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A clinical study of correlation between pterygium and dry eye

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ABSTRACT

Objectives: To study the clinical correlation between pterygium and dry eye and to evaluate the status of tear film in patients with pterygium.**Materials and Methods:** 100 eyes with pterygium were compared with 100 control eyes without pterygium. Patients between 20–70 years were included in the study. Detailed history was taken and Schirmer's test and TBUT were performed on all to evaluate the status of dry eye. Schirmer's test < 10 mm and TBUT < 10 seconds was considered abnormal.**Results:** Maximum number (52) of patients affected with dry eye in both the groups were in the age group 31–40 years which statistically showed age as a significant factor of association for both pterygium and dry eye ($P < 0.01$). Schirmer's test was slightly reduced in patients with pterygium (18.73 ± 5.69 mm). TBUT was significantly reduced in the case group (12.26 ± 2.24 sec). TBUT decreased maximally in 51–60 yrs age group (13.00 ± 2.77 sec) with pterygium showing a tear film instability. On comparison of pterygia and controls with normal and abnormal tear film, Odd's Ratio was 1.14 showing risk of dry eye in pterygia patients to be 1.14 times higher than controls.**Conclusion:** A close relationship exists between ocular irritation symptoms and functional evidence of tear instability. Schirmer's test and TBUT should routinely be used in the outpatient department to diagnose dry eye in patients with pterygium and these patients should be promptly treated to prevent any sight threatening complications.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: reprint@ipinnovative.com

1. Introduction

Pterygium is a triangular shaped growth consisting of bulbar conjunctival epithelium and hypertrophied subconjunctival tissue, occurring medially and laterally in the palpebral fissure and encroaching onto the cornea.¹ It has highest prevalence and is most severe in tropical areas near the equator and to a lesser and milder degree in cooler climates. The prevalence varies geographically with rates as high as 29% in certain equatorial areas.² Epidemiological studies around the world have shown that the prevalence rates range from 0.3% to 37.46%.^{3,4} In India the prevalence of

pterygium is 5.2%.⁵

Environmental factors such as hot and dry climate and long periods of UV light exposure are the major predisposing factors. Chronic irritation from wind and dust is also implicated. New theories include the possibility of damage to limbal stem cells by ultraviolet light and by activation of matrix metalloproteinase's. These changes induce overexpression of certain cytokines, inflammatory modulators, and growth factors, resulting in a hyperproliferation of degenerated conjunctiva cells with subsequent fibrovascular in growth into the Bowmans layer of the cornea. Recent concepts emphasize on limbal stem deficiency leading to pterygium formation.⁶

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Dry eye is a disorder of the tear film due to tear deficiency or excessive tear evaporation that causes damage to the inter-palpebral ocular surface and is associated with symptoms of ocular discomfort.^{7,8} The prevalence of dry eye has been reported to vary from 14.4%-33%.⁹ Tear function abnormalities have been proposed as an etiologic factor for pterygium due to the observation that a pterygium is further exacerbated by elevation of the pterygium head, dryness and dellen formation.¹⁰

Whether tear dysfunction is a precursor to pterygium growth or pterygium causes tear dysfunction is still not clear. Research and clinical evidence, however, suggest that there is a relationship between the two.¹¹ This study is, therefore, undertaken to investigate the correlation between pterygium and dry eye. The patients with pterygia were compared with normals to evaluate their status regarding dryness.

2. Materials and Methods

A case-control study which included 200 patients selected from the outpatient Department of Ophthalmology of a tertiary care hospital over a period of 2 years. The study was approved by the Hospital Ethical Committee and written and informed consent was obtained from all patients. Patients between 20-70 years of age were included in the study. All the patients were divided into two groups. The study group comprised of 100 eyes of 100 patients with pterygium. In case of patients having bilateral pterygia, the eye having higher grade of pterygium was considered. The control group comprised of 100 eyes of 100 patients without pterygium. Exclusion criteria included patients having any diseases of the lacrimal drainage system e.g. dacryocystitis; lid deformities, ocular inflammatory diseases e.g. uveitis; glaucoma, lagophthalmos, proptosis, history of contact lens wear or any ocular surgery. Subjects who have received topical eye medications or systemic medications such as antihistamines, phenothiazines, diazepam, lubricating drops etc. and such drugs that affect tear film stability in the 3 months prior to the study were also excluded.

