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Study of visual outcome and complications following conjunctival autograft transplant in management of primary pterygium

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Abstract
Introduction: Pterygium is a common degenerative disease of the anterior segment of the eye characterized by a wedge-shaped fibrovascular dysplasia of the bulbar conjunctiva with a prevalence of 12%. Exact etiology is unknown; risk factors include, long term exposure of ultraviolet B rays, dust, wind, chemicals and air pollution. To minimize recurrence after the traditional bare sclera surgical technique, adjuvant therapies and modifications to the surgical technique are being adopted. Geographically, Vijayapura is located close to the equator with inherent risk of higher ultraviolet radiation exposures. Of late there is an upsurge in the number of patients with diagnosed with pterygium opting for surgical correction. Conjunctival autograft transplant is promising modification of bare sclera technique is associated with significant reduction in pterygium-induced astigmatism thereby improved visual acuity, decreased postoperative complications and decreased recurrence rates.
Objective: To evaluate the visual outcome and complications following conjunctival autograft transplant in management of primary pterygium.
Methods: The present study was conducted in the department of Ophthalmology, B.L.D.E. deemed to be university Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura between October 2019 to April 2021. A total of 52 patients above 18 years with a diagnosis of primary pterygium were included in the study. Age, gender, occupation, side and severity of pterygium was recorded. Preoperative visual acuity and corresponding decimal pin whole equivalent was calculated for each patient. Upon surgery with conjunctival autograft under local anaesthesia, postoperatively, visual acuity, corresponding decimal pin hole equivalent and complications were evaluated at day 1, day 7 and day 30. Comparison of pre and postoperative data was done using appropriate statistical tests.
Results: Mean age of patients was 54.38±10.70 years and 69.3% belonged to the age group of 50-70 years. Slight female predominance was noted with female to male ratio of 1.17:1. Most of the patients were farmers (48.5%) followed by housewives (23.1%). All patients had nasal pterygium prominently on the left side than right (61.5% vs 38.5%). 76.9% patients had grade 2 pterygia. Preoperatively, most patients had a visual acuity of 6/24 (25%), followed by 6/36 (19.2%) and 6/60 (17.3%). The mean decimal equivalent value was 0.35±0.21. Compared to preoperative visual acuity, significant improvement was seen at postoperative day 1 (p=0.000), postoperative day 7 (p=0.001) and at postoperative day 30 (p=0.001). Similarly significant increase in the decimal equivalent postoperatively (0.001) than preoperative values. Factors including age, gender, occupation, side and severity had significant association on the visual outcome based on visual acuity at all follow ups. Most common postoperative complication at day1 was subconjunctival haemorrhage (36%) is the common one followed by graft edema (36%) and graft retraction (13.5%). Resolution of complications was seen by day 30.
Conclusion: Conjunctival autograft is a feasible and safe option in patients with primary pterygium with severe grading.

Keywords: Pterygium, visual outcome, complications, conjunctival autograft, visual acuity

Introduction

Pterygium is a common degenerative ophthalmic disease of the anterior segment with a global prevalence of 12% [1]. It is characterized by a wedge-shaped fibrovascular dysplasia of the bulbar conjunctiva located commonly in the nasal horizontal part of the limbus and less commonly in the temporal horizontal portion [2]. Certain hereditary factors and environmental irritants, including long-term exposure to ultraviolet B rays, wind, dust, chemicals, and air pollution, are predisposing factors for developing pterygia. Although an increased exposure to ultraviolet radiation is the leading risk factor that triggers limbal epithelial stem cell damage; however, the exact etiology of pterygium remains elucidated.

