

A Multivariate Analytical Study on Surgical Outcomes of Pterygium Excision and Conjunctival Autograft Fixation by Autologous Serum vs. Sutures in a Tertiary Eye Care Centre

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ABSTRACT

BACKGROUND

Best surgical approach to prevent recurrence of pterygium is conjunctival autografting after pterygium excision. Most commonly, conjunctival autograft is secured with sutures, but newer technique is graft fixation with autologous serum which is used as tissue adhesive for securing the conjunctival auto graft, in which there is no need of glue or sutures for fixing the auto graft. The present study was done to compare the efficacy, patient's comfort and outcomes between the two methods of securing conjunctival limbal autograft fixed with autologous serum with those of sutures in the management of primary pterygium.

METHODS

A multivariate analytical study was conducted among 60 eyes with primary progressive nasal pterygium and those who were willing for surgery. Patients were randomly divided into two groups. Pterygium excision was done, and conjunctival auto graft was fixed in group A with autologous serum and in Group B with absorbable 8-0 Vicryl sutures. The operating time taken for the procedure was recorded. To compare the efficacy of the two procedures graft recipient site attachment was noted. Post-operative outcomes such as post-operative discomfort, graft oedema, graft displacement, graft retraction, granuloma formation, and recurrence of pterygium were observed.

RESULTS

The mean age of the patients included in this study was 57.27 years. 40% were males and 60% were females. 82% people were involved in outdoor work. The mean time taken for surgery in autologous serum group was 28.17 minutes and in suture group was 35.5 minutes, Student's t test showed significant difference between the two with a P value of 0.000. Post-operative discomfort and pain was more in group B than in group A. Among postoperative complications, graft oedema was seen in 6 eyes in group A and 4 eyes in group B and all cases of graft oedema resolved within 4 weeks. In group A, minimal displacement of graft edge of 0.5 mm - 1 mm on to the corneal side was noted in 2 patients and severe displacement was seen in one patient.

CONCLUSIONS

Our study suggests that autologous blood is a useful alternative method for graft fixation in pterygium surgery instead of sutures. Efficacies of both the techniques are comparable. Postoperative discomfort and surgical time required are significantly less in autologous serum method. Incidence of graft displacement and graft loss is more with autologous serum technique, but it was not statistically significant in our study.

KEYWORDS

Pterygium Excision, Conjunctival Limbal Autograft, Sutures, Autologous Serum

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BACKGROUND

Pterygium is one of the most common ocular surface disorders. The word Pterygium was derived from a Greek word pterygose, which means 'wing'. It is elastotic degeneration of subconjunctival tissue which makes a wing of fibro vascular granulation tissue extending onto the cornea. It invades cornea and destroy epithelium bowman's membrane and superficial corneal stroma. This disease is more commonly seen in tropical countries where exposure to UV sunlight is high¹ as it may damage the limbal stem cells and activate matrix metalloproteinase.²

Pterygium can be unilateral or bilateral present on nasal or temporal inter palpebral fissure, most commonly on Nasal side.³ The prevalence of pterygium varies from 0.3% to 37.46% in different parts of the world, varying widely with altitude, age, gender, occupation and socioeconomic status.⁴ Incidence of pterygium is more in adult males than females, agricultural workers or those who are doing outdoor work in dusty and warm climate.⁵

Presentation of pterygium varies from small asymptomatic lesion to large rapidly growing lesion, which can lead to vision impairment. A pterygium is mainly divided in to 3 parts- cap, head and body of pterygium. Cap is on the cornea consisting of fibroblasts that invades and destroy Bowman's membrane. Head is the vascular area that lies behind the cap and is firmly attached to the cornea. Body is the mobile area of the bulbar conjunctiva that can be easily dissected from the underlying tissue.⁶ Iron deposition can be seen on the basal layer of the corneal epithelium anterior to cap known as Stocker's line, is a characteristic sign for chronic pterygium.

Surgical excision is the current management option for this condition, especially for grade 2 and more.⁷ Common indications for surgical excision are cosmetic and visual purposes. Commonest complication of pterygium surgery is recurrence and prevention of recurrence is the biggest challenge of pterygium surgery.

