To Compare Changes of Tear Film Function in Patients with Pterygium before and after Pterygium Excision Combined with Limbal-Conjunctival Autograft Transplantation

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ABSTRACT

Introduction: Pterygium is associated with tear instability which is a disorder of tear film. Tear instability leads to dry eye which causes vision threatening complications. Thus a prospective interventional study was done to compare changes of tear film function in patients with pterygium before & after pterygium excision combined with sutureless & glue free limbal-conjunctival autograft transplantation.

Material and Methods: The study was conducted at postgraduate upgraded department of Ophthalmology of GMC Jammu over period of one year. 90 patients having unilateral primary pterygium presenting to the eye OPD of GMC Jammu were included in the study. The TBUT, Schirmer's test & basal tear secretion/SCH-2 were estimated in all patients in normal eye & in pterygium eye both preoperatively & 2 months postoperatively. A TBUT of less than 10 seconds, a Schirmer's test of less than 10mm, basal tear secretion of less than 10mm were considered abnormal. Pterygium excision combined with sutureless & glue free limbal-conjunctival autograft transplantation done in all patients.

Results: Compared with the opposite healthy eyes, the TBUT & Schirmer's test in the eyes with pterygium were significantly different before operation ($p < 0.0001$) while no significant difference seen post-operatively. However in eyes with pterygium the results were significantly different before & 2 months after the operation ($p < 0.0001$).

Conclusion: Tear film functions improves after pterygium excision indicating that pterygium contributes to the phenomenon of disturbed tear film functions.

Keywords: Limbal Conjunctiva, Autografting, Pterygium, Tear Film Break-Up Time, Schirmer test

INTRODUCTION

Pterygium is a common external ocular disease, its prevalence increases with age and is higher in people living in sunny climates.[1,2] Prolonged exposure to sunlight or UV light is one of the causative factor of pterygium as moderate to high prevalence occuring within 35^0 lattitude above and below equator.[3] Clinically, pterygium can be divided into four parts:- cap, head, neck and body.Head is triangular in shape and is firmly adherent to the cornea. Neck is the part of the pterygium lying on the limbus. Body is a fan shaped expansion from the neck, consisting of epithelium, connective tissue and blood vessels. The clinical appearance of pterygium differs according to stage in which it is seen and according to the degree of activity of process that leads to its formation.[4] In 2007 during the Tear Film and Ocular Surface (TFOS) Dry Eye WorkShop (DEWS), the definition and classification of dry eye was updated as "Dry eye is a multifactorial disease of the tears & ocular surface that results in symptoms of discomfort, visual disturbance & tear film instability with potential damage to the ocular surface." It is accompanied by increased osmolarity of the tear film & inflammation of the ocular surface.[5] Dry eye can range from mild to severe; although the majority of patient with dry eye experience ocular discomfort without serious vision threatening sequelae, severe dry eye can compromise corneal integrity by causing epithelial defects, stromal infiltration and ulceration.[6] Several clinical tests are available for detection & diagnosis of dry eye, only three tests are used routinely which are Schirmer's test, tear film break up time (TBUT) and Rose Bengal test. Only in patients with corneal signs of dry eye (severe dry eye) Rose Bengal test is used.[7] The objective of the present study was to compare the tear film function in patients with pterygium before & after pterygium excision combined with suture less & glue free limbal-conjunctival autograft transplantation.

MATERIAL AND METHODS

The present study was conducted over a period of one year after due clearance from Institutional Ethics Committee on 90 patients having unilateral primary pterygium attending the Out Patient Department of Upgraded Department of Ophthalmology, Government Medical College, Jammu. The informed written consent from all the patients were undertaken before inclusion in the current study. All principal of bioethics were followed in totality as per ICMR and CDSCO advocated good clinical practice guidelines. The data was recorded by independent observer.

Inclusion Criteria: Patients presenting with unilateral primary pterygium during study period. The eye with pterygium was taken as diseased eye & other eye taken as control for comparison.