Owing to the presence of altered progenitor cells, loss of polarity, corneal invasiveness, epithelial cell motility, pterygium is considered a neoplastic-like growth disease [3]. The patients experience signs, including a feeling of a foreign body in the eye, the appearance of a cosmetic blemish. Slit-lamp examination confirms the presence of pterygium. Although surgical excision, namely, the bare sclera technique, was once the treatment of choice, however, is associated with significantly higher chances of recurrence (88%) [4, 5]. The presence of aberrant or transformed limbal basal cells after incomplete surgical excision infiltrates the adjacent normal epithelial cells, leading to reappearance of fibrovascular overgrowth composed of mutated cells and aggressive proliferative ability [6]. To minimize the risk of recurrence, many adjuvant therapies, including antimetabolites mitomycin C and fluorouracil, amniotic membrane coverage, conjunctival and/or limbal conjunctival grafts, and medications including anti-vascular endothelial growth factor are widely being adopted [7]. The pterygium surgery with a conjunctival autograft is a promising technique first described by Keynon *et al*. in 1985. [8] It is associated with a lower recurrence rate of up to 16.7% [9]. Here, the bare part of the conjunctiva will be covered with a normal resected conjunctival and limbal tissue from the patient's own eye. Previous studies have reported a significant reduction in pterygium-induced astigmatism post-surgery, resulting in improved visual acuity [10]. On the other hand, postoperative complications including wound dehiscence, conjunctival cyst, Tenon's granuloma, pyogenic granuloma, and conjunctival inclusion cysts have been reported [11].

Materials and Method

The present study was accepted by ethical committee of BLDE (DU), and confined to the principle of declaration. The present study was conducted in the department of Ophthalmology, B.L.D.E. deemed to be university Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura. The study conducted on patient with following criteria, Patients with primary pterygium who presented to the OPD in our institution, aged with more than and equal to 18 years and without a history of previous ocular co-morbidities or injury. Patient with exclusion criteria were excluded in our study, i.e., patient age below 18 years, history of convulsions or epilepsy, sensitivity to inj. Lignocaine, inability to give informed consent, presence of any other ocular co-morbidities including cataract, high myopia, high hypermetropia, keratoconus, corneal dystrophies, corneal ulcer, corneal degenerations, pseudopterygium and corneal opacities.

Preoperative assessment of patients

After patient comes to OPD, history is taken and patient is assessed under slit lamp for examination of conjunctiva, cornea, anterior segment, pupil, lens. With emphasis on pterygium, type morphologically, and on the basis of progression. And the pterygium is graded by, type, nature and severity of pterygium based on slit lamp examination. And severity was graded as follows, Grade I: Just touching the limbus, Grade II: Midway between the limbus and pupil, Grade III: Reaching up to the pupillary margin Grade IV: crossing the pupillary margin. Visual acuity of patients is noted, pinhole improvement is measured and converted to decimal equivalent with normal being the value 1 [12].

Distance			LogMAR Acuity Chart			
Snellen Feet 20/	Equivalent Meter 6/	Decimal	Line Number	LogMAR†	Spatial Frequency (cyc/deg)	% Central Visual Efficiency
10	3.0	2.00	-3	-0.30	60.00	100
12.5	3.8	1.60	-2	-0.20	48.00	100
16	4.8	1.25	-1	-0.10	37.50	100
20	6.0	1.00	0	0.00	30.00	100
25	7.5	0.80	1	0.10	24.00	95
30	9.0	0.67	—	0.18	20.00	91
32	9.6	0.63	2	0.20	18.75	90
40	12.0	0.50	3	0.30	15.00	85
50	15.0	0.40	4	0.40	12.00	75
60	18.0	0.33	—	0.48	10.00	67
63	18.9	0.32	5	0.50	9.52	65
70	21.0	0.29	—	0.54	8.57	63
80	24.0	0.25	6	0.60	7.50	60
100	30.0	0.20	7	0.70	6.00	50
114	34.2	0.18	—	0.76	5.26	44
125	37.5	0.16	8	0.80	4.80	40
150	45.0	0.13	—	0.88	4.00	32
160	48.0	0.13	9	0.90	3.75	30
200	60.0	0.10	10	1.00	3.00	20

Chart 1: For pinhole decimal equivalent. Using the visual acuity conversion chart (102).

The procedural details along with possible complications were explained in detail to the patient and an informed consent was obtained. Prior to surgery Xylocaine sensitivity test was done and the patient was prescribed topical Ciprofloxacin eye drops 3^0 1-day prior surgery.

