Section: Ophthalmology

Original Research Article

AUTOLOGOUS PLATELET-RICH FIBRIN FOR FIXATION OF CONJUNCTIVAL AUTOGRAFT IN PATIENTS PRESENTING WITH PRIMARY PTERYGIUM

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Abstract

Background: Pterygium is a common ocular condition that is primarily caused by exposure to sunlight. It can impair vision and require surgery in significant cases. This study aimed to evaluate the outcomes of pterygium excision using conjunctival auto grafts with autologous in situ platelet rich fibrin. **Materials and Methods:** This study included 25 patients with progressive pterygium who attended the Government Vellore Medical College Hospital between April 2023 to March 2024. A progressive pterygium was diagnosed using Tan's classification, which considers corneal involvement and episcleral vessel obscuration. Patient history, visual acuity, intraocular pressure, and pterygium location were documented, and fundus examinations were conducted using direct and slit-lamp fundoscopy. Follow-ups occurred on the 1st, 7th, 30th,90th post-operative days and at 6 months to assess graft oedema, retraction, dislodgement, and recurrence, with distant visual acuity recorded on all follow-up visits. **Result:** All patients had nasal pterygium, with a predominance of females (96%) and the right eye (56%). The age group 41-50 years was the most affected. Postoperative complications included initial graft dislodgement (8%) and retraction (12%), which stabilized at 8% by the 7th day and remained stable for 1 month. By 3 months, new complications, such as granuloma formation and recurrence, had emerged at 4%. At 6 months, graft dislodgement had decreased to 4%, while granuloma formation and recurrence had increased to 4% and 8%, respectively. Most patients (76-84%) experienced no complications during follow-up. **Conclusion:** Autologous platelet-rich fibrin (PRF) shows promise for conjunctival auto graft fixation in patients with primary pterygium, Minimal postoperative complications were observed, with 76% of the patients being complication-free at six months.

INTRODUCTION

Pterygium is a common ocular condition among middle-aged and elderly individuals. Pterygium is a degenerative growth in the subconjunctival tissue that proliferates as fibrovascular granulation tissue which encroaches over the cornea. It is often shaped like a wedge.[1] The prevalence of pterygium varies from 0.7% to 31% all over the world.[2] In tropical countries it can be as high as 9.5 to 13%.[3] Pterygium can impact the vision by inducing excessive astigmatism.[4] The most important factor related to the development of pterygium is thought to be sunlight exposure.[5] Other contributing factors include dry eyes, prolonged outdoor activities, low socioeconomic status, and high altitude.[6] A major complication is the obscuration of the visual axis if it grows into the centre of the cornea. The development of irregular astigmatism due to flattening of the cornea in the horizontal meridian is another cause of a decrease in vision.[7]

Many pterygia cases remain asymptomatic. Surgery is indicated in cases of ocular irritation, discomfort, watering, foreign body sensation, photophobia, recurrent inflammation, reduced visual acuity due to obstruction of visual acuity or astigmatism , cosmetic disfigurement, and/or diplopia due to restriction of ocular movement. Difficulties in contact lens fitting and corneal refractive surgery are other indications for surgery.[8] Most methods for small primary pterygium involve simple excision. The goal of treatment for large and recurrent

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pterygia is to prevent recurrence. Recurrence rates of older techniques were high: 50% recurred in 4 months, and nearly all recurred in 1 year.

Currently, the most widely used techniques are conjunctival autografting and mitomycin C application.[9] Human amniotic membrane grafts have also been shown to be effective.[10] Fibrin-based glues for conjunctival autografting have been used to minimise the operating time and postoperative discomfort associated with sutures and reduce the amount of suturing required.[11] Although fibrin glues improved patient comfort and showed low recurrence rates compared to suturing, the risk of transmitted disease from pooled and single-donor blood donors is a major drawback to its application.[12] Hence, the novel approach of using the patient's platelet rich fibrin as bio-adhesive was chosen and outcomes were evaluated in the present study.[13]

Aim

This study aimed to evaluate the outcomes of pterygium excision using conjunctival autografts with autologous platelet rich fibrin.

MATERIALS AND METHODS

This study included 25 patients diagnosed with progressive pterygium who attended the Department of Ophthalmology, Government Vellore Medical College and Hospital, Tamil Nadu between April 2023 to March 2024. Informed consent was obtained from all the patients.