Exclusion criteria: Subject with systemic diseases\syndromes associated with dry eye (e.g. Sjogren's syndrome), subject on systemic medication (e.g. diuretics, psychotropic's, that leads to ocular drying), contact lens users, subjects having other adnexal disease, anterior or posterior segment disease which

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alters tear secretion and stability, patients having recent ocular surgery (e.g. cataract surgery), patients on topical antiglaucoma medications that leads to ocular drying, recurrent pterygium, bilateral pterygium, those who did not gave consent.

After meeting the inclusion & exclusion criteria pterygium patients were worked out in detail in the department of Ophthalmology as under:

(1) Detailed history pertaining to symptoms was recorded – onset, duration, any aggravating factor.
(2) The patients were subjected to a routine general physical examination.
(3) Every patient underwent a detailed ophthalmic examination as (a) External eye examination: includes examination of eyelids, conjunctiva, cornea, iris, pupil, lens. (b) Visual acuity (both distance & near vision). (c) Slit lamp examination: to visualize the anterior segment of the eye. (d) The following tests were performed as given below.

Tear film break up time (TBUT): This test was performed after staining the cornea with fluorescein & then patient was examined on the slit lamp under red free illumination provided by blue filter. The time interval between appearance of the first dry spots on the tear film & the opening of the eye lids was recorded using a stop watch. Three recordings were taken & the average was recorded as the TBUT. If the average TBUT was less than 10 seconds the test considered positive. To prevent an excessive reflex secretion of tears contact with cornea was avoided.[7]

Schirmer's test: (a) Schirmer's test- 1 (Without anesthesia) & (b) Basal Secretion/SCH-2 (After anesthesia). The patient was made to sit in a dimly lit room, after a thorough slit-lamp examination the Schirmer's test was performed, the Schirmer's strip folded at the notch was placed gently over the lower palpebral conjunctiva at the junction of lateral 1/3 & medial 2/3. Ask the patient to look straight, keep his eyes open & blink normally. The amount of wetting in millimeters was recorded after 5 minutes after removing the strips. If the length of the wetting was less than 10mm at the end of 5 minutes, the Schirmer's- 1 test (without anaesthesia) was considered positive. The material used was commercially available Whatmann no. 41 filter paper strips measuring 35x5 mm known as Schirmer's tear test filter strips & is folded 5mm from one end. The Schirmer's test after anesthesia (Basal secretion) was performed in similar way as SCH-1 but after instillation of topical 4% xylocaine.[7]

Operative Procedure: One day before surgery topical instillation of antibiotic eye drops 4 times, was advised to every patient. Informed consent from all the patients were obtained after explaining the procedure. Lab tests e.g Hemoglobin (Hb), Bleeding time (BT) & Clotting time (CT) was done in each patient. 50:50 mixture of 5ml of 0.5% bupivacaine with 150 units/ml of hyaluronidase & 2% lignocaine was given as peribulbar anaesthesia injection. Eye was opened & universal eye speculum was placed. 4mm from the limbus, the body of the pterygium was dissected down to the bare sclera. Fibrovascular tissue was separated from the surrounding conjunctiva with the help of spring action scissors. From the cornea the pterygium was removed by avulsion. The portions of conjunctiva which was thickened & tenon capsule which was present adjacent & subjacent to thickened conjunctiva was excised. Cautery was not used to achieve haemostasis which occurs spontaneously. Caliper was used to measure size of defect. Donar conjunctival graft was taken from superior bulbar conjunctiva & was placed on bare sclera. Care was taken to maintain the original juxtalimbal border orientation. Gental pressure was applied over the free graft with the help of lens spatula for a period of 8-10 minutes to keep graft in position. Bandage was kept for period of 24hrs.