A detailed history of every patient was taken regarding the age, occupation and chief complaints which included a mass encroaching over the eye causing cosmetic disfigurement, diminution of vision, redness, watering, foreign body sensation or burning were noted. General examination, systemic examination and ocular examination was done. All the patients were evaluated on the slit lamp and subjected to the specific tests for dry eye (Schirmer's test and Tear film break up time). Data was collected and analyzed.

The specific tests for dry eye for tear secretion and tear film stability (Schirmer's test and tear film break up time) were done using specific strips. Diagnosis of dry eye was done depending on the results of these two tests. Results were noted.

2.1. Tests for dry eye

2.1.1. Schirmer's test

Useful in quantitative assessment of aqueous tear production. The test was performed by using a Schirmer's strip (no.41 Whattman Filter paper, 5mm wide and 35 mm long). The filter paper was folded 5mm from one end and inserted at the junction of medial two-third and lateral one-third of lower lid taking care not to touch the cornea or lashes. After 5 minutes filter paper was removed and the amount of wetting from the fold was measured. In our study 10mm was taken as the cut off mark in diagnosing dry eye. Normal range: 10 – 25mm; 6-10 mm: suggests dry eye; < 5mm: confirms dry eye.

2.1.2. Tear film break up time

Useful in qualitative assessment of tear film. It is an excellent test to detect mucin deficiency dry eye. We used fluorescein-impregnated strip, wet with lubricating eye drop (preservative free) to stain the tear film. The strip was placed in lower fornix at lateral one third to stain the eye and removed. Once the dye distributed throughout the tear film by blinking, the patient was asked to look straight ahead without blinking. Under slit lamp examination, using a cobalt blue filter, the time between the last blink and the appearance of the first break (randomly distributed dry spot) in the pre-corneal fluorescent tear film was measured. Appearance of dry spot before 10 seconds was considered as dry eye. All the findings were documented and data analyzed using a SPSS software version 17. Chi square test was applied to test the association and $p < 0.05$ was considered statistically significant.

3. Results and Observations

A total of 200 eyes of 200 patients were studied, comprising of 100 eyes of 100 patients with pterygium in the case group and 100 eyes of 100 patients in the control group. Table 1 shows age and sex wise distribution of cases in case and control group. Maximum number (52) of patients affected with dry eye in both the groups were in the age group 31-40 years. Chi square test was applied as the test of significance which showed age as a significant factor for the occurrence of both pterygium and dry eye ($p < 0.01$). Males were more than females in both the groups but the difference was not statistically significant ($p > 0.05$). Table 2 shows distribution of complaints in both the groups. In the case group, watering which was seen in 72 eyes (72%) was the main complaint while in the control group dryness which was seen in 38 eyes (38%) was the major complaint. Table 3 shows a comparison of Schirmer's test and Tear film break up time (TBUT) of case with controls. The mean value of Schirmer's test and TBUT in case group was 18.73 ± 5.69 mm and 12.26 ± 2.24 sec respectively; and in control group was 19.90 ± 6.50 mm and $14.68 \pm$

3.99 sec respectively. Schirmer's test were slightly reduced in patients with pterygium which was not found to be statistically significant ($p>0.05$). TBUT was significantly reduced in patients with pterygium which was statistically significant ($p<0.0001$). Table 4 All studied cases were divided into 2 groups. One group had a normal tear film status (TBUT >10 seconds and Schirmer's test >10 mm). This group included 65 eyes with pterygium and 68 control eyes. Second group had eyes with an abnormal tear film status (TBUT < 10 seconds and Schirmer's test <10 mm). This group had 35 eyes with pterygium and 32 control eyes. No significant correlation was found between pterygium and tear film abnormality on chi square test ($p>0.05$). Odd's Ratio was found to be 1.14 showing that the risk of having pterygium in dry eye patients is 1.14 times higher than in those patients not having dry eye.

