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Original Article

Twelve-Month Results of Pterygium Surgery with Autologous Blood Assisted, Sutureless Conjunctival Autograft: Safe and Comfortable Surgical Technique

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Abstract

Objectives: To evaluate the efficiency and safety of autologous blood-assisted, sutureless conjunctival autograft surgery in the management of pterygium.

Methods: This study included the eyes of 124 patients who were divided into two groups. Group 1 consisted of 62 patients who received autologous blood-assisted, sutureless conjunctival autograft, and Group 2 consisted of 62 patients who underwent conventional sutured conjunctival autograft surgery. The primary outcome measure was graft stability, and the secondary outcome measures were postoperative immediate patient comfort and recurrence rates at 12 months.

Results: The mean duration of surgery was significantly shorter in Group 1 (9.84±2.64 min) than in Group 2 (17.90±4.42 min) ($p<0.001$). The postoperative pain visual analog scale score was significantly lower in Group 1 ($p<0.001$). The postoperative complications included graft loss in four patients in Group 1 and recurrence of pterygium in six patients in Group 2.

Conclusion: The autologous blood-assisted, sutureless conjunctival autograft technique seems superior to the conventional sutured autograft technique in terms of postoperative patient comfort, lower recurrence rates, and shorter duration of surgery.

Keywords: Autologous blood, pterygium, recurrence, sutureless surgical procedures

Introduction

Pterygium is a prevalent ocular surface disease characterized by proliferative and degenerative changes that advance from the conjunctiva to the cornea. It can lead to sensations of foreign-body presence, diminished visual acuity, difficulties with accommodating contact lenses, and cosmetic concerns (1). The primary treatment for pterygium is surgical, and several surgical techniques have been documented. The initial method, known as the "bare sclera" approach, exhibits substantial recurrence rates, ranging from 56% to 89% (2,3).

The conjunctival autograft technique was first described by Kenyon et al. in 1985 (4). Since then, this technique has gained increasing popularity due to its low recurrence rates and higher safety margin (5). Conventionally, the conjunctival autograft is stabilized with vicryl or nylon sutures, which can

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cause postoperative discomfort, photophobia, foreign body sensation, and epiphora. Various scales, such as the Visual Analog Scale (VAS), Likert scale, Numerical Rating Scale, and Verbal Pain Score, which provide a score out of 10, are employed to assess the pain experienced during surgery (6).

Additional drawbacks of this technique include extended surgical time for suture placement and the necessity for suture removal when nylon sutures are utilized. Currently, fibrin glue is considered superior to suture closure due to its benefits in terms of patient comfort, reduced operative time, and lower recurrence rates (7). Nonetheless, it is worth noting that fibrin glue is a relatively costly material, which may limit its routine use. In this context, the autologous blood technique provides a more cost-effective alternative to fibrin glue for symptomatic pterygium surgery.

In this study, our objective was to compare the autologous blood-assisted, sutureless conjunctival autograft method with the conventional sutured conjunctival autograft method in terms of graft stability, surgical duration, and long-term recurrence rates.

Methods

Participants and Data Collection

This study adhered to the principles outlined in the Declaration of Helsinki, and ethical approval for the study was obtained from the Ethics Committee of Başakşehir Çam ve Sakura City Hospital (Approval Number: 2022/06.187). All participants were provided with detailed information regarding the potential risks and benefits associated with the surgery, and written informed consent was obtained from all patients.

This was a retrospective comparative study involving a total of 124 eyes from 124 patients diagnosed with grade 2 pterygium according to the classification by Tan et al. (8) The patients were recruited from our clinic between April 2020 and December 2023. They were then randomly assigned to two groups: Group 1 comprised 62 patients who underwent the autologous blood-assisted, sutureless conjunctival autograft procedure, while Group 2 consisted of 62 patients who underwent conventional sutured conjunctival autograft surgery (Figures 1a-d, respectively).