Due to the high recurrence rate, various surgical modalities have been tried, which include simple excision, bare sclera technique, amniotic membrane transplantation, autorotation of conjunctival flap and conjunctival autografting. The recurrence rate varies according to the type of surgery done. Bare sclera technique is associated with high recurrence rates around 38.9%.⁸

Adjuvant measures such as beta-irradiation, thiotepa, 5-fluorouracil and mitomycin-C reduces recurrence rates, but are associated with other complications like sclera necrosis. In recent year's best surgical approach was focused on conjunctival autografting after pterygium excision, by which recurrence rate can be minimized (2-9%) with relatively few sight-threatening complications.⁹ So surgical excision with conjunctival limbal autograft is considered as gold standard surgical method for preventing the recurrence of pterygium nowadays.^{10,11} Conjunctival graft is taken from the supero- temporal quadrant of the same eye which is fixed by sutures, fibrin glue or autologous serum.

Most commonly conjunctival autograft is secured with sutures. This is a time tested effective method, requires good surgical skill. Suturing of conjunctival graft has some suture related complications like prolong surgical time, postoperative discomfort, infection, chronic inflammation, irritation, and suture induced conjunctival granuloma. Because of its biological and biodegradable properties, fibrin-based adhesives maybe used under the autograft without inducing much inflammation. The use of fibrin glue improves postoperative comfort, decrease surgical time and complications.¹² High cost of fibrin glue, the risk of transmission of prion disease through plasma derived fibrin glue and the risk of anaphylaxis in susceptible individuals are the major limiting factors in this mode of treatment.^{13,14}

Recent popular method is graft fixation with autologous serum which is used as tissue adhesive for securing the conjunctival auto graft, where we don't need neither glue nor sutures for fixing the auto graft. This method is cost effective and also can reduce sutures or glue related complications.

When human tissue is injured, bleeding ensues. When the coagulation cascade is triggered, activated factor X selectively hydrolyses prothrombin to thrombin; fibrinogen is converted to fibrin. Thrombin also activates factor XIII, which stabilizes the clot, by promoting polymerization and cross-linking of the fibrin chains to form long fibrin strands in the presence of calcium ions. This is the final common pathway for both extrinsic and intrinsic pathways of coagulation in vivo. This mechanism is used to induce tissue adhesion of CAG to bare sclera¹⁵ graft adhere because of the fibrinous reaction in the patient's own blood (serum).

The present study was done to compare the efficacy, patient's comfort and outcomes between the two methods of securing limbal conjunctival limbal autograft (CAG) fixed with autologous serum with those of sutures in the management of primary pterygium.

METHODS

A multivariate analytical study was conducted for 60 eyes of 60 patients with primary progressive nasal pterygium who attended the out- patient clinic in the department of Ophthalmology, Government medical college Palakkad, Kerala from June 2017-June 2019. Informed consent was taken from all patients.

Inclusion Criteria

Patients with grade 2 or more primary nasal pterygium with willingness for surgery.

Exclusion Criteria

Recurrent pterygium, Patient with any coagulation disorder, Pseudopterygium, Ocular infections.

For all patients detailed history including occupation, presenting complaints and a thorough ocular examination was done including visual acuity, anterior segment slit lamp examination with grading of pterygium and fundus examination. Routine blood investigations and screening was done for all patients.

Pterygium was categorized into four grades based on its encroachment over the cornea.¹⁶

Grade I - Pterygium head extending up to the limbus.

Grade II - Pterygium head extending between the limbus and a point midway between the limbus and the pupillary margin.

Grade III- Pterygium head extending beyond the point midway between the limbus and the pupillary margin, but not crossing the pupillary margin.

Grade IV- Pterygium head crossing the pupillary margin

Patients were randomly divided into two groups. For group A Pterygium excision was done, and conjunctival auto graft was fixed with autologous serum. In Group B Pterygium excision was done and conjunctival auto graft was fixed with absorbable 8-0 Vicryl sutures. Surgery was done by 2 surgeons randomly.

