost considerations [4-6]. Fig. 2 A & B shows the Pterygium Dissection.

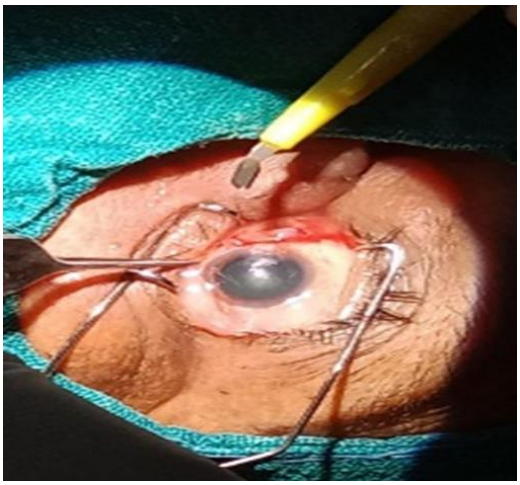

Fig. 2A: Dissection of Pterygeum

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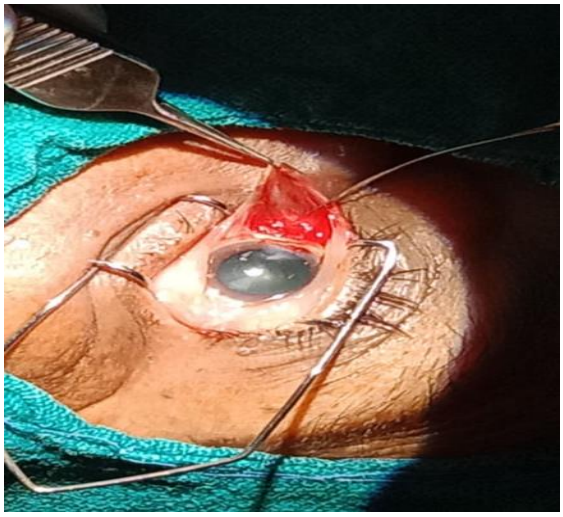

Fig. 2B: Dissection of Pterygeum

Suture vs. Sutureless Techniques

Suture Technique- The traditional method of securing a conjunctival autograft involves sutures. This technique requires high surgical skill to ensure the graft is correctly positioned and attached. Suturing (Fig. 3) is considered a reliable and cost-effective method with a relatively low risk of recurrence. However, one of the main drawbacks is the discomfort and irritation caused by the sutures. Patients often report increased post-operative pain, foreign body sensation, and prolonged recovery time. Additionally, there is a risk of complications such as granuloma formation or suture-related infections, although these are relatively rare [6,7].

Fig. 3: Conjunctival graft in place (with suture)

Sutureless Techniques- In recent years, sutureless techniques have gained popularity due to their potential to reduce post-operative discomfort and speed up recovery. Two primary sutureless methods (Fig. 4) are currently employed: fibrin glue and autologous blood [5-8].

Fig. 4: Conjunctival graft in place (suture-less)

Fibrin Glue- In this method, the graft adheres to the ocular surface using fibrin glue, a biological adhesive derived from human plasma that mimics the final stages of the coagulation cascade. The main advantage of fibrin glue is its ability to provide a robust and secure bond without sutures, resulting in less irritation and a shorter recovery period. However, using fibrin glue is associated with some concerns, including the risk of transmission of prion diseases and potential anaphylactic reactions in susceptible individuals. Additionally, the cost of fibrin glue is significantly higher than sutures, which may limit its accessibility in resource-constrained settings [7].

Autologous Blood- Another sutureless technique involves securing the graft using the patient's blood. The blood, which oozes from the cut edges of the conjunctiva and bare scleral surface during surgery, can clot naturally, anchoring the graft in place. This method does not require additional materials beyond the blood, making it a cost-effective option. However, it has challenges, such as a higher risk of graft detachment and edema, which can complicate the post-operative course [7,8].

Materials and Methods

This retrospective study was conducted at the Department of Ophthalmology, Shree Balaji Institute of Medical Science, focusing on evaluating the efficacy and safety of sutureless techniques in pterygium excision with conjunctival autograft. The study involved 120 patients diagnosed with pterygium who underwent surgery between January 2022 and January 2024. The surgeries were performed by three experienced ophthalmic surgeons within the department. The

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objective was to compare the outcomes of the traditional suture technique and two sutureless methods glue and autologous blood—for securing the conjunctival autograft.

