

# Comparison of Tear Film Break-up Time with Schirmer's Test with Anesthesia to Detect Tear Film Abnormality in Patients with Pterygium - A Study from Jammu and Kashmir

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## Abstract

**Background:** Pterygium appears as a triangular fold of vascularized conjunctiva, the apex lies towards the cornea and base merges with the sub-conjunctival tissue. Generally, it is asymptomatic but may cause redness, lacrimation, photophobia, foreign body sensation (dry eye symptoms) and astigmatism.

**Objective:** To compare tear film break-up time test with Schirmer's test with anaesthesia in patients having pterygium.

**Materials & Methodology:** 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 eye with pterygium was taken as case and other eye taken as control for comparison. The TBUT, Schirmer's test with anaesthesia/ SCH-2 were estimated in both eyes in all patients. A TBUT of less than 10 seconds, SCH-2 of less than 6mm, were considered abnormal.

**Results:** Among the pterygium eyes, decreased tear film breakup time of <10 seconds was observed in 43 (47.78%) eyes, while only 19(21.11%) of non- pterygium eyes had TBUT of <10seconds. On the other hand, 22 (24.44%) eyes with pterygium had Schirmer's test with anaesthesia abnormal.

**Conclusion:** To detect tear film abnormality in patients with pterygium tear film break-up time has better diagnostic value as compared to schirmer's test with anaesthesia.

**Key words:** Pterygium, Schirmer test, Tear film break up time, Tear secretion

## INTRODUCTION

Pterygium is a common disorder in many parts of the world, with reported prevalence rates ranging from 0.3 to 29%.<sup>1</sup> It is more common in dry, warm climate, and after exposure to ultraviolet radiations.<sup>2,3</sup> Recent evaluation using spectral

domain optical coherence tomography revealed pterygium as an elevated wedge-shaped mass of tissue separating the corneal epithelium from bowman's membrane, which appears abnormally wavy and interrupted and often destroyed with satellite masses of subepithelial pterygium tissue beyond the clinically seen margin.<sup>4</sup> 90% of the pterygia are located nasally<sup>5</sup> but can occur temporally. It is often bilateral. Pterygium occurs twice as often in males as in females and is more common in farmers than in city dwellers. While the prevalence is highest in elderly, incidence is highest in the younger age group between 20 and 40 years.<sup>6</sup> Patients with pterygium have decreased tear production, decreased tear film break-up time (TBUT), and Schirmer test value.<sup>7</sup>

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Tear instability is a disorder of tear film that is associated with pterygium.<sup>8</sup> Tear film consists of 3 layers. The most superficial layer of the tear film is lipid layer, which is 0.11  $\mu$ m thick and is produced by the meibomian glands. The middle layer is the aqueous layer produced by the main lacrimal gland as well as accessory lacrimal glands of Krause and Wolfring and is 7.0  $\mu$ m in thickness. Aqueous tear deficiency is the most common cause of dry eyes. Aqueous layer constitutes over 90% of the tear film. The layer closest to the cornea is the mucin layer 0.02-0.05  $\mu$ m thick, produced by conjunctival goblet cells.<sup>9</sup> The tear film instability causes dry eye syndrome which can lead to vision-threatening complications, and therefore, early diagnosis is important.<sup>10</sup> A close relationship between tear instability and ocular surface abnormality has been reported as Schirmer's test and TBUT test were found to be lower in pterygium eyes.<sup>11</sup> Several clinical tests are available to measure various aspects of the integrity of the tear film and ocular surface such as Schirmer test, TBUT, and vital dye staining of the ocular surface.<sup>12</sup> The objective of this study was to compare the TBUT test with Schirmer's test with anesthesia as diagnostic utility to detect tear film abnormalities in patients with pterygium.

## MATERIALS AND METHODS

This study was conducted on 90 patients having primary unilateral pterygium attending the Outpatient Department of Upgraded Department of Ophthalmology, Government Medical College, Jammu over a period of 1 year after due clearance from Institutional Ethics Committee. The informed consent from all the patients was undertaken before inclusion in the current study. All principals of bioethics were followed in totality as per ICMR and CDSCO advocated good clinical practice guidelines. The data were recorded by independent observer.

### Inclusion Criteria

Patients were presenting with unilateral primary pterygium during the study period. The eye with pterygium was taken as case and 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, psychotropics, that leads to ocular drying), contact lens users, subjects having other adnexal disease, anterior or posterior segment disease which 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 and 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, and (3) every patient underwent a detailed ophthalmic examination as (a) external eye examination includes examination of eyelids, conjunctiva, cornea, iris, pupil, and lens; (b) visual acuity (both distance and near vision); (c) slit lamp examination: To visualize the anterior segment of the eye; (d) the following tests were performed as given below.

