Original Article

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Evaluation of Tear Film Functions Preoperatively and Postoperatively in Cases with Pterygium: A Case Control Study

Ophthalmology Section

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ABSTRACT

Introduction: The presence of pterygium and dry eye symptoms often co-exist. Pterygium disturbs the tear film. The extent to which the excision of pterygium will affect the tear film needs to be evaluated. Tear-film Break Up Time (TBUT) and Schirmer's I and II test are some of the common tests used for evaluation of the tear film.

Aim: To study the effect of pterygium and pterygium excision surgery with conjunctival autograft technique on tear film.

Materials and Methods: A hospital based case control study was conducted on 200 eyes of 100 patients from September 2017 to August 2019. The eye affected with pterygium was the case eye and the other normal eye of the same patient was taken as the control. TBUT, Schirmer's I and II test were done preoperatively and postoperatively on day 10, 30 and 60. Statistical analysis was done using descriptive and inferential statistics using Student's unpaired t-test and software used in the analysis was SPSS 22.0 version and GraphPad Prism 7.0 version and $p<0.05$ was considered as level of significance.

Results: The mean TBUT preoperatively in the case eye was 9.71±1.35 seconds and in the control eye was 10.64±1.32 seconds. Their difference was statistically significant (p-value <0.0001). TBUT increased significantly postoperatively (p-value <0.0001). The mean Schirmer's I preoperatively in the case eye was 13±2.47 mm and in the control eye was 14.54±2.45 mm. Their difference was statistically significant (p-value<0.0001). Postoperatively it increased significantly (p-value<0.0001). The Schirmer's II test value preoperatively in the case eye was 9.85±2.33 mm and in the control eye was 10.44±2.54 mm. There was no significant difference between the two (p-value=0.08). No change was seen postoperatively.

Conclusion: There was an increase in the TBUT and Schirmer's I test in the case eye after pterygium excision. Preoperatively there was a significant difference between the case and control eye but after pterygium excision, no significant difference was seen between the two. This showed that ultimately, post pterygium excision, the case eye showed an increased stability of tear film which was comparable to the control eye.

Keywords: Mean basal secretion, Schirmer's test, Tear film break up time, Tear film stability

INTRODUCTION

Pterygium is an ocular surface disorder which is very common throughout the world. Fibrovascular tissue invades the cornea from the bulbar conjunctiva. As it grows over the visual axis it can cause decreased vision. It can also cause chronic ocular irritation, astigmatism and tear film disturbances [1]. The name pterygium finds its origin in the Greek word 'pterygos' which means a small wing [2]. While the exact aetiology of pterygium remains obscured, several years of exposure to Ultra Violet (UV) radiation has been proposed to be a predisposing factor [3]. Another risk factor is the prolonged duration of irritation from dust and other air borne particulate matter [2]. Symptoms of dry eye are often seen concurrently with pterygium [4]. There is an alteration in the expression of IL-6 and IL-8 due to UV exposure [5]. Cytokines like IL-6 and IL-8 bring about the production of Matrix Metalloproteinase (MMP). MMPs pools at the head of pterygium [6]. IL-6, IL-8 and MMPs damage the ocular surface and result in an unstable tear film. Subsequently, there is epithelial cell death and loss of goblet cells. The end result of this is an increase in tear osmolarity and reduced secretion of mucous [7]. A vicious cycle is set forth involving tear hyperosmolarity which propagates the inflammation of the ocular surface by releasing MMP [8]. There are two main categories of dry eye states-an aqueous tear deficiency state and an evaporative state. The aqueous tear deficiency state is further divided into Sjogren's Syndrome-associated Kerato-Conjunctivitis Sicca (SS-KCS) and non-Sjogren's KCS (non SS-KCS) [9]. Due to tear film instability, there occurs dry eye syndrome which can lead to sight threatening complications. Thus, early diagnosis is important [10,11].

Li M et al., reported that for tear dynamics, the pooling of tears at the pterygium apex caused by protrusion of pterygium lesion cause disturbance in distribution of tear film at ocular surface [12]. Safarzadeh M et al., and Onkar A et al., found the mean Tear Meniscus Height (TMH) value, measured using Optical Coherence Tomography to be significantly lower in eyes with pterygium than in those without pterygium [13,14]. Türkyılmaz K et al., found that tear osmolarity improved after pterygium excision but deteriorated again with the recurrence of pterygium [15]. Kadayifcilar SC et al., suggested that pterygium compromises the normal lid movement which may lead to changes in the epithelium indicated by less wettable areas on TBUT [16]. Rajab AY studied the same in pinguecula and pterygium [4]. Schirmer's test and tear film break up time test have been reported to be lower in eyes with pterygium which suggests a close association between tear instability and ocular surface anomaly [17,18]. Very few researches has been carried out on the effect of pterygium excision surgery on tear film [12].