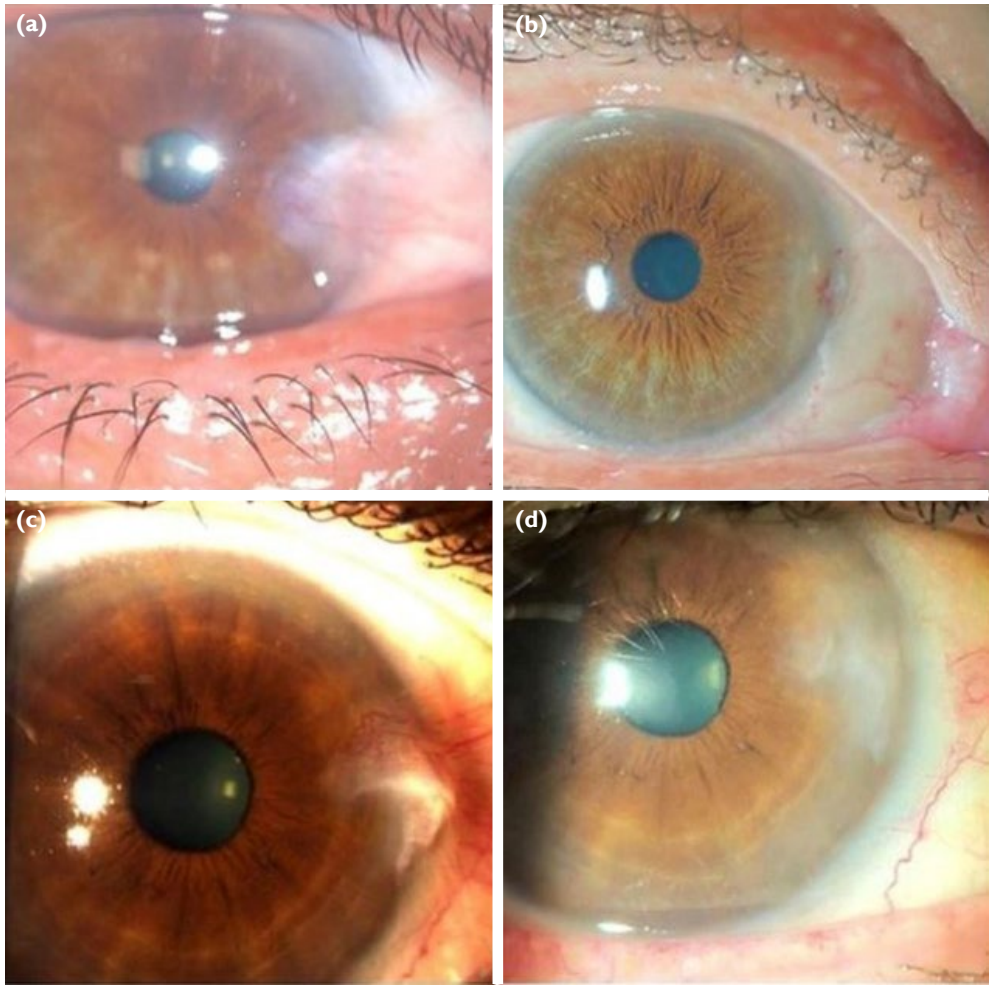

Figure 1. (a) Pre-operative (group 1), **(b)** Post-operative (group 1) **(c)** Pre-operative (group 2), **(d)** Post-operative (group 2), respectively.

Inclusion Criteria

All patients included in the study exhibited grade 2 pterygium without horizontal involvement exceeding 2–4 mm from the limbus, and there was no optic axis involvement. Patients who had no complications during or after surgery and regular follow-up for 12 months after surgery were included in the study.

Exclusion Criteria

Patients who had recurrent pterygium, pseudopterygium, were under the age of 18, or did not have sufficient conjunctival tissue for grafting; history of previous ocular surgery; coagulopathies; patients on anticoagulation therapy; ocular surface disorders that impair tear stability; history of systemic hypertension; coronary artery disease; stroke; were excluded from the study.

A comprehensive ophthalmic examination was conducted for all participants. Best-corrected visual acuity measurements were converted to logMAR for statistical analysis. Biomicroscopic anterior segment and dilated fundus examinations were performed, and anterior segment color images were recorded during all visits.