### TBUT

Because manipulation of the eyelid or instillation of the anesthetics may affect the TBUT, the TBUT test was performed before other dry eye tests and recorded after fluorescein staining. Care was taken to avoid contact with the cornea to prevent an excessive reflex secretion of tear. The patient was examined on the slit lamp under red-free illumination provided by blue filter. The time interval between the opening of the eyelids and appearance of the first dry spots on the tear film was recorded using a stopwatch. Three recordings were taken and the average was recorded as the 'TBUT' and considered positive if the average TBUT was  $<10$  s.<sup>10,13</sup>

### Schirmer's Test

Schirmer's test with anesthesia (Basal secretion/SCH-2) was performed after the instillation of topical 4% xylocaine and wiping the lower fornix with cotton. The material used was commercially available Whatman no. 41 filter paper strips measuring 35  $\times$  5 mm known as Schirmer's tear test filter strips and is folded 5mm from one end. The patient was made to sit in a dimly lit room; the strip folded at the notch was placed gently over the lower palpebral conjunctiva at the junction of lateral 1.3 and medial 2.3. The patient was instructed to keep his eyes open and look straight ahead and blink normally. After 5 min, the strips were removed and the amount of wetting in millimeters was recorded. The Schirmer's-2 test was considered abnormal if the length of the wetting was  $<6$  mm at the end of 5 min.<sup>10,13</sup>

### Statistical Analysis

The data were analyzed using statistical software SPSS version 17.0. Proportions were used to represent qualitative data. Statistical significance between the groups was evaluated using Chi-square test. A  $P < 0.05$  was considered as statistically significant and  $P < 0.01$  was considered as highly significant.

## RESULTS

This study was conducted on 90 patients with unilateral primary pterygia who attended eye OPD, GMC Hospital, Jammu, over a period of 1 year. During the study, following observations were made. The male to female ratio was 1.5:1.

**TBUT**

Among the pterygium eyes, decreased tear film break-up time (<10 s) was observed in 43 (47.78%) eyes, while only 19 (21.11%) of nonpterygium eyes have TBUT of <10 s (Table 1).

**Basal Secretion Values/Schirmer's Test with Anesthesia/SCH-2**

About 22 (24.44%) eyes with pterygium had Schirmer's test with anesthesia abnormal (<6 mm) (Table 2).

The sensitivity of TBUT in pterygium eyes was 47.7% while specificity was 78.8% (Table 1).

The sensitivity of Schirmer's test with anesthesia in pterygium eyes was 24.4% while specificity was 90% (Table 2).

**Table 1: Tear film break-up time in eyes with pterygium and without pterygium**

TBUT (in seconds)	Eyes with pterygium (%)	Eyes without pterygium (%)
<10	43 (47.78)	19 (21.11)
≥10	47 (52.22)	71 (78.89)

Sensitivity of TBUT=47.7%, specificity of TBUT=78.8%, TBUT: Tear film break-up time

**Table 2: Schirmer's 2 test in eyes with pterygium and without pterygium**

Schirmer's-2 test (in mm)	Eyes with pterygium (%)	Eyes without pterygium (%)
<6	22 (24.44)	9 (10)
≥6	68 (75.56)	81 (90)

Sensitivity of Schirmer's-2 test=24.4%, specificity of Schirmer's-2 test=90%

**Table 3: Comparison between tear film break-up time test and SCH-2 test in eyes with pterygium**

TBUT (in second)	Schirmer's -2 test		Total
	<6 mm	≥6 mm	
<10	16	27	43
≥10	6	41	47
Total	22	68	90

®Pearson Chi-square test=7.264, P<0.01(S), S: Significant, TBUT: Tear film break-up time

**Table 4: Comparison between sensitivity of tear film break-up time and SCH-2 test in eyes with pterygium**

Test	Sensitivity (%)	1 - Sensitivity (%)	® P value
TBUT	47.7	52.3	<0.0001(H.S.)
SCH-2	24.4	75.6	

TBUT: Tear film break-up time, ®Pearson Chi-square test=11.77, HS: Highly significant

In Table 3, when we compared the TBUT with SCH-2 test in pterygium eyes the results were found significant (P < 0.01).

