

Randomized comparative study of surgical outcome of pterygium surgery-conjunctival autograft vs amniotic membrane transplant

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Abstract

Pterygium is an ocular surface condition that is very common. It is a wing-shaped fibrovascular growth that extends from the conjunctiva onto the nasal, temporal, or both aspects of the cornea. It is believed that ultraviolet light is a major contributor in the formation of pterygia, though reflected, scattered light is also critical. The study aim to compare the surgical outcomes of pterygium surgery-conjunctival autograft vs amniotic membrane transplant. A total of 120 patients were randomly divided into 4 groups of 30 each by chit box method. In this study, patients underwent extended excision of pterygium followed by suture less or with sutured conjunctival autograft or amniotic membrane transplant with or without sutures. The mean age was 57.65 years and the standard deviation being 9.7 years. 69% of all the patients affected were males while 31% of the patients affected were females. Results showing there was significant improvement in visual acuity after pterygium excision ($p=0.001$). The preoperative complaints of patients were classified into either visual disturbance or ocular discomfort, or both. Comparison of Pre-operative vs post-operative visual acuity shows that there was significant improvement in visual acuity after pterygium excision. All the surgeries and complications had no significant difference ($P > 0.05$). Higher mean scores of inflammation were observed on the 3rd, 7th, 14th and 30th post-operative day. We draw the conclusion that both the amniotic membrane graft and conjunctival autograft methods are equally effective ways to treat pterygium surgery, with similar rates of recurrence and cosmetic outcomes. Either method may be chosen depending on the patient's characteristics and the ophthalmologist's access to facilities.

Keywords: Pterygium, conjunctival autograft, amniotic membrane transplant

Introduction

Pterygium is an ocular surface condition that is very common. It is a wing shaped growth, which is fibrovascular in origin, which affects one or both sides (nasal/temporal) on one or both eyes. It originates from the conjunctiva which then encroaches the cornea ^[1]. Ultraviolet light, which is thought to be the origin of pterygium, can harm limbal stem cells or produce chronic inflammation in the conjunctiva. The presence of chronic inflammatory cells in

pterygium samples suggests that chronic inflammation may play a role in the development of pterygium. The epithelium may be thick or thin or normal, however it occasionally may present as dysplasia. It is believed that a localised Limbal stem cell deficit is the or may be the root cause^[2].

Pterygium, corneal invasion and pterygium recurrence are all caused by epithelial abnormalities and fibrovascular components. Pterygia are typically asymptomatic throughout the course of the disease, but because the lesion produces irregular wetness of the ocular surface, there may be symptoms of dry eye such as tearing, itching and burning. The lesion may enlarge and become more visible to the unaided eye, resulting in an aesthetic imperfection. Due to induced astigmatism or direct encroachment onto the visual axis, further growth may result in visual complaints. Astigmatism may be brought on by pterygia that is less than 3 mm. An astigmatism of more than 1D is likely to be present in lesions larger than 3mm^[3].

The most popular methods for treating pterygia are conjunctival autograft transplantation and amniotic membrane transplantation^[4]. Amniotic membrane has been demonstrated to inhibit transforming growth factorbeta signalling in conjunctival and pterygium fibroblasts, suggesting that it has anti-fibroblastic and antibacterial properties. Free conjunctival autograft (CAT), a rapid and safe treatment that involves transplanting the resected conjunctiva to the area that was excised, has gained popularity in recent years and is known to have a low recurrence rate. Another suggested method is amniotic membrane transplantation (AMT), which has better surgical outcomes due to its biological characteristics, including less scarring, inflammation and vascularization. Another claim made with AMT is that it can relieve pain quickly, which is seen to be a key advantage. Simple excision under local anaesthesia was performed, then the bare sclera was closed with a conjunctival autograft or an amniotic membrane transplant using a sutureless glue-free approach or the traditional way of suturing, followed by bandaging for 24 hours post procedure. In light of this, our aim was to contrast the surgical results and recurrence rates of CAT and AMT.

Objectives

1. To assess the mean inflammation in first, third, sixth post –operative month.
2. To compare mean healing time of corneal epithelial defects, BCVA and postoperative complications.
3. To compare the recurrence rate post pterygium surgery.

Method

For this prospective and observational study, 120 patients with pterygium presenting to the outpatient department and residing as inpatients in the Ophthalmology ward of Mahatma Gandhi Hospital, satisfying the following inclusion & exclusion criteria were included in this study. Patients were randomly divided into 4 groups of 30 each by chit box method.