Research Design- A retrospective study was employed to evaluate the effectiveness of different surgical techniques for pterygium excision. The study included three groups of 40 patients each. Group 1 consisted of patients who underwent the traditional suture technique, where the graft was secured using Ethicon 10-0 sutures. Group 2 utilised a sutureless approach with the graft secured by fibrin glue. Group 3 also employed a sutureless technique, but the graft was fixed using autologous blood from the patient's body. The study compared the outcomes across these groups by examining factors such as post-operative complications, recurrence rates, and patient characteristics.

Inclusion Criteria

- Patients with nasal pterygium were classified as Grade 3 or 4, where the growth was significantly affecting vision or causing visual discomfort.
- Patients experiencing recurrent irritation due to the pterygium.
- Cases where the pterygium was cosmetically bothersome to the patient, impacting their quality of life.

Exclusion Criteria

- This location may involve different anatomical and surgical considerations for patients with temporal pterygium.
- Individuals with recurrent pterygium, who may have undergone previous surgeries, could influence the study's outcomes and the effectiveness of the surgical techniques being evaluated.

All patients in the study underwent a comprehensive ophthalmic examination, including an assessment of visual acuity for both near and distant vision. Patients were assigned to one of the three groups based on the surgical technique used for their pterygium excision.

Statistical Analysis- Descriptive statistics were used to summarize the demographic and clinical characteristics of the patients. The mean and standard deviation (SD) were calculated for continuous variables such as age. In contrast, categorical variables like gender and laterality of the affected eye were presented as frequencies and percentages. Comparative analysis of patient characteristics across the three groups was performed using one-way analysis of variance (ANOVA) for continuous variables (such as age) and Pearson's Chi-square test for categorical variables (such as gender distribution and laterality of the affected eye). Differences were considered statistically significant at a p-value less than 0.05.

Ethical Approval- The Ethical Committee of SBIMS, India, has approved the study.

RESULTS

Table 1 provides the descriptive statistics for patient characteristics. The mean age of patients was 53.97 years with a standard deviation of 9.64 years, and the age ranged between 16 to 77 years. There was a male preponderance of 52.5% compared to females with 47.5%. The procedure was performed on 53.5% of the left and 47.5% of the right. The suture procedure was used in 39 (32.5%) patients, glue was used in 41 (34.2%) patients, and blood in 40 (33.3%) patients.

Table 1: Descriptive statistics for patient characteristics

Characteristics	Level	Statistic
Age in years [Mean (SD); Min-Max]		53.97 (9.64); 16-77
Gender [n (%)]	Male	63 (52.5%)
	Female	57 (47.5%)
Eye [n (%)]	LE	63 (53.5%)
	RE	57 (47.5%)
Procedure	Suture	39 (32.5%)
	Glue	41 (34.2%)
	Blood	40 (33.3%)

Table 2 compares patient characteristics across procedures. The mean age of patients in the sutures group was 61.69 (SD: 5.87) years, while that of the glue group was 50.17 (SD: 10.84) years, and blood (autologous serum) was 50.13 (SD: 6.14) years. The difference of means was statistically significant with a $p<0.001$. The gender-wise distribution of patients and the eye distribution were not significantly different across procedures ($p>0.05$).

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Table 2: Comparison of patient characteristics across procedures

Characteristic	Level	Procedure			p-value
		Suture (N=39)	Glue (N=41)	Blood (N=40)	
Age in years [Mean (SD); Min-Max]		61.69 (5.87); 50-77	50.17 (10.84); 16-70	50.13 (6.14); 37-64	< 0.001*
Gender [n (%)]	Male	21 (53.8%)	25 (61.0%)	17 (42.5%)	0.245§
	Female	18 (46.2%)	16 (39.0%)	23 (57.5%)	
Eye [n (%)]	LE	21 (53.8%)	18 (43.9%)	24 (60%)	0.342§
	RE	18 (46.2%)	23 (56.1%)	16 (40%)	

**Obtained using one-way ANOVA; §Obtained using Pearson's Chi-square test;*
Bold p-value indicates the statistical significance of the difference

Table 3 and Fig. 5 provide the type and the number of complications in each procedure category. In the sutures category, there were a maximum of 3 (7.7%) patients with graft edema, followed by 2 (5.1%) with granuloma. In the glue category, 3 (7.3%) patients had graft loss, followed by 2 (4.9%) with graft edema and retraction. There was 1 (2.4%) patient of granuloma and recurrence. In the blood category, there were 5 (12.5%) patients with graft edema and 2 (5%) patients with graft loss.