Table 1: Age and sex wise distribution of cases in case and control group

Age (Yrs)	Cases	Control	Total
21 – 30	12	26	40
31 – 40	22	30	52
41 – 50	29	18	47
51 – 60	24	14	38
61 – 70	13	10	23
Total	100	100	200

Chi-square = 13.23, $P<0.01$

Sex	Cases	Control	Total
Male	53	54	107
Female	47	46	93
Total	100	100	200

Chi-square = 0.02, $P>0.05$

4. Discussion

There is a wide variation in the incidence and severity of pterygium and dry eye in different parts of the world. It is common in the tropical and subtropical areas, particularly in persons exposed to sun, wind and dust. The most popular theory in the pathogenesis of pterygium being UV insolation and differentiation of limbal stem cells as a result. Though UV light and environmental factors play an important role in the development of pterygium, only some people develop pterygium, living under the same conditions suggesting the role of other factors in its pathogenesis.

Our study included patients between 20-70 years of age. The prevalence of pterygium was most common between 3rd and 4th decade of life (52). In our study, majority of patients in the case group were in 41-50 years (29%) age group while in the control group they were in 31-40 years (30%) age group. Chi square test was applied as the test of significance which showed age as a significant

factor of association. (Table 1) This peak reflects a dry state induced by environmental exposure. This group of individuals are more prone to pterygium because they are active occupationally and therefore exposed to vagaries of environment. Rajiv et al found most number of cases in 30-40 year age group.¹² D.J.Pandey et al. in his study found that majority of patients with pterygium were older than 60 years of age.¹³ A study by Shiroma H et al in Japan showed age as a significant factor for the development of pterygium. Thus, it is likely that the prevalence of pterygium increases with age.¹⁴ In a study done by Sahai et al, it was found that the prevalence of dry eye progressively increased, with age group of 31-40 years showing the highest prevalence rates.¹⁵

In our study, case group had 53 males and 47 females while control group had 54 males and 46 females. Male to Female ratio was 1.15:1. No significant difference was seen between the two. This could be because of the fact that our study included more of working women as compared to housewives. (Table 1) The association of gender in the occurrence of pterygium is controversial.¹⁴ Some studies have shown the prevalence of pterygium and dry eye to be more common in males. The increased prevalence in males was attributed to their greater exposure to adverse climatic conditions and outdoor work. Pterygium was more common in males (64.29%) than females (35.71%) in the study done by Rajiv et al.¹² A study done by Goldberg et al¹⁶ found no sex differences in the prevalence of dry eye and pterygium.

Early pterygia may be asymptomatic or may cause occasional symptoms of dry eyes. Visual disturbances may occur due to induced astigmatism or secondary to direct obstruction of the visual axis. In our study, the most common complaints were watering, dryness, diminution of vision, lid crusting and a mass encroaching on the cornea. In the case group, watering (72) was present in majority of patients while in the control group, dryness (38) was observed in maximum number of patients. However no complaints were present in 18 patients (Table 2). A few studies have reported that visual acuity is decreased in people with pterygium. The correlation between pterygium and corneal astigmatism was also found to be significant.^{14,17,18} Moss et al found that 14.4% of population have symptoms of dry eye. This compares favorably with the Salisbury Eye Evaluation study which reported the prevalence of dry eye based on symptoms to be 15%.^{19,20}

A strong relationship exists between ocular symptoms, surface abnormalities and functional evidence of tear film instability. One of the objectives of this study was to study the status of tear film in patients with and without pterygia.

As shown in previous studies, Schirmer's test is the most popular test as it is easy to perform without additional equipment and it indicates the instability of the aqueous phase of the tear film. The Tear Film Break Up Time

Table 2: Complaints wise distribution of cases in case and control group

Complaints	Cases (n=100)	Control (n=100)	Z Value	P Value
Burning	38	36	0.29	>0.05
Redness	36	30	0.90	>0.05
Watering	72	30	6.55	<0.0001
Dryness	25	38	1.99	<0.05
Diminution of vision	29	14	2.63	<0.01
Foreign body sensation	26	34	1.24	>0.05
Lid crusting	0	8	2.95	<0.01
Encroaching mass	31	0	6.70	<0.0001
None	0	18	4.69	<0.0001