Group A: Pterygium excised with CAT with suture (CAG 1)

Group B: Pterygium excised with CAT sutureless (CAG 2)

Group C: Pterygium excised with AMT with sutures (AMG 1)

Group D: Pterygium excised with AMT sutureless (AMG 2)

Patients underwent extended excision of pterygium followed by suture less or with sutured conjunctival autograft or amniotic membrane transplant with or without sutures. Routine Pre-operative evaluation done according to standards

1. Essential ocular history.
2. Uncorrected and best corrected visual acuity.
3. Slit lamp examination-complete anterior segment evaluation.
4. Examination of Retina.

Peribulbar anesthesia was given. Eye to be operated was cleaned with povidine. Eye was covered with surgiware. Eye speculum was used to open both lids, followed by use of superior

rectus bridge suture to get eye in primary gaze. An incision was made at the limbus where the pterygium begins to encroach over the cornea. Head of pterygium was dissected from the corneal surface with help of crescent knife and 11 number blade. After removing it, the body portion and tissues underneath was dissected and excised. Taking care that none of pterygium tissue is left behind. Surgeon needs to be very careful in this step that he or she doesn't dissect or cut medial rectus muscle insertion while operating a nasal pterygium.

Size of defect was measured and adequate size conjunctival autograft was taken from supero-temporal quadrant of the same eye and graft fixation was achieved using serum from the bleeding conjunctival vessels for sutureless group and with ETHILON 10-0 for with suture group. (while taking conjunctival graft you have to make sure that graft is smooth, devoid of subtenon's tissue for better cosmetic reasons). Operative eye is closed with sterilized gauzed and ciprofloxacin eye ointment is also added before patching.

On the 1st postoperative day, tablet Ciprofloxacin and Diclofenac is advised twice a day for 3 days and injection Diclofenac is optional. After opening eye patch on 2nd postoperative day, Moxifloxacin with ketorolac eye drop is advised four times a day. Tobramycin with dexamethasone eye drop is advised for 2 hourly/day for 2 days, tapering it till 30 days of span and 1% carboxymethylcellulose, lacrigel are also advised. For the amniotic membrane group, appropriate size amniotic membrane graft was used and placed with the basement side facing upwards. Graft fixation was achieved using serum, or ETHILON 10-0.

Post-Operative Assessment Post operatively, follow up visits were performed on day one, at the end of 1st week, 1st month, 3rd month, 6th month. In each visit, a BCVA and slit-lamp examination was done. Required healing time for the corneal epithelial defect, recurrence, size and time of recurrence and possible complications. The inflammation was clinically graded according to hyperemia in the site of pterygium excision zone as follows: 0 = none, 1 = mild, 2 = moderate, and 3 = severe.

Statistical Analysis

All the demographic details, base line data and postoperative data were recorded in the case report form over the course of the study. The quantitative data was represented as Mean \pm Standard Deviation. Data was analyzed using Chi-square test and independent sample t-test for group analysis. The difference was considered as being of statistical significance at $p < 0.05$. The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 22.0 statistical Analysis Software.

Results

In the study that we conducted, the minimum age of presentation was 37 years and maximum age was 75 years. 57.65 years is the mean and the standard deviation being 9.7 years. A majority of affected individuals presented in the 5th decade, with highest frequency being in the 51-55 and 56-60 age group (42%). No patients were less than 35 years of age. 69% of all the patients affected were males while 31% of the patients affected were females.

From the study that we did, 115 patients had pterygium on the nasal side while 5 patients had it on the temporal side. Out of the 120 patients, 19 patients (16%) had a pterygium in both eyes, while 44 patients (37%) had it on the right eye. 57 patients (47%) had it on the left eye. Grade T2 and T3 by TANS classification were included in the study. 67% of the total patients in the study belonged to grade 2 (67%). The preoperative complaints of patients were classified into either visual disturbance or ocular discomfort, or both. The Pre-operative Visual acuity of 6/6 was present in 2 patients only, 6/9 in 16 patients, 6/12 in 20 patients, 6/12 in 20 patients, 6/18 in 24 patients, 6/24 in 16 patients, 6/36 in 24 patients and 6/60 in 18 patients.

Post operatively, no patient had a Visual acuity of 6/60, 6/6 was found in 22 patients, 6/9 in 24 patients, 6/12 in 26 patients, 6/18 in 12 patients, 6/24 in 20 patients, 6/36 in 16 patients. Comparison of Pre-operative vs post-operative visual acuity shows that there was significant improvement in visual acuity after pterygium excision.

The following surgeries and the complications were noted during the course of the study,

thereby, tabulating and mapping the complication rate related to each surgery. This data was then updated into the SPSS software to calculate if there is a statistically significant difference.