Surgical procedure

Following application of topical anaesthetic agent, the eye was cleaned, draped and exposed using eye speculum. Head of pterygium was lifted and dissected off from the cornea. Main mass of pterygium was then separated from the sclera inferiorly and the conjunctiva superficially. The separated pterygium tissue was then excised taking care not to damage underlying medial rectus muscle. Based on the size and shape of the host bed, a free graft is an autograft of conjunctival tissue obtained from the upper bulbar conjunctiva from the limbus part from the same or fellow eye with following prerequisites of graft: square, rectangular, or crown section shaped and measure up to 20 mm long by 12mm wide, without causing alterations in the depth of the fornix containing epithelium with its substantia propria but without Tenon's capsule and should fit it snuggly with no traction or excess tissue. Obtaining the tissue for grafting: The size and shape of the donor area was marked with two radial incisions prior to subconjunctival injection. The conjunctiva was dissected from underlying Tenon's capsule with scissors introduced through one of the incisions and taken out through the opposite incision. Following this, a third upper conjunctival incision was made and the inverted graft was placed over the cornea, raw aide up. Next, using smooth conjunctiva forceps and Westcott's scissors, all Tenons' remnants were removed from the exposed side until the tissue was transparent. In order to avoid subsequent damage to conjunctiva on subsequent handling, Care was taken not to open holes in the conjunctiva with the scissors. Finally, limbal edge of the conjunctiva was cut with scissors. Treating the Donor Site: To avoid formation of traction scars, Tenon's capsule in the donor site was carefully handled and haemostasis of few bleeding vessels was achieved. The donor site left bare to allow spontaneous reduplication of conjunctival epithelium for secondary healing. The tissue debris was scraped towards a to prevent epithelial cells from remaining in the host area and subsequent inclusion cyst. Finally, a compressive dressing was placed and left for 24 hours.

Postoperative assessment of patients

Patients were evaluated at day 1, day 7 and day 30. Corrected and uncorrected visual acuity and pinhole decimal equivalent were recorded. Immediate postoperative complications were recorded at each postoperative visit including subconjunctival haemorrhage (SCH), graft necrosis, superficial corneal epidefect, granuloma, graft retraction, tenon's cysts.

