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Original Research Article

Comparison of pre-operative and post-operative astigmatism and visual acuity after pterygium excision followed by sutureless and gluefree conjunctival autograft

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Abstract

Objective: To compare change in refractive astigmatism and visual acuity following pterygium excision followed by sutureless and gluefree conjunctival autograft.
Method: A prospective , non randomized , comparative and interventional case series .This study was carried out on 52 eyes of 50 patients with primary pterygium in one or both eyes .our surgical technique comprised of pterygium excision followed by sutureless and gluefree conjunctival autograft which had additional benefit of having lowest recurrence rate at present. Visual acuity and refractive astigmatism were assessed pre-operatively and post – operatively on 2nd month follow up.
Result: The mean age of the patient was 40.9 ±12.09 years .17 patients (32.69%) had grade III pterygium,12 patients each (23.07%) were of grade I and grade II and 21.15% were of grade IV. There was significant reduction in refractive astigmatism (mean±s.d) and improvement in visual acuity (mean±s.d) in all grades of pterygium post – operatively along with recurrence of merely in 1 patient i.e. 1.92 %.
Conclusion: The present study concludes that pterygium excision reduces refractive astigmatism, improves visual acuity with additional benefit of lowest recurrence rate credited to sutureless and gluefree conjunctival autograft.
Keywords: pterygium, astigmatism, visual acuity

1. Introduction

Pterygium is a degenerative, triangular, wing shaped, fibro vascular connective tissue of bulbar conjunctiva towards and onto the cornea [1], leading to significant astigmatism [2,3]. pterygium is attributed to dry ,dusty and hot climate .recent studies suggests that damage to limbal stem cells and activation of matrix metalloproteinase [4] due to u v rays triggers pterygium occurrence. The pterygium invades the superficial peripheral cornea along with destruction of bowman's layer and the superficial corneal lamellae. As it moves towards the pupillary area it causes corneal distortion and visual loss. Mostly pterygium are nasal in location, but temporal can also occur. Pterygia may be classified as progressive or stationary. A stationary pterygium shows little or no progression over a long period. A progressive pterygium behaves in a far more aggressive fashion, with an advancing margin of grayish opacification and hyperemia within the tissue. Decrease in visual acuity due to pterygium can occur due to following cause:

(i) Encroachment of pterygium at pupillary area [5]
(ii) Astigmatism
(iii) Restriction of medial rectus muscle

The progression of a pterygium onto the cornea leads to significant corneal distortion which eventually causes development of astigmatism. Pterygium induced astigmatism can be the cause of various visually significant complaints like decrease visual acuity, glare sensitivity and monocular diplopia [6].

Various theories are there which explains the occurrence of the induced astigmatism [7-9] such as:

(i) Pooling of the tear film at the apex of the pterygium
(ii) Mechanical traction exerted by the pterygium on the cornea

Pterygium leads to a considerable effect on corneal refractive status, measured by refraction, keratometry and corneal topography [2,10-12]. Such effects increase with the increase in the grade of pterygia. Pterygium induced astigmatism and involvement of the visual axis by the invading pterygium is one of the leading indications for pterygium surgery as this result in significant visual impairment [13]. Apart from reduction of astigmatism and visual acuity improvement we should also consider such technique which have lowest recurrence rate. Pterygium excision followed by sutureless and gluefree conjunctival autograft can be considered as a better technique to reduce astigmatism, improvement in visual acuity with additional benefit of low recurrence rate [14], in comparison to other techniques [15-18].