Table 3: Occurrence of complications in patients according to procedure

Complication	Procedure		
	Suture (N=39)	Glue (N=41)	Blood (N=40)
	n (%)		
Graft edema	3 (7.7%)	2 (4.9%)	5 (12.5%)
Graft loss	0	3 (7.3%)	2 (5%)
Graft retraction	1 (2.6%)	2 (4.9%)	0
Granuloma	2 (5.1%)	1 (2.4%)	0
Recurrence	0	1 (2.4%)	1 (2.5%)
None	33 (84.6%)	32 (78%)	32 (80%)

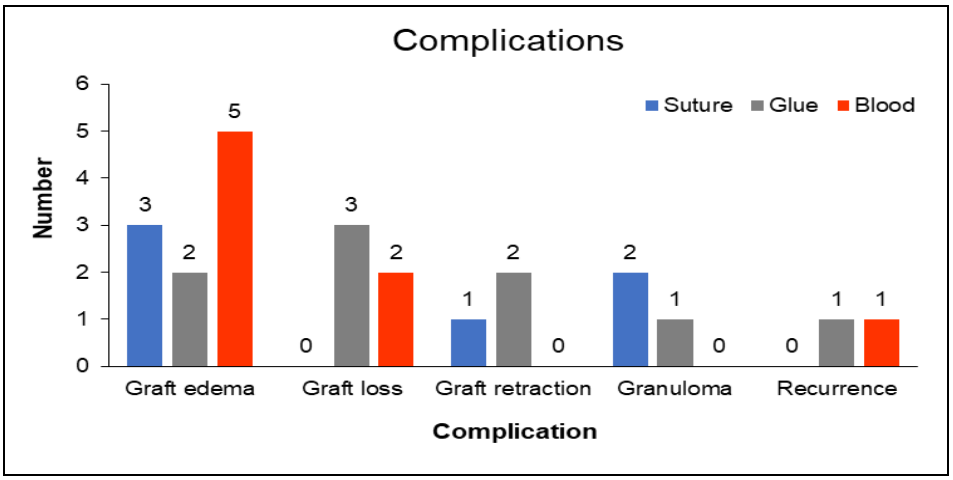

Fig. 5: Column chart showing the number of complications in each procedure type

Fig. 6 shows the association between different procedures (suture, glue, and blood) and the occurrence of various complications following pterygium surgery was analyzed using Pearson's Chi-square test. For graft edema, the incidence was observed in 3 patients in the suture group, 2 in the glue group, and 5 in the blood group. The difference in the occurrence of graft edema among the three groups was not statistically significant,

with a p-value of 0.456. Regarding graft retraction, there was 1 case in the suture group, 2 in the glue group, and no in the blood group. The p-value for the association between the type of procedure and graft retraction was 0.372, indicating no statistically significant difference across the groups. The occurrence of granuloma was found in 2 patients in the suture group, 1 in the glue group, and none in the blood group. The p-value of 0.344 suggests no significant association between the type of procedure and granuloma formation. No cases were reported for graft loss in the suture group, while 3 cases occurred in the glue group and 2 in the blood group. The p-value for graft loss was 0.248, indicating no statistically significant difference among the procedures. Lastly, pterygium recurrence was observed in 1 patient in the glue group, while no recurrences were reported in the suture and blood groups. The p-value for recurrence was 0.613, demonstrating no statistically significant association between the type of procedure and recurrence. The statistical analysis reveals no significant differences in complications such as graft edema, graft retraction, granuloma, graft loss, and recurrence among the three surgical techniques used for conjunctival autografting.