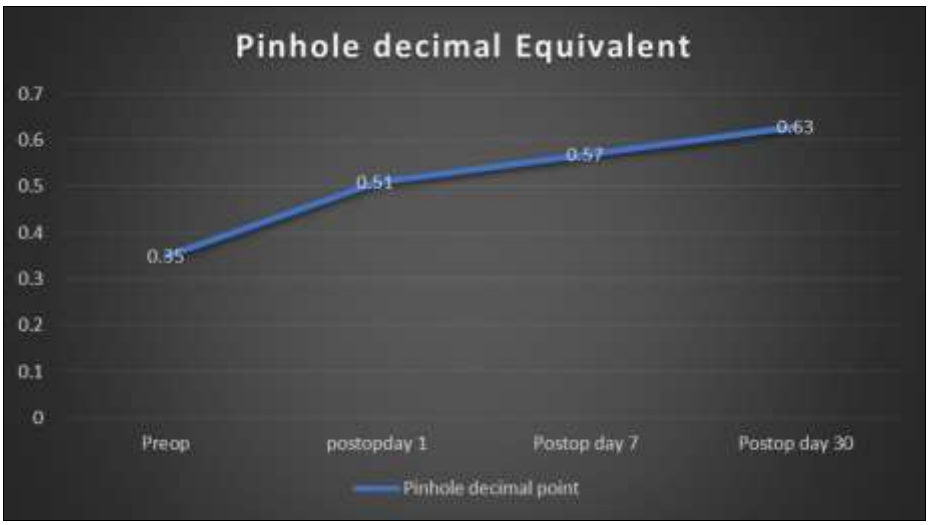
Results

The study cohort comprised of patients aged 26 to 69 years with a mean of 54.38±10.70 years. Most of the patients belonged to the age group of 51-60 years. The study population comprised of 28 (53.8%) females and 24(46.2%) males with mild female predominance with 1.17:1 ratio. Among 52 patients, 25(48.1%) patients were farmers, 12(23.1%) patients were housewives, 8 (15.4%) patients were laborers. All 52 (100%) patients had Nasal type of pterygia. Right eye (61.5%) was commonly affected than left eye (38.5%). In our study, 40 patients (76.9%) had grade 2 pterygia and 12 patients (23.1%) had grade 3 pterygia. Most patients had a visual acuity of 6/24 (25%), followed by 6/36 (19.2%) and 6/60 (17.3%). Of the 52 patients, vales of pinhole decimal places ranged from 0.03 to 1. The mean pinhole decimal equivalent value was 0.35±0.21. While patients in the younger age groups had near normal visual acuity with lower fractions, the visual acuity was poor with increasing age. The association was statistically significant (p=0.000). No significant difference in the distribution of visual acuity between genders was noted (p=0.322) and also in preoperative visual acuity in the left and right eye in pterygium patients (p=0.681), and in the distribution of visual acuity between disease severity (p=0.289). Significant association between preoperative visual acuity and different types of occupation was noted (p=0.044). Visual outcome after surgery was measured in terms of improvement in the visual acuity and pinhole decimal equivalent. Compared to preoperative visual acuity, significant improvement was seen at postoperative day 1. (p=0.000). Significant improvement was seen at postoperative day 7 as compared to baseline. (p=0.001). Significant improvement was seen at postoperative day 30 as compared to baseline. (p=0.001). In our study factors including age, occupation, had significant association on the visual outcome based on visual acuity at postoperative day 1 (p=0.000 for each variable), postoperative day 7 (p=0.001 for each variable) and postoperative day 30(p=0.001 for each variable). Mean±standard deviation of pinhole decimal equivalent at postoperative day 1 was 0.51±0.26, at postoperative day 7 was 0.57±0.28 and at postoperative day 30 was 0.63±0.25. Significant improvement in the mean pinhole decimal equivalent was seen at postoperative day 1(p=0.000), postoperative day 7 (p=0.000) and postoperative day 30(p=0.000) as compared to preoperative mean pinhole decimal equivalent. On postoperative day 1, all patients had SCH. Additionally, 14 patients had graft edema, 5 patients each had lid edema and superficial corneal defect, 4 patients had graft retraction and 1 patient had cornea epithelial defect. On postoperative day 7, 48 patients had SCH, 4 patients had superficial corneal defect, 2 patients had additional graft edema and 1 patient had cornea epithelial defect. On Postoperative day 30, only 2 patients had SCH.

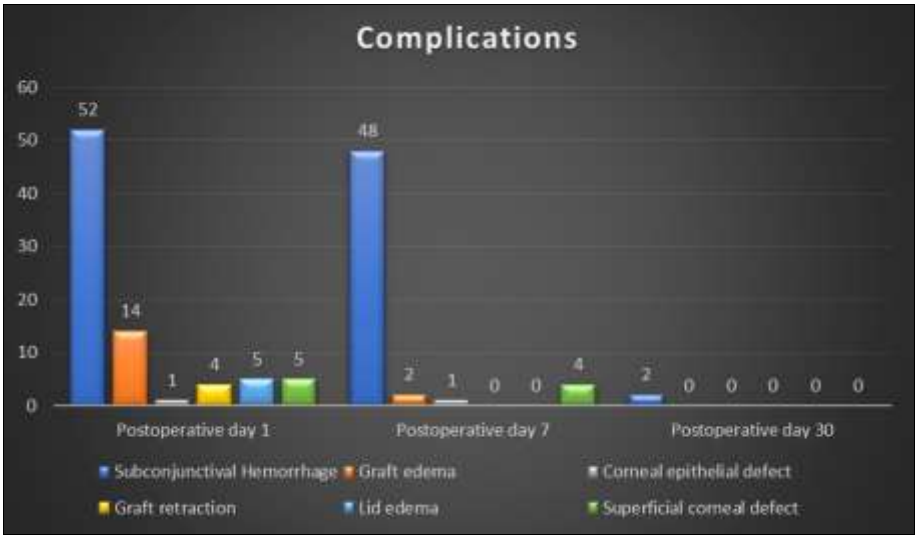
Table 1: comparison of pre and postoperative visual acuity at day1

Visual acuity	Preop	Post op day 1	Chi square value	P value
6/6P	0	3(5.8)	238.14	0.000
6/9	1(1.9)	3(5.8)		
6/9P	6(11.5)	6 (11.5)		
6/12	1(1.9)	1(1.9)		
6/12P	3(5.8)	1(1.9)		
6/18	2(3.8)	14 (26.9)		
6/18P	1(1.9)	0		