Inclusion Criteria

Both men and women aged between 18 years to 60 years diagnosed with primary nasal progressive pterygium were included in this study.

Exclusion Criteria

Patients presenting with recurrent pterygium, any history of trauma, chemical/thermal burn injury, or a history of positive serology for HIV, Hepatitis B, and pseudopterygium were excluded from this study.

Methods

A diagnosis of progressive pterygium was made clinically based on the thickness and vascularity according to Tan's classification.[14] Pterygium is graded depending on the extent of corneal involvement. Grade I: Head of the pterygium present between the limbus and a point midway between the limbus and pupillary margin. Grade II: Head of the pterygium present between a point midway between the limbus and pupillary margin, and a point on the pupillary margin. Grade III: Crossing the pupillary margin.

Pterygium is classified according to the extent to which the sclera and other contents are obscured as follows (Tan's classification): T1 (atrophic), episcleral vessels underlying the body of pterygium were unobscured and distinguished; T2(intermediate), episcleral vessels not indistinctly seen or partially obscured; and T3(fleshy), episcleral vessels underlying the body of pterygium were obscured. A detailed history of the patient was collected regarding the onset of presentation, presenting complaints, occupation, personal history, and family history. Visual acuity was assessed using a Snellen chart. Intraocular pressure measurement was performed using non-contact tonometry. The location of the pterygium (nasal or temporal) was also noted. Fundus examination was performed routinely using direct and slit-lamp-guided fundoscopy with a 90 D lens.

Surgical Procedure

Ciprofloxacin eye drops were instilled 6th hourly on 1 day before surgery. All basic blood tests were performed. The lignocaine test dose was administered subcutaneously. Venous blood samples were collected in sterile coagulant-free recollection tubes. The tube was centrifuged at 3,000 rpm for 10 min in a hospital. This results in fibrinogen concentration in the superior two-thirds of the tube and its polymerisation into a fibrin clot. The supernatant plasma was discarded and the clot was carefully aspirated to obtain platelet-rich fibrin (PRF). Centrifugation concentrates fibrinogen in the middle and upper parts of the tube, and the absence of anticoagulants allows platelet activation, resulting in the transformation of fibrinogen into fibrin, which polymerises into a three-dimensional fibrin mesh. Platelets and leukocytes were trapped in this mesh. A fibrin clot is formed in the middle of the tube, which is drained to obtain the PRF that acts as a physiological fibrin matrix scaffold, which interacts with the patient's cellular matrix and sustainably releases epitheliotropic factors to support cell adhesion, proliferation, migration, and differentiation of the ocular surface epithelium, thereby promoting healing and adherence of the graft.

All the surgeries were performed by a single surgeon. All patients were administered a peribulbar block with 2% lignocaine and 0.5% bupivacaine. Under sterile aseptic conditions, the eye was painted with betadine solution and covered with sterile drapes. A universal wire speculum was applied and the eyelids were retracted. The body of the pterygium was then separated from the sclera beneath it and excised and care should be taken to avoid the insertion of the medial rectus muscle. The neck of the pterygium was lifted using limb forceps and peeled off from the corneal surface with a controlled pull in a centripetal fashion. Remnants of conjunctival tissue on the cornea were scraped off using a crescent blade to smoothen the surface. The size of the bare sclera was measured using a calliper. No cautery was used throughout the procedure, and excess bleeding was avoided by using a cotton bud as tamponade throughout the procedure area of anchoring the graft, which was kept dry. Conjunctival donor grafts were obtained from the superior conjunctival area. An approximately 1 mm oversized graft was obtained, avoiding button holes and Tenon's capsule. Autologous platelet-rich fibrin (0.5 mL) was

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dropped onto the bare sclera. Graft was placed over the bare sclera, maintaining limbus to limbus polarity and after 5 minutes the eyelids were closed and patch was applied over the operated eye.

The patch was removed the next day (the first postoperative day) and assessed for symptoms, such as watering, pain, foreign body sensation, graft position, and any complications. Moxifloxacin eye drops 6 times/day were prescribed on postoperative day 1, and prednisolone eye drops 6 times/day were prescribed and tapered over the next 4 weeks. Eye drops of carboxymethylcellulose (1%) were used as lubricants four times/day for 4 weeks. The patient was followed up later on the 1st POD, 7th POD, 30th POD, 90th POD and at 6 months. At each visit, the patient was assessed for graft oedema, retraction, dislodgement, and recurrence. Distant visual acuity was recorded on the 30th POD and during subsequent follow-ups' data are presented as frequencies and percentages.