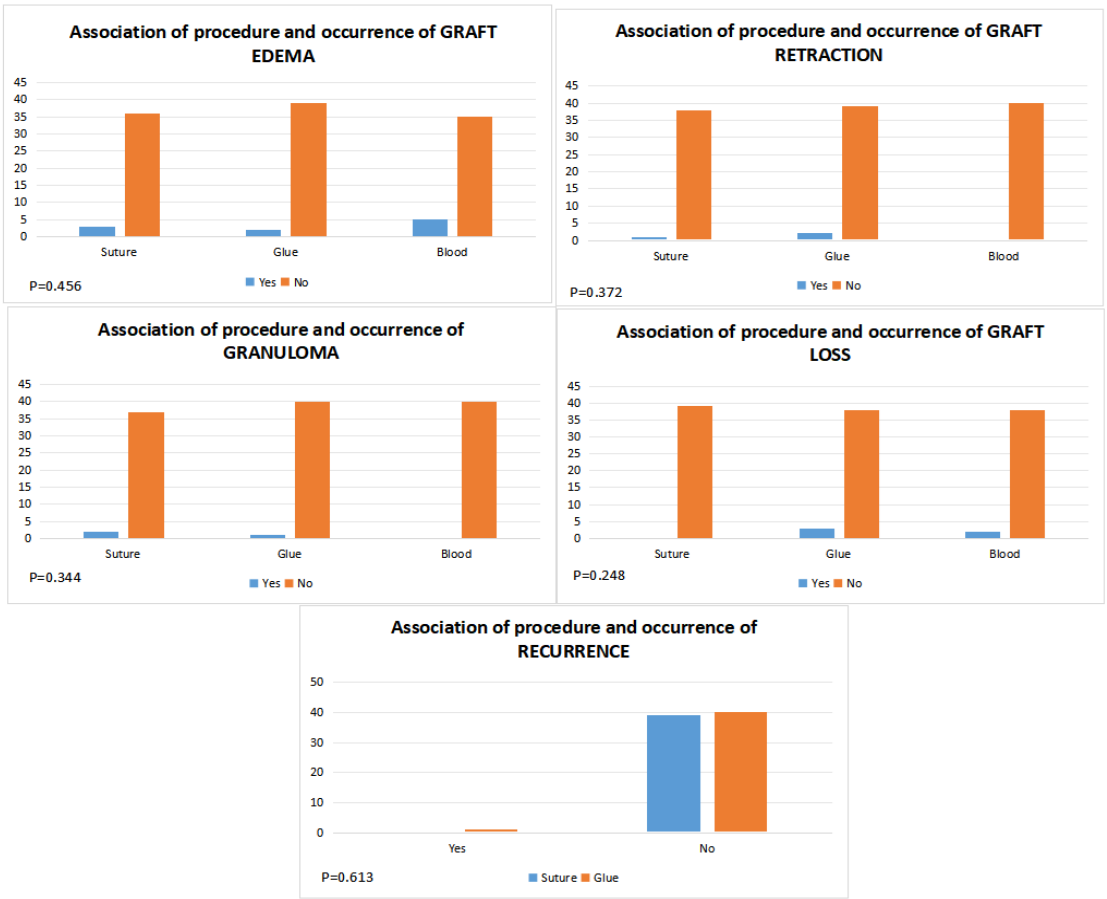

Fig. 6: Statistical Analysis of several parameters among the patients

DISCUSSION

Conjunctival autografting is widely regarded as the gold standard in managing primary pterygium, a common ocular condition characterized by the growth of fibrovascular tissue from the conjunctiva onto the cornea. This condition is often attributed to environmental factors such as prolonged exposure to ultraviolet radiation, dust, and wind, leading to chronic ocular surface inflammation. Pterygium can cause significant discomfort, redness, foreign body sensation, and visual disturbances, especially when it infringes onto the central cornea. Surgical excision is considered the most effective treatment for pterygium, particularly when it causes visual impairment or severe discomfort. However, a major concern for ophthalmic surgeons is pterygium recurrence following surgery, commonly occurring within the first six months postoperatively. Several factors can influence recurrence rates, including the surgical technique used, the extent of the pterygium, and individual patient characteristics [9].

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Autologous conjunctival grafting has become a preferred method for reducing the recurrence rate after pterygium excision by restoring the barrier function of the limbus, the border area between the cornea and sclera. The graft, typically harvested from the superior or inferior bulbar conjunctiva, is transplanted onto the excised pterygium site to cover the bare sclera and provide a new surface that prevents regrowth of the fibrovascular tissue. By acting as a mechanical barrier and reestablishing the normal anatomy and function of the conjunctiva and limbus, conjunctival autografting has proven to significantly reduce the risk of recurrence compared to other techniques, such as bare sclera excision without grafting or amniotic membrane transplantation [10].

Conjunctival autografts can be attached using various techniques, including suturing with silk or nylon threads or biological adhesives such as fibrin glue and autologous blood. Each method offers distinct advantages and disadvantages, and the choice of technique often depends on the surgeon's preference, the availability of resources, and patient-specific factors. Suturing has been the traditional method of securing the autograft. While it remains popular due to its cost-effectiveness and the widespread familiarity of surgeons with the technique, it is not without drawbacks [11]. For instance, Suzuki et al. reported that the use of silk or nylon sutures for conjunctival autografting is associated with several complications, including conjunctival inflammation and the migration of Langerhans cells into the cornea, which can provoke an inflammatory response and increase the risk of recurrence. Moreover, the suturing technique requires a longer operating time, leading to additional patient discomfort and an increased risk of postoperative complications, such as Dellen formation, symblepharon, or graft tear. These complications can significantly impact patient outcomes and satisfaction, highlighting the need for alternative techniques that offer similar or improved efficacy with fewer adverse effects [7,8].