Therefore, the present study was conducted with an aim to evaluate tear film functions in patients with pterygium before and after pterygium excision surgery combined with limbal conjunctival autograft using autologous blood with the hypothesis that the tear film stability improves post pterygium excision with limbal conjunctival autograft.

MATERIALS AND METHODS

A rural hospital based case control study was conducted from September 2017 to August 2019. Cases admitted for pterygium excision surgery by conjunctival autologous graft technique at Acharya Vinoba Bhave Rural Hospital Sawangi (Meghe), Wardha, were included in the study. Study was approved by the Institutional Ethics Committee of the University (Ref.DMIMS (DU)/IEC/2017-18/6658). All

the patients enrolled in the study were briefed about the nature of the study and the necessity of examination. Sample size was calculated by using reference from a previous study [19] and according to that 61 patients are required in the study and in present study, 100 subjects were taken to compensate for non-response. Pterygium was graded according to the location of the head of the pterygium as follows:

Grade I- between limbus and a point midway between limbus and the pupillary margin

Grade II- between a point midway between limbus and pupillary margin and the pupillary margin

Grade III- crossing the pupillary margin [20]

Inclusion Criteria

Subjects presenting with Grade II pterygium during study period. Only Grade II pterygium was included in present study. This was done so that the grade of the pterygium would not influence the result.

Exclusion Criteria

Subjects with systemic diseases/syndromes associated with dry eye (e.g., Sjogrens syndrome). subjects on systemic medication (e.g., diuretics, psychotropics), subjects using contact lenses, subjects having other adnexal diseases, anterior or posterior segment diseases which alters tear secretion and stability, subjects having recent ocular surgery (e.g., cataract surgery), subjects on topical antiglaucoma medications. recurrent pterygium, subjects with pterygium in both eyes, double headed pterygium, those who did not give consent, patients who had graft loss postoperatively. After enrolment of the subject in the study, all subjects had undergone a thorough ophthalmic examination. The eye with pterygium that underwent pterygium excision was taken as case group and the normal eye of the same subject was taken as control group. Systemic history (hypertension, diabetes mellitus, bronchial asthama), ocular history (medical and surgical history), visual acuity on Snellen's chart of both eyes and Schirmer's I test, Schirmer's II test and TBUT were done by Slit lamp examination before the surgery in case as well as control eye. All surgeries were conducted at the Department of Ophthalmology, Acharya Vinoba Bhave Rural Hospital, Sawangi by a single experienced surgeon. Reflex secretion of tear can occur if there is contact with the cornea, and so this was avoided. Manoeuvring of the eyelid or anaesthetic instillation can affect TBUT, due to this reason TBUT test was performed first followed by other dry eye tests. The patient was examined on the slit lamp by cobalt blue filter using a broad beam. The patient was asked to blink twice in order to distribute the fluorescein equally. The patient was then asked to open the eyes. A stopwatch was used to record the duration between the opening of the eyelids and appearance of the first random dry spot on the cornea. TBUT was considered positive if a reading of <10 seconds was obtained [10]. The Schirmer's test and TBUT test were performed 30 minutes apart. The patient was made to sit in a dimly lit room. At the junction of medial 2/3rd and lateral 1/3rd the Schirmer's strip was folded 5 mm from one end and then placed over the lower palpebral conjunctiva. The patient was asked to look straight, keep his eyes open and blink gently if required. The strip was removed in five minutes and the amount of wetting was recorded in millimetres. If the length of the wetting was less than 10 mm at the end of five minutes, the Schirmer's- 1 test (without anaesthesia) indicated that the patient had dry eye. Whatmann no. 41 filter paper strip measuring 35x5 mm was used for performing this test [21]. The Schirmer's II test was performed in similar way as Schirmers-I but after instillation of topical 0.5% proparacaine [21]. Topical instillation of a combination of moxifloxacin 0.5% and ketorolac 0.5% was done four times a day for two days before the surgery and Random blood sugar level and blood pressure of the patient was measured.