In Table 4, when we compared the sensitivity of TBUT with SCH-2 test in pterygium eyes the results were found highly significant (P < 0.0001).

**DISCUSSION**

Tear break-up time test is the standard clinical procedure that was introduced by Norn and its high sensitivity suggests a strong connection to the dry eye.<sup>14</sup> It is an excellent diagnostic test for detecting the mucin and lipid layer deficiency of the tear film.<sup>15,16</sup> Smith *et al.* in his study have shown that the most frequently used diagnostic test to determine tear film abnormality was the tear break-up time test which was done by 93% of the participants, followed by conjunctival and corneal staining done by 74-85%. Schirmer's test was performed by 41% of the participants, which was more likely because of the irritative nature and time needed for this test.<sup>17</sup> Korb has reported that the most common diagnostic test performed for tear film abnormality by 53% of the participants was the tear break-up time test, while the Schirmer's test was done by 44%.<sup>18</sup> As shown in a study, Schirmer's test with anesthesia is the most popular test as it is easy to perform without any additional equipment and it indicates the instability of the aqueous phase of the tear film.<sup>19,20</sup>

We correlated and found that the tear film abnormalities occur in patients with pterygium, and we performed clinical diagnostic TBUT and Schirmer's tests with anesthesia. Schirmer's test values with anesthesia are reduced in eyes with unilateral pterygium. According to Ishioka *et al.*, tear film instability is reported in patients having pterygium, as values of both the tests were significantly reduced in these patients, and they found an association between pterygium and a shortened tear break-up time and Schirmer's test in the case-control study. They concluded that there is a correlation between pterygium formation and unstable tear film.<sup>21</sup> Lekhanont *et al.* found that the presence of pterygium was significantly associated with positive dry eye tests.<sup>22</sup>

Our study found that in patients with pterygium eyes, TBUT test was abnormal in 47.78% of eyes and 21.11% of control eye. Ergin and Bozdogan had found that TBUT test was positive in 30.35% eyes with pterygium and 21.91% eyes in the control group.<sup>23</sup> Similarly, Balogun *et al.* had also found unstable TBUT test in 39.7% eyes with pterygium and 23% eyes in the control group.<sup>8</sup> Among our

patients with pterygium, the value of TBUT test was more compared to other studies which may be due to exposure to dust and hot climate leading to excessive evaporation of tears, as most of our patients were involved in outdoor work.<sup>10</sup> Results similar to our study were found by Roka *et al.* who in his study had reported positive TBUT test in 43.42% eyes with pterygium, and 19.07% eyes in the control group.<sup>24</sup> Rahman *et al.* reported TBUT test to be positive in 75.6% eyes with pterygium, and 9.3% eyes in the control group.<sup>10</sup>

Among our patients, the Schirmer test with anesthesia was positive in 24.44% of eyes with pterygium and 10% of eyes in the control group. Ishioka *et al.* found that the Schirmer's test with anesthesia was shortened in the eye with pterygium with significance.<sup>21</sup> Balogun *et al.* in his study has shown positive Schirmer's test in 31.2% eyes with pterygium and 30.82% in the control group.<sup>8</sup> However, Rahman *et al.* had reported that the Schirmer test was positive in 9.3% of eyes with pterygium and 3.5% of eyes in the control group,<sup>10</sup> whereas Bandyopadhyay *et al.* had found no patient with pterygium and in the control group with abnormal value of Schirmer's test.<sup>13</sup> Chaidaroon and Pongmoragot found Schirmer's test value with anesthesia was decreased significantly in eyes with pterygium when compared with a healthy eye.<sup>19</sup> Roka *et al.* had also found that the mean basal secretion was less in pterygium group as compared to control group, and there was statistically significant difference between the two groups ( $P < 0.05$ ).<sup>24</sup>

Our study showed that statistically, sensitivity of Schirmer's-2 test was found to be 24.4%, whereas specificity was 90%. The sensitivity of the TBUT test was 47.7% and specificity was 78.8% in eyes with pterygium, showing that it had good sensitivity compared to the Schirmer's test with anesthesia and was an important diagnostic tool for detecting tear deficiency in eyes with pterygium. Also in literature, reduced TBUT test in patients with pterygium has been reported, whereas no significant difference was seen with regard to the Schirmer's test.<sup>25</sup> Both tests were performed by a single examiner. As such, observer bias was excluded from the study.