The stability of the autograft at day 2 was classified as follows:

- Graft in place
- Mild retraction of the graft, conjunctival defect not exceeding 1 mm
- Mild displacement of the graft, extending over the corneal surface.
- Prominent displacement or loss of the graft.

The recurrence of the pterygium is classified as described by Yong et al. (7)

Grade 0, normal conjunctival appearance

Grade 1, fine episcleral vessels

Grade 2 (conjunctival recurrence), fibrovascular tissue up to the limbus border

Grade 3 (corneal recurrence), fibrovascular tissue infiltrating the cornea

Surgical Procedure

All surgeries were conducted under local anesthesia using a subconjunctival injection of lidocaine HCL solution containing 0.1–0.2 mL of 2% epinephrine. Under the operating microscope, the pterygium body was dissected from the limbus using Wescott scissors. Subsequently, the pterygium head was excised with forceps, and any remaining corneal remnants were removed using a blade. Tenon's capsule was excised, leaving the bare sclera exposed. The size of the resulting defect was measured with calipers.

The tenon-free conjunctival autograft, approximately 1 mm larger in width and length than the recipient bed, was harvested from the superior temporal bulbar conjunctiva. The graft was then flipped over the cornea and positioned near the excision area. Subsequently, the graft was carefully placed over the defect area. Depending on the method allocated to the patients in both groups, either a conjunctival-limbal autograft or a different graft was applied.

In Group 1, the conjunctival autograft was secured in place using a strabismus hook with gentle pressure. Hemostasis was allowed to occur spontaneously without the use of cautery. After confirming that the autograft had fully adhered to the recipient bed, an antibiotic ointment (oxytetracycline and polymyxin B ophthalmic ointment, Pfizer) was applied, and the eye was tightly wrapped with a bandage for 48 h to prevent unintended migration of the autograft.

In Group 2, the autograft was secured to the recipient bed using interrupted 10/0 nylon sutures. Following the application of topical antibiotic ointment (oxytetracycline and polymyxin B ophthalmic ointment, Pfizer), the eye was covered with an eye pad for 24 h. Sutures were removed 1 week after the procedure. The duration of the surgery, determined as the time between the insertion and removal of the eyelid speculum, was recorded for both groups.

Postoperatively, all patients received the same medications: moxifloxacin 0.5% (Abdi İbrahim), dexamethasone 0.1% (Alcon), and a 0.1% sodium hyaluronate solution for 1 month.

After the removal of the bandage, topical moxifloxacin was administered 4 times a day for 1 month. Artificial tears and topical dexamethasone were initiated on an hourly basis and gradually reduced after the 4th day. The antibiotic was discontinued after 2 weeks, and the steroid was tapered off after 4 weeks.

For patients in the second group, topical moxifloxacin, nonsteroidal anti-inflammatory preparations, and artificial tears were administered immediately, 4 times a day. Once graft reepithelization was complete, topical dexamethasone was introduced on the 2nd day and administered hourly with a gradual reduction.

Postoperative follow-up visits were scheduled for the following time points: postoperative day 2, week 1, month 1, month 6, and month 12. During these visits, the graft stability, recurrence rates, and complications were recorded. The degree of proper fit, irregularity, and interface were also observed. For the purposes of this study, pterygium tissue extending more than 2 mm beyond the limbus was considered indicative of recurrence.

Pain Assessment

The VAS was employed immediately after surgery to assess postoperative patient comfort. Participants were instructed to verbally inform the surgical staff if they experienced discomfort or bothersome mild or severe pain at any stage of the surgery. VAS is a subjective pain assessment questionnaire that utilizes a one-dimensional, modified scale.

The scale consists of numbers (degrees) that are located only near the evaluator and spans 10 cm in length (equivalent to 10°) (9).

On the VAS, the "0" point signifies no pain, whereas the "10" point indicates the most severe pain (10-12). The VAS assessments were conducted by an evaluator who was not part of the surgical team.