A 1:3 mixture of 0.5% Bupivacaine and 2% Lignocaine was given as peribulbar anaesthesia injection. The body of the pterygium was separated from the bare sclera 3 mm from the limbus. Spring action scissors were used to separate the fibrovascular tissue from the surrounding conjunctiva. The pterygium was avulsed from the cornea. The thickened part of the conjunctiva as well as the tenons capsule that surrounded it were excised. The extent of bare sclera was measured using a Castroviejo Calliper. The source of the allograft was the superior bulbar conjunctiva of the same eye. Juxta-limbal orientation was maintained by marking the limbal side with a surgical marker. The graft was then placed on the bare sclera. No cautery was used to achieve haemostasis. Haemostasis occurred spontaneously. For 8-10 minutes, gentle pressure was applied on the free graft in order to keep graft in position. Pad and bandage was given till next day.

Postoperative medication: The patient was given T Ciprofloxacin 500 mg BD for three days, T. Ibuprofen 400 mg BD for three days and T. Pantoprazole 40 mg OD for three days and topical instillation of antibiotic and NSAID combination (moxifloxacin 0.5% & ketorolac 0.5%) eye drops four times a day for two months postsurgery. Topical artificial tear substitutes were not prescribed to patients postoperatively. All patients were followed postoperatively on 10th, 30th and 60th day. TBUT, Schirmer's I and Schirmer's II test were performed on these days and eye drops were continued till then.

STATISTICAL ANALYSIS

Statistical analysis was done by using descriptive and inferential statistics using Student's unpaired t-test and software used in the analysis was SPSS 22.0 version and Graph Pad Prism 7.0 version and p<0.05 was considered as level of significance.

RESULTS

The mean age of the patients included in this study was 52.84±11.99 years. The male to female ratio was 1:1.12 (47 male and 53 female), hence, female preponderance was seen.

The mean preoperative TBUT value in the control eye was 10.64±1.32 seconds. The mean TBUT preoperatively and postoperatively on day 10, 30 and 60 in the case eye has been shown in [Table/Fig-1]. There was a significant increase in the TBUT postoperatively (p-value<0.0001).

	Mean	N	Std. deviation	Std. error mean	Mean difference	t-value	p-value
Pre-Op	9.71	100	1.35	0.13	-	-	-
Day 10	10.29	100	1.14	0.11	0.57±0.45	12.72	<0.0001,S
Day 30	10.60	100	1.11	0.11	0.88±0.50	17.66	<0.0001,S
Day 60	10.87	100	1.09	0.10	1.16±0.62	18.67	<0.0001,S

[Table/Fig-1]: TBUT (seconds) in case eye preoperatively and on postoperative day 10, 30 and 60.
S: Significant

The day 10 showed significant difference between the case and control (p-value<0.051), day 30 (p-value=0.79) and 60 (p-value<0.17) showed no significant difference [Table/Fig-2]. The mean preoperative Schirmer's I value in the control eye was 14.54±2.45 mm. There is a significant increase in Schirmer's I test results postoperatively on day 10 and 30 (p-value<0.0001). There was no difference between the values on day 30 and 60 [Table/Fig-3]. In the present study out of 100 patients, the mean preoperative Schirmer's I value in the case eye was 13.00±2.47 mm preoperatively. The mean value on 10th, 30th, and 60th postoperative day was 14.39±2.34 mm, 14.78±2.11 mm and 14.78±2.11 mm, respectively. There was a significant difference (p-value<0.0001) in the Schirmer's I value on preoperative day and postoperative day 10 [Table/Fig-4].

Time period	Case eye		Control eye		t-value	p-value
	Mean	SD	Mean	SD		
Pre-Op	9.71	1.35	10.64	1.32	4.87	0.0001,S
Day 10	10.29	1.14	10.64	1.32	1.96	0.051,S
Day 30	10.60	1.11	10.64	1.32	0.26	0.79,NS
Day 60	10.87	1.09	10.64	1.32	1.37	0.17, NS

[Table/Fig-2]: Comparison of TBUT (seconds) in control and case eye pre operatively and postoperatively on day 10, 30 and 60.
Student's unpaired t-test; S: Significant; NS: Nonsignificant

	Mean	N	Std. deviation	Std. error mean	Mean difference	t-value	p-value
Pre Op	13.00	100	2.47	0.24	-	-	-
Day 10	14.39	100	2.34	0.23	1.39±0.63	21.92	0.0001,S
Day 30	14.78	100	2.11	0.21	1.78±0.87	20.42	0.0001,S
Day 60	14.78	100	2.11	0.21	-	-	-