Surgical Steps

- 1) Topical anaesthesia with proparacaine drops instilled at 5 minutes interval 2 times prior to surgery
- 2) Eye was cleaned and draped, wire speculum was placed
- 3) Subconjunctival injection of 1 ml 2% Xylocaine was given on to pterygium to balloon up the tissue
- 4) Pterygium was cut near the neck at the limbus and head severed of the cornea using conjunctival forceps
- 5) Fibro vascular tissue dissected underneath the conjunctiva with Westcott scissors and that was excised
- 6) Bare area was measured with Castroviejo callipers in horizontal and vertical measurements
- 7) Patient is asked to look down, superotemporal conjunctiva measured for appropriately sized graft (1 mm bigger sized graft was taken for group A, and same sized graft for group B). Small opening was created at conjunctiva towards fornix and then blunt dissection was carried out with the help of conjunctival scissors to separate a thin conjunctival graft up to the limbus so as to include limbal stem cells and superotemporal conjunctiva trying to avoid tenons capsule.
- 8) Graft was placed on the cornea with epithelial side up and marking the limbal orientation

For Group A autologous serum bed was formed at bare sclera from the normal oozing of the subconjunctival vessels. Pooling of blood was avoided. In case of inadequate oozing of blood, small superficial scratch marks were made on sclera to facilitate oozing. In case of excessive bleeding

minimal cautery was applied to reduce pooling. The graft was placed to sclera with epithelial side up and maintaining limbal orientation. If any clot had formed on the operating bed, while the graft was removed, it was removed. The graft was evenly spread on bed with uniform compression as if ironing the graft with 1 mm extra edge undermining the conjunctival borders using iris spatula. Gentle pressure was applied for 5 minutes for proper placement of graft. Graft stability is confirmed by asking the patient to move eyes gently towards nasal side and make sure that the graft is not displacing. Gently remove the eye speculum and also confirm the absence of displacement of the graft following gentle eye closure and opening movements. Pad and bandage with antibiotic ointment was given.

In group B the same sized graft was placed and secured with 8-0 Vicryl absorbable sutures. 5-7 Sutures were placed to stabilize the position of graft. Pad and bandage was given with antibiotic.

The operating time taken for the procedure was recorded. Operating time was noted from the placement of lid speculum till applying pad and bandage. In both groups patch was removed after 18-24 hours. Post operatively antibiotic steroid eye drops was given 6 times and analgesics for 2 days. Antibiotic steroid drops dose was tapered every week up to 6 weeks. All patients were examined on the day 1, day 7, 4 weeks and 12 weeks.

To compare the efficacy of two procedures graft recipient site attachment was noted. Post-operative outcomes such as post-operative discomfort grade, graft oedema, graft displacement, graft retraction, granuloma, recurrence were observed.

Discomfort graded as mild, moderate, severe and very severe. Graft survival was defined as the intact graft by 4th week and graft failure is defined as absence of graft at 4th week. Recurrence was defined as any growth of fibro vascular tissue 1.5 mm on to cornea at 12 week follow up. A retraction of the graft means sliding of the graft from its original position with conjunctival defect of approximately 1 mm around the graft, displacement of the graft, defined as graft extending over the corneal surface.

Patient followed up on day 1, day 7, 4th week and 12th week. Symptoms and discomfort grade recorded. Thorough slit lamp examination was done to look for graft oedema, position of graft to note down retraction or displacement, granuloma, recurrence of pterygium recorded.

RESULTS

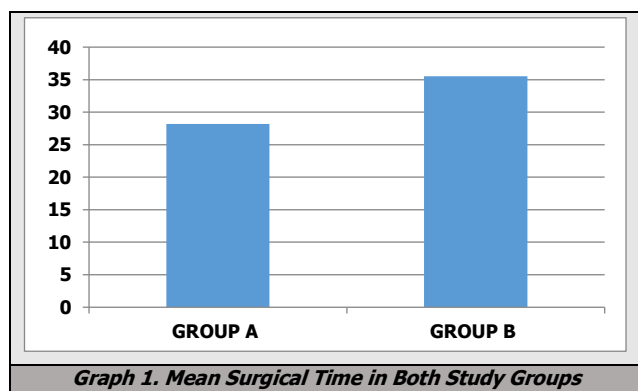
60 patients were enrolled in this study after taking informed consent. They were randomly selected for pterygium excision with conjunctival auto graft by autologous blood (group A) and sutures (group B). 30 patients were enrolled in each group. The mean age of the patients included in this study was 57.27 years age ranging from 35-71 yrs. 24 patients (40%) were males and 36 (60%) were females. Presenting complaints were defective vision in 73% patients, mass in 67% patients, and redness in 32% patients.

Analysing the occupation 49 (82%) people were involved in outdoor work and 11(18%) people involved in indoor works. 19 people (32%) were having grade 2 pterygium, 28 people (47%) with grade 3 and 13 people (22%) with grade 4 pterygium. The mean time taken for surgery in group A was 28.17 minutes and in group B mean time was 35.5 minutes. Analysing the mean time for both group students t test showed significant difference between time taken for auto graft and sutures with t value 7.438 and P value 0 .000. During post-operative period, the discomfort and pain was more in group B than in group A.