6/24	13(25.0)	11 (21.2)		
6/24P	0	1(1.9)		
6/36	10(19.2)	5 (9.6)		
6/36P	2(3.8)	3(5.8)		
6/60	9(17.3)	2(3.8)		
6/60P	2(3.8)	2(3.8)		
CF3MT	2(3.8)	0		
Total	52 (100)	52 (100)		



Graph 1: Line diagram showing improvement in pinhole decimal equivalent of vision



Graph 2: Bar diagram showing postoperative complications

Discussion

Pterygium, the wing shaped extension of the fibrovascular tissue from the bulbar conjunctiva into the cornea, clinically gives rise to grittiness, feeling of foreign body or redness in patients [13]. Continuous enlargement of the pterygium leads to visual disturbances due to astigmatism, obscuration of direct visual axis and diplopia due to restricted extraocular movements [14]. Our study comprised of patients aged between 26 to 69 years with a mean of 54.38±10.70years. Mean age was in accordance with previous reports by Alsarhani *el al*. [15]. (53.3±14.2 years). most of our patients (n=36, 69.3%) belonged to the age group of 50-70 years suggesting that increased age increases the risk of pterygium due to higher UV radiation exposure and increased exposure to dust particles. While, previous reports suggest a male predominance of pterygia [15, 16], in our study slight female predominance was noted with 53.85% females diagnosed with pterygium than 46.2% males. This could be due to new world where females go out more often to field work or take part in outdoor activities than being confined to the housework. Also, considering the rural women traditionally do not use sunglasses to cover eye when outdoor. Amongst the many etiologic factors, exposure to ultraviolet rays is the major risk factor for disease development especially occupational related. Previous studies [17, 18] have shown an increased prevalence of pterygium in rural population living near the equator with higher outdoor activities. Notably, sun exposure for >5 hours per day is considered to have higher potential towards severity of pterygium [13, 19]. In our study nearly half of the patients (48.5%) were farmers with outdoor work correlating with increased UV exposure in this group. UV exposure causes oxidative stress with

resultant release of cytokines and growth factors with subsequent cellular proliferation [20, 21]. Literature suggest that covering the eyes with sunglass and hat reduces the risk of developing Pterygium, hence it is essential people especially those working outdoor about eye protection [22]. Nasal pterygium is common than temporal variant [23]. In our study, all 52 (100%) patients had Nasal type of pterygia. Extensions [15, 24, 25]. Based on the extension of pterygium, in our study, 40 (76.9%) patients had grade 2 pterygia wherein the pterygium was extending midway between the limbus and pupil, and 12 (23.1%) patients had grade 3 pterygia with pterygium extension up to the pupillary margin, not crossing it. Pterygium involving the visual axis leads to visual impairment [10]. Most patients had a visual acuity of 6/24 (n=13;25%), followed by 6/36 (n=10;19.2%) and 6/60 (n=9;17.3%). We further graded the pin hole decimal equivalent into fractional values, 1 being normal. Pinhole decimal equivalent ranged from 0.03 to 1 with a mean pinhole decimal equivalent value of 0.35±0.21, which is accordance with Bhandari *et al*., (2015) [11] with a mean of 0.35±0.20 The mean preoperative uncorrected visual acuity in log MAR reported by Garg *et al*. [26] was 0.56±.049 was slightly higher than our study. We observed a significant difference in the preoperative visual acuity between younger and older age; younger age groups had near normal visual acuity with lower fractions, the visual acuity was poor with increasing age. All patients underwent surgical excision of pterygium with autografting from same eye. Postoperatively, visual outcome after surgery was measured in terms of improvement in the visual acuity and pinhole decimal equivalent. Varsanno *et al*. [27] also reported significant improvement in visual acuity postoperatively defined by 1 line improvement, 2 line improvements. In our study, compared to preoperative visual acuity, significant improvement was seen at postoperative day 1, postoperative day 7 and at postoperative day 30. Significant improvement in the mean pinhole decimal equivalent was seen at postoperative day 1(0.51±0.26), postoperative day 7 (0.57±0.28) and postoperative day 30(0.63±0.25) as compared to preoperative mean pinhole decimal equivalent (0.35±0.21). Our studies are in accordance with Garg *et al*. [26], Maheshwari *et al*. [10], Misra *et al*. [28] and Jha *et al*. [29] who reported significant improvements in the visual acuity after surgery starting from 1 day after surgery. Bhandari *et al*. [11] observed a significant improvement in visual acuity postoperatively, they suggested that improvement was higher in type 2 and type 3 than in type 1 pterygium. In our study comprised of patients with type 2 and type 3 pterygia, the results can be correlated to results by Bhandari *et al*. [11]. Notably other preoperative factors including Factors including age, gender, occupation, side of pterygium and severity also had significant association on the visual outcome in our study. Furthermore, Pearson correlation showed that age was significantly correlated with postoperative outcome. According to the metanalysis by Clearfield *et al*., [30] conjunctival edema and inflammation, conjunctivitis, graft edema and retraction, eyelid edema and epithelial erosions are few of the common side effects reported. Amongst these, SCH (36%) is the common one followed by graft edema (36%) and graft retraction (13.5%)(97,98) In our study, on postoperative day 1, all patients had SCH. Additionally, 14 patients had graft edema, 5 patients each had lid edema and superficial corneal defect, 4 patients had graft retraction and 1 patient had cornea epithelial defect. On postoperative day 7, 48 patients had SCH, 4 patients had superficial corneal defect, 2 patients had additional graft edema and 1 patient had cornea epithelial defect. On Postoperative day 30, except for SCH in 2 patients no other side effects were noted. Similar to Thatte *et al*. by a month almost all complications resolved.