[Table/Fig-3]: Schirmer's I (mm) test in case eye on preoperative day, postoperative day 10,30 and 60.
S: Significant

Time period	Case eye		Control eye		t-value	p-value
	Mean	SD	Mean	SD		
Pre-Op	13.00	2.47	14.54	2.45	4.49	0.0001,S
Day 10	14.39	2.34	14.54	2.45	0.44	0.66,NS
Day 30	14.78	2.11	14.54	2.45	0.74	0.46,NS
Day 60	14.78	2.11	14.54	2.45	0.74	0.46,NS

[Table/Fig-4]: Comparison of Schirmer's I Test (mm) in control and case eye on preoperative day, postoperative day 10, 30 and 60.
Student's unpaired t test; S: Significant; NS: Nonsignificant

The mean preoperative Schirmer's II test value in the control eye was 10.44±2.54 mm. No change in Schirmer's II test results in the case eye was seen postoperatively [Table/Fig-5]. [Table/Fig-6] compares the Schirmer's II test results in the case and control eye preoperatively and on postoperative day 10, 30 and 60. No significant difference was seen between the case and control eye (p-value=0.08). Graft related complications have been shown in [Table/Fig-7].

	Mean	N	Std. deviation	Std. error mean
Pre Op	9.85	100	2.33	0.23
Day 10	9.85	100	2.33	0.23
Day 30	9.85	100	2.33	0.23
Day 60	9.85	100	2.33	0.23

[Table/Fig-5]: Schirmer's II (mm) test in case eye on preoperative day, postoperative day 10, 30 and 60.

Time period	Case eye		Control eye		t-value	p-value
	Mean	SD	Mean	SD		
Pre Op	9.85	2.33	10.44	2.54	1.70	0.08,NS
Day 10	9.85	2.33	10.44	2.54	1.70	0.08,NS
Day 30	9.85	2.33	10.44	2.54	1.70	0.08,NS
Day 60	9.85	2.33	10.44	2.54	1.70	0.08,NS

[Table/Fig-6]: Comparison of Schirmer's II test in control eye and case eye on preoperative day, postoperative day 10, 30 and 60.
Student's unpaired t-test; NS: Nonsignificant

DISCUSSION

These tests were performed in view of assessing if the tear film stability improves after excision of pterygium. This was also done to gauge if the tear film functions of the affected eye and normal eye are comparable post pterygium excision by limbal conjunctival autograft by autologous blood technique. The use of topical antibiotics and NSAID only in the postoperative period would have affected the outcome and so in order to maintain uniformity, an antibiotic and NSAID combination of topical drops were given for two days preoperatively as well as postoperatively to the patient in the case eye. While most other studies prescribed steroid drops postoperatively to patients undergoing pterygium excision with graft, we have refrained from doing so in this study since prescribing steroid drops to the case eye preoperatively is unwarranted.

In a study conducted by Safarzadeh M et al., the mean values of TBUT in the pterygium and control eyes were 8.7±1.6 seconds and 13.2±2.1 seconds, respectively, constituting a highly significant difference (p<0.001) [13]. This was similar to the findings seen in the present study. In a study conducted by Roka N et al., the case group had a mean TBUT of 10.56 seconds and control group had a mean TBUT of 16.52 seconds. The two groups showed a statistically significant difference (p<0.05) [21]. This was similar to the findings seen in the present study. In a study conducted by El-Sersy TH et al., the mean TBUT was 11.70±2.16 seconds in normal healthy eyes. Though, in eyes with pterygium, this value was noticeably reduced to 5.91±1.95 seconds. There was a statistically significant difference in TBUT between the patients and controls (p<0.0001) which was similar to the findings seen in the present study [22]. In a study conducted by Manhas A et al., the mean TBUT in pterygium eye and control eye was 9.9±3.4 seconds and 13.1±3.0 seconds, respectively. The difference between the two was statistically significant (p-value<0.0001) which was similar to the finding in the present study [19]. A significant increase was seen in the TBUT after pterygium excision in studies conducted by El-Sersy TH et al., (t=9.97, p <0.0001) [22], Manhas A et al., (p-value<0.0001) [19], Türkyılmaz K et al., (p-value <0.001) [15] and Wang S et al., (p=0.013) [23]. Similar results were obtained in the present study.