Post Operative Care: Bandage was removed after 24hrs, topical instillation of antibiotic & steroid combination (moxifloxacin & betamethasone) eye drops were advised. For initial two weeks the frequency of drops were 4 times a day, tapered over the next 4 weeks & then stopped. Artificial tear drops were not prescribed to patients post-operatively. All patients were followed post-operatively 24hrs, 1 week, 2 week, 1 month & 2 months. TBUT & schirmer's test were performed 2 months posto-peratively

STATISTICAL ANALYSIS

Analysis of data was done using statistical software MS Excel / SPSS version 17.0 for windows. Data presented as percentage (%) & mean (SD) as discussed appropriate for quantitative and qualitative variables. Statistical significance between the groups was evaluated using student't' test. A p value <0.05 was considered as statistically significant and p value of <0.01 was considered statistically highly significant.

Tests	Diseased eye pre-operatively (n=90)		Control eye (n=90)		Statistical inference		
	Mean	SD	Mean	SD	Mean difference	t-value	P -value
Mean TBUT	9.9	3.4	13.1	3.0	3.2	-6.7	0.0001
Mean SCH-1	13.2	4.6	16.1	3.0	2.9	-5.1	0.0001
Mean Basal	10.1	4.8	12.1	3.5	2	-3.1	0.001

Table-1: Comparison between mean TBUT, mean Schirmer's-1, mean basal secretion values in diseased eye pre-operatively & control eye of patients.

Tests	Diseased eye post-operative (n=90)		Control eye (n=90)		Statistical inference		
	Mean	SD	Mean	SD	Mean difference	t-value	P -value
Mean TBUT	12.8	2.7	13.1	3.0	0.3	-0.7	0.484
Mean SCH-1	15.7	3.2	16.1	3.0	0.4	-0.9	0.361
Mean Basal	11.9	3.7	12.1	3.5	0.2	-0.4	0.683

Table-2: Comparison between mean TBUT, mean Schirmer's-1, mean basal secretion values in diseased eye 2 months post-operatively & control eye of patients.

RESULTS

The present study was carried over a period of one year, on 90 patients with primary unilateral pterygia who attended eye OPD, GMC Hospital, Jammu. In the present study, the age of pterygium patient varied from 23-76 years. The mean age was 41.88±12.04 years. Following observations were made;

Table-1 and Figure-1 shows that the difference between mean TBUT of diseased eye pre-operatively & control eye was 3.2($p<0.0001$), between mean Schirmer's test 1 of diseased eye pre-operatively & control eye was 2.9($p<0.0001$) and between mean basal secretion of diseased eye pre-operatively & control eye was 2($p<0.001$) all of which were highly significant.

Table-2 and Figure-2 shows that the mean TBUT, mean Schirmer's test 1 and mean basal secretion of diseased eye post-operatively were almost equal to that of control eye and no significant difference exists between them.

Table-3 and Figure-3 shows that the difference between mean TBUT of diseased eye pre-operatively & post-operatively was 2.9, between mean Schirmer's test 1 of diseased eye pre-operatively & post-operatively was 2.5 and between mean basal secretion of diseased eye pre-operatively & post-operatively was 1.8, all of which were highly significant ($p<0.0001$).

Out of the 90 patients, No significant intraoperative complications were noted except for button-holing of the conjunctival flap in 2 patients (2.22%). In the present study patients were followed upto 2 months post-operatively, 2 eyes (2.22%) had graft retraction while no recurrence was seen. The exposed area in graft retracted eyes was epithelialized adequately on follow up & thus no active treatment was required. 28(31.11%) eyes showed haemorrhage at 24 hours, which persisted in only 2(2.22%) eyes at 1 month and resolved completely in 100% of eyes at 2 months. Edema was also noted in 5 (5.56%) eyes, persisted only in 2(2.22%) eyes at 1 week and