A study by Corcel-Ghanem et al. evaluated the outcomes of 58 eyes that underwent primary pterygium surgery with conjunctival autografting using sutures. The study found that 15 eyes, or 25.9%, experienced recurrence within 4.5 months post-surgery [8-10]. This relatively high recurrence rate underscores the limitations of the suturing technique, particularly in terms of patient comfort and the potential for post-operative complications. Given these drawbacks, there has been increasing interest in sutureless techniques for conjunctival autografting, which aim to reduce surgical time, minimize patient discomfort, and potentially lower recurrence rates. One such method involves using fibrin glue, a biological adhesive derived from human plasma that mimics the final stages of the blood coagulation cascade. Fibrin glue allows for a quick and secure graft fixation with a shorter surgical time than suturing, and studies have suggested that it may offer several advantages in terms of patient comfort and reduced post-operative inflammation [10].

However, fibrin glue is not without its disadvantages. The high cost of fibrin glue can be prohibitive, particularly in resource-limited settings, and there is also a theoretical risk of transmission of infectious agents, such as prions or viruses, despite rigorous screening and purification processes. In the study by Corcel-Ghanem et al., a recurrence was observed in 12 eyes (11.3%) out of 106 eyes that had undergone pterygium surgery with fibrin glue to secure the conjunctival autograft. While this recurrence rate is lower than that reported for the suturing technique, the cost and potential risks associated with fibrin glue remain important considerations for its use in clinical practice [10-12].

Another sutureless approach for securing conjunctival autografts is using autologous blood, which involves utilizing the patient's blood to fix the graft. This method is particularly appealing when fibrin glue is unavailable or unaffordable, as it requires no additional materials beyond the patient's blood. The autologous blood technique leverages the natural clotting process to adhere the graft to the scleral bed, and it has been associated with shorter surgical times and reduced patient discomfort compared to suturing. However, there are concerns about the stability of the graft with this method, as there may be a higher risk of graft displacement or detachment, particularly in the early post-operative period [6-9].

Boucher et al. conducted a study that examined the use of autologous blood for graft fixation in pterygium surgery and reported a recurrence rate of 20% (4 out of 20 patients). While still significant, this recurrence rate is lower than that reported for the traditional suturing technique, suggesting that autologous blood may offer a viable alternative to sutures, particularly in settings where cost is a concern. Another study by Elwan

explored the outcomes of pterygium excision with conjunctival autografting using both autologous blood and sutures. The study reported conjunctival edema in 8 eyes (16%) and six eyes (6%) and recurrence in 3 eyes (6%) and 8 eyes (8%) for the autologous blood and sutured groups, respectively. Additionally, granuloma formation was observed in 3 eyes (3%) in the sutured group, while no granulomas were reported in the autologous blood group. These findings suggest that autologous blood may be associated with a lower incidence of certain complications, such as granuloma formation, compared to suturing. However, graft edema and detachment risk may be higher, potentially impacting overall patient outcomes [12,13].

A study by Hall *et al.* further supports the potential benefits of sutureless techniques in pterygium surgery. In this study, no recurrence was observed in the group that underwent pterygium excision with conjunctival autografting using a sutureless technique. While the absence of recurrence is a promising finding, it is essential to note that the sample size and study design can significantly influence these results. Larger, randomized controlled trials are needed to confirm the effectiveness of sutureless techniques in reducing recurrence rates and improving patient outcomes [14,15].

CONCLUSIONS

The main conclusion of this study is that there are no significant differences in the rates of complications, including graft edema, graft retraction, granuloma formation, graft loss, and recurrence, among the three techniques—sutures, fibrin glue, and autologous blood—used for securing conjunctival autografts in pterygium surgery. The findings indicate that while there were variations in the age of patients undergoing different procedures, with a statistically significant difference in mean age ($p<0.001$), there were no significant differences in gender distribution or the eye affected across the procedures ($p>0.05$). Additionally, no statistically significant differences were observed in the occurrence of complications such as graft edema, graft retraction, granuloma, graft loss, or recurrence among the three surgical techniques (suture, glue, and blood) used for conjunctival autografting (all $p>0.05$). These results suggest that all three methods are comparably effective regarding complication rates, allowing for flexibility in selecting the surgical approach based on patient preference and clinical circumstances.

CONTRIBUTION OF AUTHORS

Research concept- Swati Tamaskar
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Data collection- Swati Tamaskar
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Writing article- Harapriya Sahoo
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Article editing- K.K. Bhoi
Final approval- U.C. Tiwari

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