2. Materials and Methods

A prospective, non randomized, comparative study enrolling 52 eyes of 50 patients with primary pterygium between June 2011 to May 2012; attending the outdoor of our eye hospital after obtaining permission from institutional review board. The patients were informed about the design of the study and procedure and written consent was obtained from all patients. All surgeries were carried out by a single experienced surgeon. Patients with recurrent pterygium, history of ocular trauma, blephritis, keratits, dry eye, entropion, ectropion, other ocular surface pathologic features and major systemic illness like D.M, collagen vascular disease were excluded from the study. All the eyes underwent detailed ocular examination like visual-acuity measured by snellen's chart; refractive astigmatism measured by automated refractrokeratometer and slit lamp biomicroscopy. Quantitative data of astigmatism and visual acuity were evaluated by paired t- test. Characteristics of the pterygium (location, grade, activity) were noted and graded according to the extent of cornea covered by pterygium head. (Table-1)

Table 1: Grading of pterygium

Grade I	Pterygium invading <1.5 mm of cornea
Grade II	Pterygium invading > 1.5 mm of cornea
Grade III	Pterygium invading over half the radius of cornea
Grade IV	Pterygium reaching almost up to the centre of cornea

2.1 Surgical technique

All of the patients underwent pterygium excision followed by supero temporal conjunctival auto grafting surgery performed under local anesthesia by peribulbar block. No sutures or fibrin glue was used to stabilize the graft. The neck of pterygium was grasped with toothed forceps. The head of the pterygium was then, excised off the cornea using no-15 bard parker blade. The keratectomy was continued up to the limbus, thus freeing the pterygium off the cornea, with the help of spring scissor, the pterygium was excised approximately midway between the limbus and canthus. Sub conjunctival fibrous tissue under the pterygium was excised and the edges were undermined about 1mm. Cautery was not applied to the bleeding vessels.

The bare area of the sclera was measured using castor-Viejo calipers and graft of the same size was procured from supero-temporal bulbar conjunctiva after marking with the help of trypan blue and separating it properly from underlying tenon's capsule with the help of sub conjunctival injection of saline. Graft was taken after blunt dissection of conjunctiva from the tenon's capsule and was then slided over the cornea without lifting the tissue off the cornea, towards the bare sclera and it was spread and positioned such that the limbal polarity was maintained. Care was taken to obtain a thin graft without any button hole and close to the limbus. The edges of the graft were placed below the undermined edges of the surrounding conjunctiva (Figure-1).

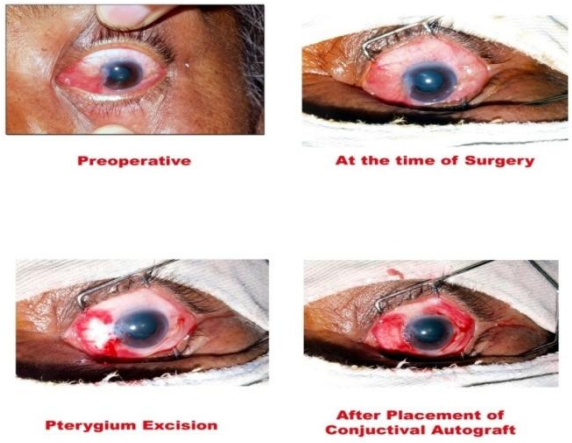

Figure 1: Surgical Procedure

Pad and bandage applied for 1 day and patients were put on oral analgesic –anti-inflammatory (Diclofenac ± Paracetamol) tablets twice a day for 3 days.

2.2 Post operative follow up

After surgery, biomicroscopic examination was performed on the first day, and topical antibiotic (Gatifloxacin 0.3%) and steroid (Prednisolone acetate 1%) drops four times a day was prescribed which was tapered in subsequent weeks and artificial tears(Carboxy methyl cellulose 0.5%) was given four times a day. Patients were examined weekly for a month then monthly for 6 months and at 3 month

intervals for a year. Refractive astigmatism and visual acuity were assessed at month – 2 follow up.

3. Results

All patients completed the 12 month follow up without any drop outs from the study. Demographic data of patients are displayed in (TABLE-2).There were 29 males and 21 females in the study with mean age 40.9 year(12.09) and range 21 -60 years. 80.76% pterygiums were nasal in location.

Table 2: Demographic details

Number of eyes (patients)	52(50)
Age in years	
Mean (SD)	40.9(12.09)
Range	20-60 years
Sex	
Male	29
Female	21
Laterality	
Nasal	48
Temporal	1
Bilateral	2
Double*	1

* Nasal was operated

Table -3 displays that 12 patients had grade I and same no of patients had grade II pterygium. 17 patients had grade III pterygium while 11 patients had grade IV pterygium. The percentage of all grade pterygium is shown in figure -2.