Table 1: Surgeries and complications

Complications	CAG 1	CAG 1	CAG 2	CAG 2	AMG 1	AMG1	AMG2	AMG2
	Count	%	Count	%	Count	%	Count	%
Graft Oedema	3	10%	0	0	3	10%	0	0
Graft Recession	2	6.6%	1	6.6%	2	6.6%	2	6.6%
Graft Infection	0	0	0	0	1	3.33%	0	0
Graft Loss	0	0	0	0	0	0	0	0
Recurrence	2	6.6%	1	3.33%	1	3.33%	3	10%

The above table 1 demonstrates that Graft Oedema was seen in 3 patients with Amniotic membrane graft with suture and Conjunctival graft with suture. No Graft Oedema was seen in patients with either amniotic or conjunctival graft without suture ($P=0.137$). Graft recession was seen in all types of surgery, with a maximum of 2 patients (6.6%) in patients who underwent Amniotic Membrane Graft with and without suture, and Conjunctival Graft with suture ($P=0.45$). Graft infection was seen in just 1 patient who underwent Amniotic Membrane Graft Transplant. No patients had a graft loss. Recurrence was seen in 3 patients with Conjunctival Autograft and 4 patients with amniotic membrane graft transplant. All the above parameters had no significant difference ($P > 0.05$).

Table 2: Inflammation score comparison between AMG and CAG Inflammation score comparison between Conjunctival Autograft with Suture vs. Conjunctival Autograft without Suture

Inflammation Score	AMG	CAG	P Value
Post-op Day 3	2.40 ± 0.22	2.21 ± 0.34	0.0004
Post-op Day 7	2.22 ± 0.41	1.99 ± 0.37	0.0016
Post-op Day 14	2.02 ± 0.45	1.8 ± 0.4	0.0079
Post-op Month 1	1.71 ± 0.38	1.56 ± 0.36	0.011
Post-op Month 3	1.42 ± 0.52	1.21 ± 0.44	0.018
Post-op Month 6	0.30 ± 0.27	0.27 ± 0.25	0.528

Table 3: Inflammation score comparison between CAG 1 and CAG 2 Inflammation score comparison between Amniotic Membrane with Suture vs. without Suture

Inflammation Score	CAG 1 (w/ Suture)	CAG 2 (w/o Suture)	P Value
Post-op Day 3	2.36 ± 0.27	2.09 ± 0.37	0.0020
Post-op Day 7	2.17 ± 0.37	1.9 ± 0.4	0.0087
Post-op Day 14	1.96 ± 0.42	1.72 ± 0.33	0.0169
Post-op Month 1	1.64 ± 0.35	1.44 ± 0.37	0.0357
Post-op Month 3	1.28 ± 0.3	1.15 ± 0.36	0.1341
Post-op Month 6	0.29 ± 0.21	0.25 ± 0.24	0.4948

Table 4: Inflammation score comparison between AMG 1 and AMG 2

Inflammation Score	AMG 1 (w/ Suture)	AMG 2 (w/o Suture)	P Value
Post-op Day 3	2.19 ± 0.39	2.24 ± 0.42	0.466
Post-op Day 7	2.09 ± 0.29	2.20 ± 0.40	0.064
Post-op Day 14	1.87 ± 0.42	1.89 ± 0.54	0.245
Post-op Month 1	1.32 ± 0.53	1.27 ± 0.51	0.570
Post-op Month 3	0.83 ± 0.57	0.74 ± 0.51	0.326
Post-op Month 6	0.38 ± 0.54	0.44 ± 0.56	0.51

Above tables 2,3,4 shows that patients of both the groups (CAG, AMG) were followed for an average of 1 year ± 1.2 months. Inflammation scores were objectively given from 0 to 3. Higher mean scores of inflammation were observed on the 3rd, 7th, 14th and 30th post-operative day, all of which, the data has been shown below. There was significant difference between the scores of inflammation between the CAG and the AMG group, with AMG group showing higher 1st post-operative month scores of inflammation. (P=0.004). On 3rd month post-operative revisit, there was an inflammation score of 1.42 ± 0.52 for AMG vs. 1.21 ± 0.44 for CAG, with a P=0.018, being statistically significant. On 6th month post-operative revisit, there was an inflammation score of 0.40 ± 0.39 for AMG vs. 0.21 ± 0.34 for CAG, with a P=0.545, having no significant difference. While clearly, CAG having lesser post-operative scores vis-à-vis AMG, we further calculated if suture vs sutureless would yield significant results, and the results were as follows: CAG group with suture had a mean inflammation score of 1.71 ± 0.38 while CAG group without suture had a mean inflammation score of 1.44 ± 0.37, on 1st postoperative month, with a P value of 0.0357, thereby being statistically significant. On the other hand, on 3rd post-operative month onwards, the mean inflammation score were similar, with a P value of 0.4948, having no statistical significance, implying there is no difference in inflammation 3 months onwards.