Statistical Analysis

In the study, statistics related to continuous variables were reported as mean±standard deviation, and descriptive statistics related to categorical variables were reported as numbers and percentages. The compatibility of continuous variables with a normal distribution was evaluated through a Kolmogorov–Smirnov test. Intergroup comparisons were performed using an independent group t-test or Mann–Whitney U test, depending on the distribution structure. The relationships between categorical variables were analyzed using a chi-square test. IBM SPSS Statistics Version 28 (SPSS Inc., Chicago, IL) software was used for statistical analyses. The analyses were performed considering a 95% significance level, and $p \leq 0.05$ was considered statistically significant.

Results

The baseline characteristics of the groups were comparable ($p>0.05$) (Table 1). For Groups 1 and 2, the mean baseline visual acuity values were, respectively, 0.24±0.39 LogMAR and 0.22±0.34 LogMAR, and the month-12 best-corrected visual acuity values were, respectively, 0.17±0.31 LogMAR and 0.16±0.30 LogMAR. Further, for Groups 1 and 2, the mean duration of surgery was respectively 9.84±2.64 min and 17.90±4.42 min ($p<0.01$).

On postoperative day 2, graft loss was seen in four cases in Group 1, whereas all grafts remained stable in Group 2 ($p<0.05$). Among the patients with graft loss in Group 1, two underwent primary closure of the conjunctival defect with sutures, and two opted against repeat surgery. Additionally, mild graft retraction was seen in three and two cases in Groups 1 and 2, respectively. Two patients in Group 1 developed pyogenic granuloma that resolved with topical medication during the 1st month following surgery. Over the 12-month follow-up period, grade 2 recurrence of pterygium was observed in six patients (9.6%) in Group 2, whereas no obvious recurrences were observed in Group 1 ($p=0.014$).

We employed the VAS to assess and compare the mean pain scores reported by the patients. The mean VAS was significantly lower in Group 1 (3.7) than in Group 2 (7.2) ($p<0.001$). No other complications such as symblepharon, graft necrosis, scleral necrosis, or pannus formation occurred in either group. Significant differences were observed between the two groups in terms of the mean duration of surgery ($p<0.01$), graft loss ($p<0.05$), recurrence ($p=0.014$), and VAS ($p<0.001$) (Table 1).

Discussion

In this comparative study, significant differences were observed between the two groups in terms of the recurrence rate, mean operative time, and VAS. The autologous blood-assisted technique proved effective in reducing the recurrence rate following pterygium surgery. Prolonged surgical time was associated with an increased risk of recurrence and postoperative reactions. Complications such as graft detachment and loss can occur with the autologous blood technique, whereas no graft loss was observed in the sutured conjunctival autograft group.

The most critical factor following pterygium excision is recurrence; it is influenced by the pterygium grade, surgical technique, and patient's race and ethnicity (13,14). Although various surgical techniques have been described to achieve the lowest recurrence rates and highest patient comfort, an ideal procedure has not yet been definitively determined.

Table 1. Patient demographics and comparison of main outcomes in both groups

Variable	Group 1 (n=62)	Group 2 (n=62)	p
Age (mean±SD) years	52.4±11.8	51.9±10.9	0.49
Sex (F/M)	27/35	29/33	0.72
Preoperative BCVA (LogMAR)	0.24±0.39	0.22±0.34	>0.1
Postoperative month-12 BCVA (LogMAR)	0.17±0.31	0.16±0.3	>0.1
Mean duration of surgery (minutes)	9.84±2.64	17.90±4.42	<0.001
Graft Lost (number of eyes)	4	0	<0.05
Recurrence (number of eyes)	0	6	0.014
VAS score	3.7	7.2	<0.001

BCVA: Best-corrected visual acuity; F: Female M: Male; VAS: Visual analogue scale.