Table 3: Grading of pterygium according to Youngson R.M [19]

Grades of pterygium	**No of patients (eyes)**
I. Pterygium invading < 1.5 mm of cornea	12
II. Pterygium invading < half the radius of cornea	12
III. Pterygium invading > half the radius of cornea	17
IV. Pterygium almost or reaching the centre of cornea	11

Figure 2: Percentage of different grades of pterygia

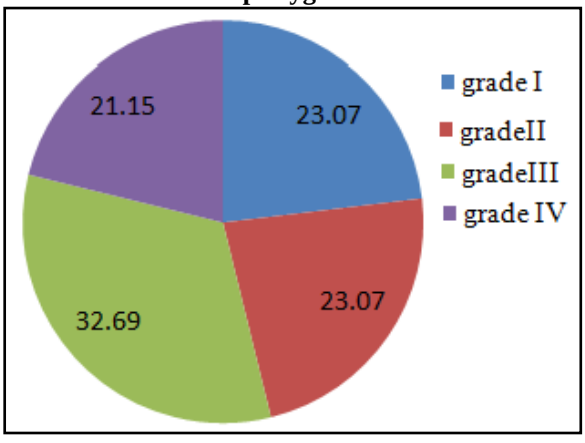

Table-4 shows the stage of pterygium. 63.46% pterygia were thick and progressive type while thin and stationary pterygia were encountered in 36.53% cases.

Table 4: staging of pterygia

Stage of pterygia	**Number of pterygia**
Thick and progressive	33 (63.46%)
Thin and stationary	19 (36.53%)

Table-5 displays the amount of pterygium induced astigmatism pre operatively and post operatively in all four grades of pterygium. In grade I pterygia mean pre operative astigmatism was 1.12 ± 1.23 D which reduced to post operatively 0.36 ±0.46 D which is not much significant. In grade II pterygia the mean pre operative astigmatism was 1.104 ±0.711 D and post operative value was 0.333 ±0.492 D which shows very statistical significance. In grade III pterygia pre operative mean value was 2.72 ±1.470 D which reduced markedly up to 0.76 ±0.487 D post operatively. While in grade IV pterygia pre operative mean refractive astigmatic value was 4.28 ±2.534 D decreased to 1.847 ±1.714 D post operatively. The p value are significant in all grades are significant except grade I pterygium.

Table 5: Grade of pterygia and astigmatism

Grade of pterygium	**Pre operative Mean astigmatism ± S.D**	**Post operative Mean astigmatism ± S.D**	**P – value***
I	1.12 ± 1.23 D	0.36 ±0.46 D	0.0574
II	1.104 ±0.711 D	0.333 ±0.492 D	0.0054
III	2.72 ±1.470 D	0.76 ±0.487 D	0.0051
IV	4.28 ±2.534 D	1.847 ±1.714 D	0.0158

* Paired t- test S.D: standard deviation

Table-6 displays post operative visual status of the patients. Improvement in visual acuity was observed in 32 patients; Rest of the patients who didn't had improvement had cataractous changes and were of senile age group. No deterioration of visual acuity was observed in our study.

Table 6: post operative visual acuity

Post operative vision	**Number of patients**	**percentage**
Improved	32	61.53
Unaltered	20	38.46
Deteriorated	0	0

Table -7 displays the quantitative pre operative and post operative visual acuity changes in all grades of the pterygium. The mean pre operative visual acuity in grade I was 0.142 ± 0.168 which changed to 0.067 ±0.098 post operatively. Changes in visual acuity of patients having grade I pterygium

is not much significant as the patients were of young age group and their aim of surgery was to get rid of cosmetic disfigurement. In grade II the mean pre operative visual acuity was 0.126±0.127 which improved to 0.025±0.0621 post operatively. In grade III pterygium patient the mean pre operative visual acuity was 0.441±0.257 which markedly improved post operatively up to 0.159±0.166. The p value is extremely significant in grade II and III pterygium. While in grade IV pterygium patients the mean pre operative value was 0.690±0.333 which became 0.40±0.355. The p value here is not quite statistically significant as majority of the patient having grade IV pterygium had cataractous changes of variable stages.