Table 3: Comparison of Schirmer's test and TBUT in case and control group

Parameter	Cases Mean ± SD (n=100)	Control Mean ± SD (n=100)	Z Value	P Value
Schirmer's test (mm)	18.73 ± 5.69	19.90 ± 6.50	1.35	>0.05
TBUT (Sec)	12.26 ± 2.24	14.68 ± 3.99	5.29	<0.0001

Table 4: Tear film status wise distribution of cases in case and control group

Tear film status	Cases	Control	Total
Abnormal	35	32	67
Normal	65	68	133
Total	100	100	200

Chi-square = 0.20, P>0.05 OR = 1.14

(TBUT) test is an excellent diagnostic test for detecting the mucin and lipid layer deficiency of the tear film. In our study, mean Schirmer's value was found to be reduced in both the groups. The decrease was not statistically significant ($p>0.05$) (Table 3). In a study from India, when Schirmer's test was done in normal healthy eyes and the eyes of patients with pterygium, it was found that the mean wetting of the filter paper was 12.6mm and 5.2mm respectively. They concluded that the values were significantly reduced in cases of pterygium indicating the inadequacy of tear film in patients with pterygium.¹² TBUT is used to detect mucin deficiency. In our study the mean value of TBUT in patients with pterygia was decreased showing that patients with pterygia have unstable tear films as compared to controls. This reduction was seen to be statistically significant ($p<0.0001$)(Table 3). A study by Kadayifcilar found that there was a decrease in marginal tear meniscus and TBUT in patients with pterygium. They however found no difference in Schirmer's test values in patients with pterygium.²¹ Rajiv et al observed a mean TBUT of 10.4secs in control group which was markedly reduced to 5.6secs in eyes with pterygium.¹²

All cases were further divided into 2 groups. One group had a normal tear film status (TBUT > 10 seconds and Schirmer's test > 10mm) and the second group had eyes with an abnormal tear film status (TBUT < 10 seconds and Schirmer's test < 10mm). No significant correlation was found between pterygium and tear film abnormality on chi square test ($p>0.05$). Odd's Ratio was 1.14 showing the risk

of having pterygium in dry eye patients is 1.14 times higher than in those patients not having dry eye (Table 4).

A study was done in Turkey to determine the abnormality of tear film in patients with pterygium. They found that the values of tear function tests were similar in patients with pterygium and in the controls.²² A study by M.M.Balogun et al in Ibadan also found that an unstable tear film was associated with pterygia.¹¹ In another study conducted in Ibadan with an objective to identify symptoms and surface abnormalities associated with dry eyes, it was found that the mean tear meniscus height, Schirmer's test and TBUT were lower among patients with pterygium. Rose Bengal staining score was also found to be inversely related to Schirmer's and TBUT. This showed the existence of a close relationship between ocular irritation, surface abnormalities and functional evidence of tear instability.²³

M.Saleem et al. in their study examined 120 patients having 170 pterygia. They found a decreased TBUT with a mean of 6 seconds and a range of 3-14 seconds and a decreased Schirmer's test with a mean of 5.70mm in patients with pterygium. This showed a positive correlation between pterygium and TBUT and Schirmer's test values. Patients with decreased tear production are more prone to the damaging effects of U-V rays in the sun light. There is a positive correlation between dry eyes and pterygium.²⁴

A study by Roka et al. in Nepal found that when Schirmer's test 1 and 2 and TBUT were done to analyse the relation between pterygium and dry eye, the mean values of all were reduced significantly in patients with pterygium.

The mean Schirmer's test 1, mean basal secretion and mean TBUT values were 16.19mm, 10.01mm and 10.56seconds respectively in patients with pterygium. It was 20.22mm, 13.25mm and 26.25 seconds respectively in the control group. There was a statistically significant difference in dry eye results between pterygium cases and controls ($p < 0.05$). The odds ratio between pterygium and dry eye was 3.28. Dry eye was present in 26% of normal patients and in 54% of pterygium cases. There was an evidently strong relationship between pterygium and dry eye.²⁵

5. Conclusion

A close relationship exists between ocular irritation symptoms, surface abnormalities and functional evidence of tear instability. Simple diagnostic dry eye tests like Schirmer's test and Tear film break up time test which are cheap and easy to perform can be used as an initial screening tool in out patient department to detect tear film abnormalities in patients with pterygium causing dry eye syndrome.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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