In a study conducted by Kampitak K et al., the mean TBUT one month postsurgery was 7.9±3.1 seconds. (p=0.44). There was no significant change in TBUT values post pterygium excision [24]. This study placed a wet amniotic membrane graft at the site of the bare sclera post pterygium excision which was different from the technique used in this study (conjunctivalautograft with autologous blood). Moreover the sample size (n=40) taken by them was smaller as compared to the sample size in this study (n=100). These two factors might have resulted in a difference in the results between their study and that of present one.

In a study conducted by Safarzadeh M et al., in the pterygium and control eyes, the mean Schirmers 1 values were 13.2±4.1 mm and 17.8±4.1 mm, respectively, that constituted a highly significant difference (p<0.001) which was similar to the findings in the present study [13]. In a study conducted by Roka N et al., Schirmer's I value in case and control group was 16.19 mm and 20.22 mm, respectively. The two groups showed a statistically significant (p<0.05) difference. The same was seen in this study [21]. A significant difference between the case and control eye was seen in the Schirmer's T test result in studies conducted by El-Sersy TH et al., (p<0.0001) [22] and Manhas A et al., (p-value=0.0001) [19]. The same was seen in the present study. In a study conducted by El-Sersy TH et al., (t=27.23, P < 0.0001) [22] and Manhas A et al., (p-value<0.0001) [19] there was a significant increase in the Schirmer's I test value postoperatively which was similar to the present study results.

Türkyılmaz K et al., found that the mean postoperative Schirmer's I

Postoperative day	Hemorrhage no.	Hemorrhage %	Retraction no.	Retraction %	Oedema no.	Oedema %
10	7	7	0	0	5	5
30	0	0	0	0	0	0
60	0	0	0	0	0	0

[Table/Fig-7]: Postoperative graft related complications.

test value in pterygium eye on 3rd month, 12th month and 18th month was 12.5±3.5 mm, 12.7±3.9 mm and 12.9±3.6 mm, respectively all of which showed no statistically significant improvement from baseline (p-value >0.05). This was contrary to the present study findings probably because this study had a longer follow up period of 3,12 and 18 months as compared to this study which only followed the patient up to 60 days post pterygium excision surgery [15]. In a study conducted by Wang S et al., there was no significant difference between the case and control eye preoperatively (p>0.05). There was no significant improvement in the results of Schirmer's II test postoperatively [23]. This was similar to the findings seen in the present study. In a study conducted by Roka N et al., the mean Schirmer's II test was 10.01 mm in pterygium patients and 13.25 mm in the control group. Statistically significant difference was seen between the two groups (p<0.05). This was different from the results found in the present study, probably due to the fact that their control group consisted of different patients and not the other normal eye of the same patient, which was the control that was taken in the present study [21]. In a study conducted by Manhas A et al., the Schirmer's II test in pterygium eye was 10.1±4.8 mm and 12.1±3.5 mm in control eye, the difference between which was statistically significant (p-value<0.0001). The Schirmer's II test two months postoperatively was 11.9±3.7 mm in pterygium eye and 12.1±3.5 mm in control eye, which was statistically significant [19]. This was different from the finding in this study probably because in their study they did not exclude any grade of pterygium, as opposed to the present study were only grade II pterygium patients were enrolled. In a study conducted by Kampitak K et al., the mean Schirmer's I test one month postsurgery was 10.0±6.3 mm which was not significantly different from the preoperative values (p=0.30) [24]. This was similar to the finding in the present study.

Limitation(s)

Only grade II pterygiums were included in the study. Furthermore, tear film stability was measured only up to two months postsurgery. The study should be conducted with a longer follow up period and all grades of pterygium should be evaluated to further evaluate whether the size of the pterygium has any implications on the tear film functions.

CONCLUSION(S)

There was an increase in TBUT and Schirmer's I test results in the case eye after pterygium excision surgery. On the preoperative day, there was a significant difference between the case and control eye but after pterygium excision surgery, no significant difference was seen between the two. This showed that ultimately, post-pterygium excision, the case eye showed an increased stability of tear film which was comparable to the control eye.

It is recommended that patients diagnosed with pterygium should be counselled to undergo pterygium excision surgery even in a lower grade of pterygium in view of the dry eye symptoms caused by them. Patients should be discouraged from waiting till the pterygium causes a significant decrease in vision (by causing astigmatism and eventually blocking the visual axis).

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