Table 7: Grade of pterygia and visual acuity

Grade of pterygium	Pre operative Mean visual acuity ± S.D	Post operative Mean visual acuity ± S.D	P – value*
I	0.142 ± 0.168	0.067 ±0.098	0.1953
II	0.126±0.127	0.025±0.0621	0.0363
III	0.441±0.257	0.159±0.166	0.0006
IV	0.690±0.333	0.40±0.355	0.0621

* Paired t- test S.D: standard deviation

Recurrence was seen in 1 (1.92%) case that had temporal pterygium in a 35 year female which was thick and progressive. It was observed at 6th month follow up. Recurrence was defined as regrowth of fibro vascular tissue which crosses the limbus onto the cornea.

4. Discussion

Pterygium is a worldwide ocular disease which is particularly more common in tropical and sub tropical area [20-23]. The development of a pterygium can lead to significant astigmatism. A pterygium usually causes localized flattening central to the apex of the pterygium [24]. Fong et al in 1998 observed that pterygium excision usually induces the reversal of pterygium related corneal flattening [25]. The magnitude of astigmatism increases with the grade of pterygium. Subsequently, successful pterygium surgery should reduce pterygium induced refractive astigmatism and improve visual acuity.

In the present study, maximum numbers of patient were of grade III i.e. 32.69 %, grade I and grade II pterygium were 23.07 % each while grade IV were 21.15 %. Younger age patients were having grade I pterygium and underwent surgery for cosmetic purpose. Pterygium induced astigmatism was high in grade IV pterygium and post operative mean astigmatism was 1.847±1.714 D and the p value was very significant. Post operative astigmatism observed in grade III pterygium was 0.76 ±0.487 D with a significant p value. In grade II pterygium the mean post operative astigmatism was 0.333 ±0.492 D with a significant p value. Grade I pterygium patient had post operative mean astigmatism of 0.36 ±0.46 D which was not much significant. Patients with grade I pterygium underwent surgery for cosmetic purpose. This shows that as the grade of pterygium increases, the amount of astigmatism also increases in the same proportion. Similar observations were found in the study of Maheshwari, Fong et al., Avisar et al [7,25,26].

In our study, the improvement in the visual acuity after successful pterygium followed by sutureless and gluefree conjunctival autograft, which was significantly seen in grade II and grade III ($p < 0.005$). The mean post operative visual acuity in grade II pterygium patients was 0.025±0.0621 while in grade III was 0.159±0.166. The mean post operative improved visual acuity in grade I pterygium patient was 0.067±0.098 and in grade IV was 0.40±0.355. There was improvement in visual acuity in grade I and grade IV pterygium patients but was not very much significant. As in grade IV pterygium patient's cataractous changes were also present. In few patients large spherical error was also present due to which the visual acuity remain unaltered. These observations were matched with studies carried out by Maheshwari [7] in India. Lindsay and Sullivan from the University of Melbourne, Australia, also found similar significant correlation between successful pterygium excision surgery and improvement in the visual acuity [27]. In our study improvement in vision was found in 61.53 % and in 38.46 % the vision was unaltered, not related to the surgery but was either due to cataract, high spherical errors or retinal pathology. No serious intra operative and post operative complications were seen. The recurrence rate was very low i.e. 1.92 % attributed to sutureless and gluefree conjunctival autograft due to which sutures and fibrin glue related complications are bypassed [14,28-30].

5. Conclusion

This study concludes that pterygium excision induces the reversal of the pterygium induced corneal flattening resulting in the decrease in refractive astigmatism and significant improvement in visual acuity. Along with sutureless gluefree conjunctival autograft adds the benefit of less post operative discomfort caused by sutures and risk of prion transmission and anaphylaxis related to fibrin glue with low recurrence rate.

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