RESULTS

All patients (100%) had a nasal pterygium, indicating that it was the predominant location for this condition in the study group.The majority of patients were female, accounting for 96% of the cases and only 4% of the patients were male. The right eye was more commonly affected (56%) than the left (44%).The age group of 41-50 years had the highest percentage of patients, comprising 34% of the study population.Patients aged < 40 years accounted for 24% of the patients.Both the 51-60 years and over 61 years age groups had equal representation, each at 20%.Most patients had a BCVA of 6/9 (44%), followed by 6/12 (40%).A smaller percentage of patients had BCVA levels of 6/36 (12%) and 6/18 (4%), indicating a range of visual acuity impairment among the patients enrolled in the study due coexistent cataract changes in the eye [Table 1].

Complications following the procedure showed an initial graft dislodgement rate of 8% and a graft retraction rate of 12% on the first day, both of which decreased slightly over time.By the 7th day, both graft dislodgement and retraction were 8%, and these rates remained stable for 1 month.By 3 months, new complications, such as granuloma formation (4%) and recurrence (4%), occurred. At 6 months, the graft dislodgement decreased to 4%, graft retraction remained at 8%, and granuloma formation and recurrence increased to 4% and 8%, respectively. Throughout the follow-up period, most patients (76-84%) experienced no complications [Table 2].

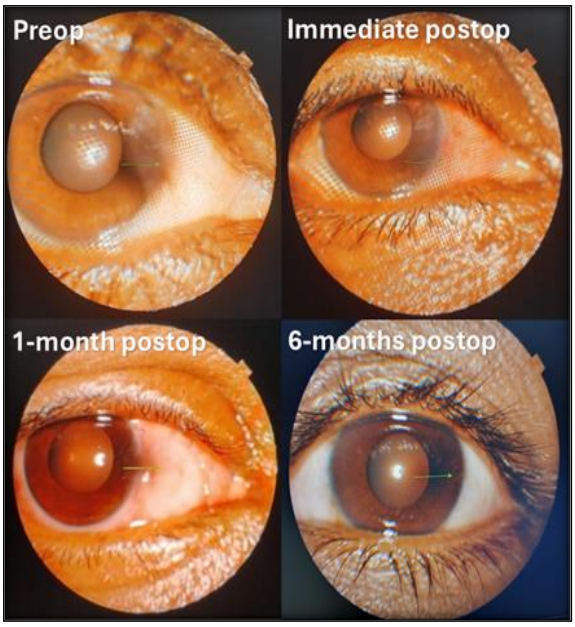

Figure 1: Clinical Pictures

Table 1: Demographic and clinical characteristics of pterygium patients.

		Number of patients	Percentage
Age in years	< 40	6	24%
	41-50	9	34%
	51-60	5	20%
	> 61	5	20%
Sex	Female	24	96%
	Male	1	4%
Eye	Left	11	44%
	Right	14	56%
Location	Nasal pterygium	25	100%
BCVA	6/9	11	44%
	6/12	10	40%
	6/18	1	4%
	6/36	3	12%

Table 2: Postoperative complications in patients presenting with primary pterygium.

Complications	Graft dislodgement	Graft Retraction	Granuloma Formation	Recurrence	Nil complications
1st day	2 (8%)	3 (12%)	0	0	20 (80%)
7th day	2 (8%)	2 (8%)	0	0	21 (84%)
1 month	2 (8%)	2 (8%)	0	0	21 (84%)
3 months	2 (8%)	2 (8%)	1 (4%)	1 (4%)	19 (76%)
6months	1 (4%)	2 (8%)	1 (4%)	2 (8%)	19 (76%)

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DISCUSSION

Pterygium is an abnormal fold of the membrane in the interpalpebral area that is strongly attached to its apex and neck. A probe cannot be passed behind the neck of the pterygium.[1] There was found to be a non-malignant transformation even though it shows the features of local invasion and recurrence.[15] Pterygium can be present in several distinct forms. The progressive type is characterised by a thick, fleshy appearance with a vascular cap that gradually increases in size and potentially reaches or crosses the centre of the cornea. In contrast, a stationary pterygium, although vascular, has a less vascularised head and often shows a Stocker's line due to tear pooling. The regressive form is thin, grey, poorly vascularised, and lacks a cap. A primary double pterygium involves the presence of both nasal and temporal pterygia.