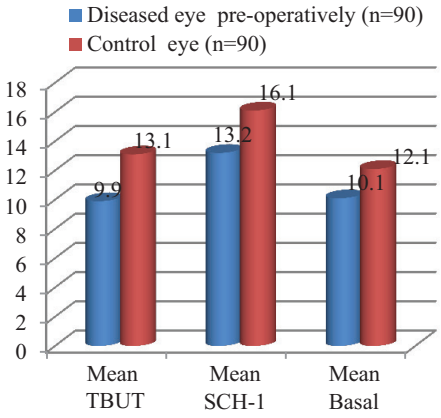

Figure-1: Showing comparison between mean TBUT, mean Schirmer's-1, mean basal secretion values in diseased eye pre-operatively & control eye of patients.

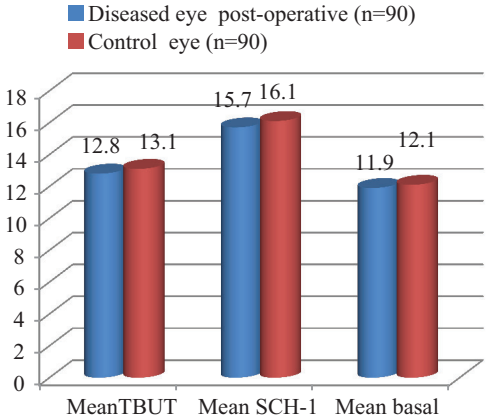

Figure-2: Showing comparison between mean TBUT, mean Schirmer's-1, mean basal secretion values in diseased eye 2 months post-operatively & control eye of patients.

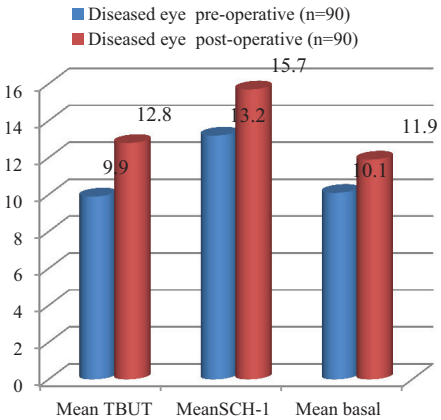

Figure-3: Showing comparison between mean TBUT, mean Schirmer's-1, mean basal secretion values in diseased eye pre-operatively & 2 months post-operatively

Tests	Diseased eye pre-operative (n=90)		Diseased eye post-operative (n=90)		Statistical inference		
	Mean	SD	Mean	SD	Mean difference	t-value	P -value
Mean TBUT	9.9	3.4	12.8	2.7	2.9	-16.7	0.0001
Mean SCH-1	13.2	4.6	15.7	3.2	2.5	-8.9	0.0001
Mean Basal	10.1	4.8	11.9	3.7	1.8	-9.9	0.0001

Table-3: Comparison between mean TBUT, mean Schirmer's-1, mean basal secretion values in diseased eye pre-operatively & 2 months post-operatively.

Follow-up	Haemorrhage		Retraction		Oedema		Recurrence	
	No.	% age	No.	% age	No.	% age	No.	% age
24hrs	28	31.11	2	2.22	5	5.56	0	0
1week	22	24.44	2	2.22	2	2.22	0	0
2weeks	10	11.11	2	2.22	0	0	0	0
1month	2	2.22	0	0	0	0	0	0
2month	0	0	0	0	0	0	0	0

Table-4: Post-operative complications

resolved completely by 2 weeks. After surgery, within 2 weeks the donor site reepithelialized completely; without shrinkage or malformation. No other complications were noted (Table 4).