Clinical photographs

Fig 1: Pre-op Right eye grade 2 nasal pterygium

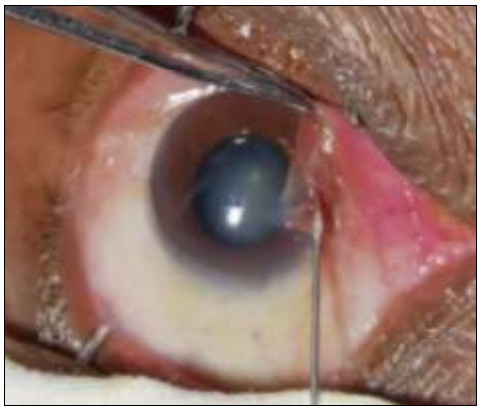


Fig 2: Right eye- Intraop subconjunctival injection of lignocaine)

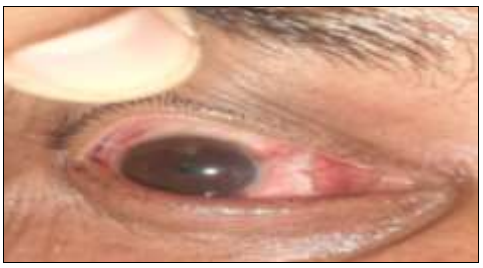


Fig 3: Right eye Right Post-op graft in situ

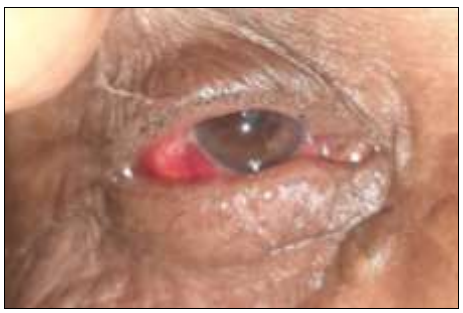


Fig 4: Right eye: Right eye post-op day 1 subconjunctival haemorrhage

Conclusion

In this study of conjunctival autograft in management of primary pterygium, significant improvement in the visual acuity was noted after surgery at day 1. Further improvements were noted at day 7 and day 30 as well. Compared to the preoperative pinhole decimal equivalent values, significant increase in the pinpoint decimal equivalent values was seen at postoperative day 1, post-operative day 7 and postoperative day 30. Most common immediate postoperative complications reported at day 1 was sub conjunctival haemorrhage followed by graft edema and graft retraction. By the third follow up, resolution of complications was seen except for mild SCH in few patients. Above results suggest that conjunctival autograft is a feasible and safe option in patients with primary pterygium.

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