Recurrent pterygium, which appears wider after primary excision, and pseudopterygium, in which a fold of the conjunctiva adheres to the cornea, are also notable forms of pterygium. Some types of pterygium also exhibits movement restriction to the opposite side. Small pterygia are typically asymptomatic, but as they grow, they can lead to dry eye symptoms such as discomfort, foreign body sensation, congestion, irritation, and tearing due to irregular corneal wetting. As the pterygium progresses, it may become visibly noticeable, potentially causing cosmetic concerns and disturbances in visual acuity, either through direct encroachment or induced astigmatism. In cases of recurrent pterygium, patients might experience binocular diplopia, especially when horizontal movement is restricted due to traction.[16] The use of autologous platelet-rich fibrin for conjunctival graft fixation did not have any side effects and was a safe method with a decreased operating duration compared to the conventional suture method and the postoperative discomfort was lower.[17]

Our study showed a low recurrence rate (4%) and complication rate of 28%. The total recurrence rate was 8%. In a study by Alamdari et al., the recurrence rate with platelet-rich fibrin was lower, and there was no increase in the complication rate when compared to using sutures for graft fixation.[18] A prospective series by Maharjan et al. has reported a recurrence rate of 2-39%.[6]

Our study revealed a male-to-female ratio of 1:24 with a mean age of 49 years (SD, 13, Range 22-80). In contrast to our study, Bahar and Sabur included 50 patients (21 males and 29 females) who underwent pterygium excision and conjunctival autograft with age between 20-60 years.They concluded that platelet-derived growth factors are a safe and effective adjuvant therapy that promotes faster healing of conjunctival autografts and reduces recurrence.[19]

Asritha and Manaswini reported the following complications: graft oedema in 4 cases (8%), graft retraction in 1 case (2%), and subgrant haemorrhage in 2 cases (4%). Common issues include subconjunctival haemorrhage, chemosis, congestion, discomfort, corneal scarring, corneal epithelial defects, and inadequately sized grafts. No recurrences or dehiscences were observed.[20] Cakmak et al. studied 35 patients and found that PRF membranes had a shorter surgical time (about 10 minutes less) and milder postoperative inflammation than with CsA (0.05% cyclosporine eye drops application) and amniotic membrane grafting. No suture reactions were observed with PRF, but these differences were not statistically significant, likely due to the small sample size.[21] Zhao et al. examined 62 patients and found shorter surgical times with PRF membranes, with no significant differences in complications or recurrence rates.[22] Both studies concluded that PRF membranes are a safe and effective method for pterygium surgery, with benefits including reduced recurrence and complications. Reduced postoperative inflammation and shorter surgical time with PRF may lower the economic burden on low-income patients in underdeveloped regions.

A notable strength of this study is the use of autologous PRF, which is both cost-effective and highly feasible, with a lower recurrence rate in a resource-constrained setting. However, a significant limitation was the follow-up period of six months which was not sufficient to capture long-term complications and recurrences. To address these limitations and further validate the findings, we recommend conducting additional randomised clinical trials with larger sample sizes to ensure robust and generalizable results. Future studies with larger, more diverse populations, longer follow-up periods, and control groups are necessary to validate these findings and establish the efficacy and safety of PRF in the fixation of conjunctival autografts for pterygium treatment.

CONCLUSION

The use of autologous platelet-rich fibrin (PRF) for the fixation of conjunctival autografts in patients with primary pterygium has shown promising results. Most patients (96%) were female, with the most affected age group being 41-50 years. Postoperative complications were relatively low, with graft dislodgement and retraction observed in a small percentage of the patients during the follow-up period. By the end of six months, 76% of the patients experienced no complications. Hence autologous PRF fixation in pterygium excised patients gives desiring results with lower rates of recurrence and complications. It is a safe, effective, economical and less time-consuming technique for pterygium surgery which needs further evaluation and validation.

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