DISCUSSION

The first line of defense against environmental injury, including ultraviolet exposure (which is believed to be the key factor of pterygium development) is the preocular tear film. Many authors suggest that disturbed tear film function in pterygia occurs because of pathological conjunctival, corneal, or eyelid changes while others suggest that abnormal tear function is a risk factor for dry eye.[8]

In the present study, TBUT in diseased eye was lower significant pre-operatively than in control eye (P <0.0001) while no significant difference seen post-operatively. This is consistent with Rajiv et al who in his study found that pterygium cases had significantly reduced TBUT values which caused inadequacy of tear film.[9] Bekibele et al. also reported that TBUT was lower among cases than among their corresponding control eyes.[10] Wang S et al found that TBUT in the eyes with pterygium when compared with the opposite healthy eyes were significantly different ($p < 0.05$).[11] El-Sersy TH found that the mean TBUT was 11.70 ± 2.16 s in normal healthy eyes wheras in eyes with pterygium this value was markedly reduced to 5.91 ± 1.95 s.[12]

Schirmer-1 test results in present study were significantly lower in the diseased eye pre-operatively than the control eye (P < 0.0001) while no significant difference seen post-operatively. This is in agreement with Bekibele et al. who found that Schirmer test values were lower among cases than their corresponding control eyes. The mean difference between the Schirmer test values were statistically significant.[10] Moreover, Bandyopadhyay et al. reported significantly different Schirmer strip wetting length & TBUT test results in study & control groups.[13] Roka N, et al. (2013) had also found statistically significant difference between mean Schirmer test value of pterygium patients and control group.[7]

In present study, Schirmer-2 test results were significantly lower in the diseased eye pre-operatively than the control eye (P < 0.001) while no significant difference seen post-operatively. Ishioka M et al found that the Schirmer's test with anesthesia was shortened in the eye with pterygium with significance.[14] Chaidaroon W & Pongmoragot N had found mean Schirmer's test value with anesthesia was 11.6±0.4 mm in eyes with pterygium & 12.4±0.4 mm in eyes without pterygium which revealed that Schirmer's test value with anesthesia was decreased significantly in eyes with pterygium when compared with a healthy eye.[15]

We compared alternations of tear function before and after pterygium excision. Tear film functions were significantly different before & after pterygium excision (p<0.0001). This is in agreement with Li et al. who found that before surgery, the average TBUT was 9.74 ± 3.43 s which was significantly prolonged to 11.49 ± 3.76 s 1 month postoperatively and no significant difference was observed between preoperative & postoperative Schirmer test value (P > 0.05).They found that tear function in patients with primary pterygium improves after pterygium excision.[16]

In an effort to prevent the development of pterygium, artificial tear therapy was introduced, due to possibility that dry eye & pterygium co-occur.[17] In pterygia patients risk of dry eye symptoms was increased twice as noted recently. The author hypothesized that pterygium formation in outdoor workers occur because of dusty polluted environment & UV light, which possibly becomes the risk factors of dry eye in pterygium patients.[18] Once pterygium is formed, it leads to tear film function abnormality. Lee AJ et al. suggested various environmental factors, besides these factors, several other factors as abnormal tear dynamics and composition related to pterygium also contribute to the abnormality of tear function. For tear dynamics, the pooling of tears at the pterygium apex[19] caused by protrusion of pterygium lesion cause disturbance in distribution of tear film at ocular surface.[16] When tears were dried total corneal refractive power increased significantly.[19] The role of of tear volume in pterygium patients in abnormal tear function is unclear.[16] Some studies[14,15,9] reported decreased tear production while others reported unchanged tear volume.[16] The results of the present follow-up study such as TBUT, Schirmer's-1, SCH-2 were prolonged after pterygium excision, suggest that pterygium itself leads to abnormal tear film function.

CONCLUSION

From the present study, we can suggest that unstable tear film is found to a greater extent in eyes with pterygium than in eyes without pterygium. Tear film functions improves after pterygium excision indicating that pterygium contributes to the phenomenon of disturbed tear film. Tear film abnormality causes dry eye syndrome, which leads to vision-threatening complications. Thus, this study clearly demonstrated that tear functions improves after pterygium excision with suture less & glue free limbal conjunctival autografting which was safe & prevent recurrence of pterygium.

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