In this study, our objective was to compare the autologous blood-assisted, sutureless conjunctival autograft technique with the conventional sutured conjunctival autograft method in terms of graft stability, patient comfort, and long-term recurrence rates. Our results demonstrated that the autologous blood-assisted, sutureless conjunctival autograft technique provides a faster and more comfortable surgical experience. Additionally, no recurrences were observed during the 1-year follow-up period in the sutureless group. These findings could be explained by the minimally invasive nature of the sutureless surgery. Surgical trauma and subsequent inflammation can accelerate fibroblast and vascular endothelial proliferation, leading to fibrosis and the accumulation of extracellular matrix proteins. Several molecules, such as fibroblast growth factor, cytokines, platelet-derived growth factor, transforming growth factor, matrix metalloproteinases, and tumor necrosis factor, play roles in this process. The primary cause of recurrences is believed to be surgical trauma and postsurgical inflammation, leading to fibroblast proliferation (15).

Choudhury et al. (16) reported similar recurrence rates between conjunctival limbal autografts with 10-0 monofilament nylon sutures and the autologous blood coagulation method. Similarly, Sati et al. (17) found that the recurrence rates of three conjunctival autograft fixation techniques, namely, vicryl suture, fibrin glue, and autologous in situ blood coagulum following pterygium excision, were similar. However, the definition of recurrence and the baseline pterygium grade were not consistent across these studies. In our study, we included only patients with primary grade 2 pterygium in both groups to ensure a precise comparison of the effects of two different surgical techniques on recurrence rates.

Weijuan et al. (18) conducted a meta-analysis involving seven randomized controlled trials with a total of 516 patients. In four studies involving 379 patients, they compared autologous blood and fibrin glue and found that the autologous blood-assisted technique yielded superior results in terms of surgical time, graft retraction, and displacement. In addition, they compared the autologous blood-assisted technique with the traditional sutured autograft in four studies involving 152 patients and found that autologous blood was superior to the sutured technique in terms of surgical time. However, there was no difference in terms of graft displacement or recurrence rate (19).

However, graft retraction was more common in the autologous blood group. In our current study, we observed graft loss in 6.4% of the patients in the autologous blood-assisted, sutureless conjunctival autograft group. Additionally, three and two cases, respectively, in Groups 1 and 2, showed mild graft retraction. Similarly, Natung et al. (20) conducted a study involving patients with grade 3 pterygium and found that, compared with a sutured autograft, an autologous blood-assisted autograft was superior in terms of postoperative symptom scores but inferior in terms of graft stability. Based on our experience, graft loss is a rare but unpredictable complication of autologous blood-assisted autograft surgery. However, in cases of failure after the initial surgery, primary suturation or harvesting a new conjunctival autograft from another site of the bulbar conjunctiva can be successfully performed.

Another significant advantage of the autologous blood-assisted technique is the reduction in surgical time. In our study, we observed a considerably shorter surgical duration in the autologous blood group compared to the sutured autograft group. This reduction in surgical time can contribute to patient and surgeon comfort. In addition, a shorter surgical time may lead to reduced postoperative inflammation, potentially resulting in lower recurrence rates. Consequently, the mean postoperative pain score was significantly lower in the autologous blood-assisted group.

Our study has some limitations. First, it has a retrospective design. Second, the sample size is relatively small. Third, a 1-year follow-up period may be insufficient to comment on the effectiveness of the proposed method in terms of recurrence. The systemic conditions of the patients may have affected the pain score and tissue healing. The fact that the results included only grade 2 pterygiums and advanced pterygiums was also a limitation. Randomized controlled trials are needed to evaluate the recurrence rate and complications after surgery using sutures. Further studies involving a larger number of patients and a detailed examination of anterior segment characteristics are needed to identify predictive factors for postoperative graft loss.

Conclusion

In conclusion, our study offers a precise comparison of the autologous blood-assisted, sutureless conjunctival autograft and conventional sutured conjunctival autograft techniques for managing grade 2 pterygium. The results reveal that the autologous blood-assisted autograft technique provides a faster and more comfortable surgery and is associated with lower recurrence rates; however, graft loss, although rare, remains a significant concern following surgery.

Disclosures

Ethics Committee Approval: This study adhered to the principles outlined in the Declaration of Helsinki, and ethical approval for the study was obtained from the Ethics Committee of Başakşehir Çam ve Sakura City Hospital (Approval Number: 2022/06.187).

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