On evaluating the postoperative complications graft oedema was seen in 6 (20%) eyes in group A and 4 (13%) eyes in group B. All cases of graft oedema resolved within 4 weeks. Minimal displacement of graft edge 0.5 mm- 1 mm on to the corneal side was noted in 2 (6%) patients and severe displacement in one patient were graft was not adherent properly to the scleral bed for one patient (3%) in group A and additional patching was given for one more day for these patients and on 1 week follow up the graft was well secured in its place in 2 patients and graft loss was noted in one patient who had severely displaced graft. No incidence of displacement and graft loss reported in group B. Graft retraction was seen in 1 patient in group A. Recurrence of pterygium was seen in 1 patient each in both groups. But on statistical analysis there is no significance between the postoperative outcome. Granuloma on suture site was noted in one patient in group B.

	Autograft Group A	Suture Group B
Grade 2	9	10
Grade 3	13	15
Grade 4	8	5
Total	30	30

Table 1. Grades of Pterygium in Both Groups

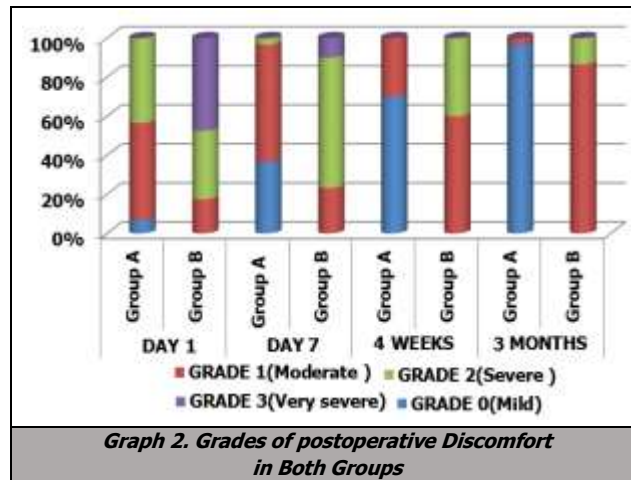


	Mean Surgery Time (in Minutes)	Time Range
Group A	28.17	20-36
Group B	35.5	28-42

Table 2. Mean Surgical Time and Time Range in Both Groups

Group	Day 1		Day 7		4 Wks.		3 M	
	A	B	A	B	A	B	A	B
Grade 0 (Mild)	2	0	11	0	21	0	29	0
Grade 1 (Moderate)	15	7	18	7	9	18	1	26
Grade 2 (Severe)	13	14	1	20	0	12	0	4
Grade 3 (Very severe)	0	19	0	3	0	0	0	0
Chi Sq. Value	13.946		36.030		36		56.148	
P Value	.003		.000		.000		.000	

Table 3. Patient's Discomfort Grades in Postoperative Follow Up Visits



	Oedema	Displacement	Retraction	Granuloma	Recurrence
Group A	6	3	1	0	1
Group B	4	0	0	1	1
Chi square vale	0.480	3.158		1.017	
P value	0.731	0.237	0.1	0.1	

Table 4. Graft Related Complications



DISCUSSION

Pterygium is a common external ocular disease in tropical countries like India. The most challenging situation in the treatment of pterygium is prevention of its recurrence. Many surgical techniques have been tried, but none of them had been universally accepted because of the varying recurrence rate⁶ and free conjunctival limbal auto graft surgery shows fewer recurrence rates and is associated with fewer complications.

A goal to offer rapid recovery safely with minimal discomfort encouraged surgeons to revise the conventional surgical methods of fixing auto graft with sutures. Present study was conducted to assess and compare the mean surgical time, efficacy, post-operative patient comfort and postoperative outcome of the graft among the patients undergoing pterygium excision surgery and conjunctival graft fixation by using autologous serum (Group A) and sutures (Group B).

The mean age of patients in our study was 57.27 years. In the study by Malik K P et al¹⁷ and by das et al¹⁸ mean age was 42.8 years, 38.92 ± 11.2 yrs. respectively. In our study the incidence of pterygium was more in females 60%.