Discussion

Pterygium is a prevalent issue that ophthalmologists deal with on a daily basis in India. Surgery is the preferred method of treatment, but it has a high recurrence rate. The fact that many surgical methods have developed over time shows how challenging it is to identify a "optimal" surgery. Autologous conjunctival grafting is a quick, painless, and tissue-preserving surgery. Because the normal conjunctiva serves as a barrier to stop the aberrant tissue from proliferating and moving closer to the limbus, there is a low recurrence rate. Even if the number of recurrences has decreased, one of the main worries has been that it could influence the results of glaucoma-filtration surgery if the donor ultimately needs it. Due to a lack of suitable healthy tissue for grafting, this surgery may not be feasible in cases of extensive or double-headed pterygium. As a result, a workable substitute was required, and amniotic membrane was discovered to be a good choice in this regard.

By stimulating conjunctival epithelialization, reducing inflammation, and inhibiting sub conjunctival fibrosis, amniotic membrane reduces the rates of recurrences. Thus, a study contrasting these two methods was necessary. Pterygium is more prevalent in middle-aged adults. Most of the patients in the current study (42 patients; 35%) were found to be between the ages of 51 and 60. The age group between 40 and 50 was the next most impacted (29 patients, 24.16%). It is possible that work exposure was to accountable for the increased incidence reported in these age groups.

Men are more likely than women to develop pterygium, maybe as a result of greater exposure to dust and other environmental variables. However, according to J.H. Hillgers^[5], this sex difference vanishes if both people work in the same line of work. Out of 120 patients in the current study, 83 (69%) were men and 37 (31%) were women.

A significant factor in the aetiopathogenesis of pterygium is occupation. In the current study, people working outside, such as farmers, coolies, and sellers, had a higher incidence of pterygium; they accounted for up to 102 of the total 120 cases (85%). This is in line with the

findings of Sonnenberg ^[6], who found that farmers experience pterygium more frequently than those who work in sedentary occupations. Hillgers ^[5], Anderson and Kerknezov ^[7] have published similar studies.

In the current study, 115 patients had nasal pterygium (97%) and 5 patients (3%) had temporal pterygium. It has been suggested that the nasal aspect of pterygium results from tears carrying dust particles flowing from the temporal to the nasal aspect and accumulating, which leads to higher irritation. This is consistent with research by Shaw *et al.* ^[8] In the current study, patients in the conjunctival autograft group and the amniotic membrane group, respectively, experienced graft oedema in 3 (2.50%) and 3 (2.50%) individuals. Using topical steroids and antibiotics, this faded in a week. 4 patients (3.33%) in the conjunctival autograft group and 3 patients (2.5%) in the amniotic membrane group both experienced graft recession.

Conjunctival autograft patients did not experience post-operative infection, but one patient in the amniotic membrane group did and it affected the cornea. The recurrence rate in the current study was 5%, comparable to those discovered by Kenyon ^[9], Solomon *et al.*, ^[10] and Prabhasawat *et al.* ^[11] in other research. Amniotic membrane transplantation and conjunctival autografting were both used in a study by Memarzadeh F, Fahd AK, Shamie N and Chuck RS ^[12]. Regarding post-operative inflammation, amniotic membrane transplant group had a higher incidence of inflammation as compared to the conjunctival group. It was statistically significant, up to post-operative month 3. Further onwards, inflammation rates were similar when compared on post-operative month 6. These were statistically insignificant. A similar study by Mitra Akbari *et al.* ^[1] concluded that inflammation rates were higher in conjunctival group as compared to amniotic membrane group.

Conclusion

Autologous conjunctival grafting is a simple, low-risk technique with a low recurrence rate. In addition, graft recession was seen less among conjunctival autograft group. Amniotic membrane transplant have the drawbacks of requiring extensive surgical skill and higher rates of postoperative inflammation. In clinical settings needing substantial tissue healing, recurrent cases with scarring, and patients who require filtration surgery, the use of amniotic membranes has produced positive outcomes. Additionally, rejection is minimal. In clinical settings needing substantial tissue healing, recurrent cases with scarring, and patients who require filtration surgery, the use of amniotic membranes has produced positive outcomes. Additionally, rejection is minimal. However, the main disadvantage is that it takes a long time, is tedious, needs skill, knowledge, and money to acquire under sterile and aseptic circumstances. Trained personnel and top-notch lab facilities are needed for the storage and preparation of media. As a result of our study's findings, we draw the conclusion that both the amniotic membrane graft and conjunctival autograft methods are equally effective ways to treat pterygium surgery, with similar rates of recurrence and cosmetic outcomes. Either method may be chosen depending on the patient's characteristics and the ophthalmologist's access to facilities.

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