Though few previous studies suggest that the prevalence of pterygium was higher in males, Kumar P et al,¹⁹ conducted a study and found higher prevalence of pterygium in females (62%). In Our study the incidence of pterygium is more (81%) in patients engaged with outdoor activities. Similar results were found by Chavan W M et al in 2015 in a study conducted in Maharashtra.²⁰

Pterygium was classified in to different grades, and in our study 31% were having grade 2, 47% were having grade 3, 22% grade 4. Study conducted by Maheshwari S et al²¹ in 2003, Patkar P et al¹⁵ maximum number of patients belonged to grade 2 and 3 pterygium. We compared two surgical techniques for pterygium excision. In our study mean surgical time was 28.17 minutes in autologous group and 35.5 minutes in suture group. There is a significant difference in time taken between two methods, time taken was less in autologous serum group. In a study by Patkar P et al¹⁵ the mean surgical time was 34.8 min. Suturing of conjunctival auto graft increases the operating time as well as requires more surgical skill. Our findings are comparable to studies done by Shaaban AM et al²² and Ti Se et al.²³

The degree of discomfort after surgery was noted subjectively post operatively in each visits in two groups. On first day 50% patients were having mild discomfort and 43% were having moderate discomfort in autologous group and 47% had severe discomfort and 63% had very severe discomfort in suture group. This result is statistically significant .On each follow up visits discomfort was comparatively less in autologous group and this also found to be statistically significant . Post –operative discomfort was significantly less in group B which is comparable to studies done by Shaaban AM et al²² and Chandra N et al.²⁴

Retraction of graft from edges of conjunctival border was found in 1 patient (3%) in autologous group, and none in suture group .In a study conducted by Singh et al²⁵ graft displacement was more common in the no glue, no suture group. Shaaban AM et al²² found 6% graft retraction in sutured and 12% in suture less glue-free limbal conjunctival auto graft. Study by Tan Detal²⁶ showed graft retraction occurs due to sub epithelial fibrosis and it can be reduced by proper dissection of sub-epithelial tissue.

Recurrence was noted on 3 month follow up visit as ingrowth of conjunctiva on to cornea at least 1.5 mm at the limbus, 1 patient (3%) each in serum as well as suture group had recurrence. Few studies showed less recurrence with autologous serum group recurrence rate was higher in suture group patients (22.7%) as compared to autologous group (3.6%).¹⁵ Whereas, in a study conducted by Elwan S et al in 2014, the rate of recurrence in suture group was found to be 8% and that in autologous group was 6%. Evidence suggests that increased ocular surface inflammation during the postoperative period may increase the risk of pterygium recurrence.¹² In Sharma et al.'s study,²⁷ out of 150 cases, who underwent graft fixation with autologous blood recurrence during the follow-up period was seen in 4 patients –2.6%. Studies by Soliman Mahdy MA et al²⁸ found 4.7% in sutured and Bhatia J et al²⁹ found 6%

recurrence in suture less method and it was found to be comparable to those found in other studies^{17, 25} (2.5–10%).

In our study Postoperative complications graft displacement was seen in 3 patients (10%) in serum group, with one patient has graft loss on 1 week post operatively. No incidence of displacement was noted in suture group. 2% patients showed graft displacement in a study by Dasgupta et al¹⁸ in 2016 and the study conducted by Singh et al²⁵ graft displacement was more common in the no glue, no suture group. Rathie et al³⁰ reported 2% graft loss following suture less and glue free technique. In the study by Anita et al³¹ 2 cases (6.6%) had graft loss and all belonged to autologous group. Thick graft due to inadequate dissection of tenons tissue, insufficient blood film or excessive bleeding on graft bed reduces the adhesion of graft can lead to displacement.

Granuloma was noted in suture site in one patient (3%) with suture. On further statistical analysis these complications were not statistically significant which was consistent with study by Sharma A et al¹⁰ and Anita et al.³² While other studies²⁹ reported this complication in suture less and glue-free technique also.

CONCLUSIONS

Autologous blood is a useful alternative method for graft fixation in pterygium surgery instead of sutures. Efficacies of both the techniques are comparable. Postoperative discomfort and surgical time required are significantly less in autologous serum method. Incidence of graft displacement and graft loss is more with autologous serum technique, but it was not statistically significant in our study.

Limitations and Future Directions

Sample size was small in this study and majority of the participants were from the same institution which could not truly represent the characteristics of whole population. So studies from larger sample size from different centres are needed in future.

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