## CONCLUSION

From this study, we can suggest that unstable tear film is found to a greater extent in eyes with pterygium than in another eye. The study demonstrated high sensitivity of the TBUT test compared to the Schirmer's test. This study has clearly demonstrated that Tear film break-up time test has better diagnostic value compared to Schirmer's test in

detecting tear film abnormality in patients with pterygium. Tear film abnormality causes dry eye syndrome, which leads to vision-threatening complications. Thus, TBUT test could be used as an initial screening tool in outpatient departments to detect tear film instability in patients with pterygium.

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## REFERENCES

1. Moran DJ, Hollows FC. Pterygium and ultraviolet radiation: A positive correlation. *Br J Ophthalmol* 1984;68:343-6.
2. Detels R, Dhir SP. Pterygium - A geographical study. *Arch Ophthalmol* 1967;78:485-91.
3. Asokan R, Venkatasubbu RS, Velumuri L, Lingam V, George R. Prevalence and associated factors for pterygium and pinguecula in a South Indian population. *Ophthalmic Physiol Opt* 2012;32:39-44.
4. Shtein RM, Sugar A. Pterygium and conjunctival degenerations. In: Yanoff M, Duker J, editors. *Yanoff Duker Ophthalmology*. 4<sup>th</sup> ed. China: Elsevier Saunders; 2014. p. 203-5.
5. Adamis AP, Starck T, Kenyon KR. The management of pterygium. *Ophthalmol Clin North Am* 1990;3:611-23.
6. Townsend WM. Conjunctival flaps and pterygium. In: Waltman SR, Keates RH, Hoyt CS, Frueh BR, Herchler J, Carroll DM, editors. *Surgery of the Eye*. Vol. 1. New York: Churchill Livingstone; 1988. p. 263-84.
7. Saleem M, Muhammad L, Islam ZU. Pterygium and dry eye-a clinical study. *J Postgrad Med Inst* 2004;18:558-62.
8. Balogun MM, Ashaye AO, Ajayi BG, Osuntokun OO. Tear break-up time in eyes with pterygia and pingueculae in Ibadan. *West Afr J Med* 2005;24:162-6.
9. Tiffany JM. The normal tear film. *Dev Ophthalmol* 2008;41:1-20.
10. Rahman A, Yahya K, Fasih U, Waqar-ul-Huda, Shaikh A. Comparison of Schirmer's test and tear film breakup time test to detect tear film abnormalities in patients with pterygium. *J Pak Med Assoc* 2012;62:1214-6.
11. Bekibele CO, Baiyeroru AM, Ajaiyeoba A, Akang EE, Ajayi BG. Case control study of dry eye and related ocular surface abnormalities in Ibadan, Nigeria. *Int Ophthalmol* 2010;30:7-13.
12. Gulati A, Sullivan R, Buring JE, Sullivan DA, Dana R, Schaumberg DA. Validation and repeatability of a short questionnaire for dry eye syndrome. *Am J Ophthalmol* 2006;142:125-31.
13. Bandyopadhyay R, Nag D, Mondal SK, Gangopadhyay S, Bagchi K, Bhaduri G. Ocular surface disorder in pterygium: Role of conjunctival impression cytology. *Indian J Pathol Microbiol* 2010;53:692-5.
14. Begley CG, Himebaugh N, Renner D, Liu H, Chalmers R, Simpson T, *et al.* Tear breakup dynamics: A technique for quantifying tear film instability. *Optom Vis Sci* 2006;83:15-21.
15. Isreb MA, Greiner JV, Korb DR, Glonek T, Mody SS, Finnemore VM, *et al.* Correlation of lipid layer thickness measurements with fluorescein tear film break-up time and Schirmer's test. *Eye (Lond)* 2003;17:79-83.
16. Marzeta M, Toczolowski J. Study of mucin layer of tear film in patients with pterygium. *Klin Oczna* 2003;105:60-2.
17. Smith J, Nichols KK, Baldwin EK. Current patterns in the use of diagnostic tests in dry eye evaluation. *Cornea* 2008;27:656-62.
18. Korb DR. Survey of preferred tests for diagnosis of the tear film and dry eye. *Cornea* 2000;19:483-6.
19. Chaidaroon W, Pongmoragot N. Basic tear secretion measurement in pterygium. *J Med Assoc Thai* 2003;86:348-52.



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20. Kaye SB, Sims G, Willoughby C, Field AE, Longman L, Brown MC. Modification of the tear function index and its use in the diagnosis of Sjogren's syndrome. *Br J Ophthalmol* 2001;85:193-9.
21. Ishioka M, Shimmura S, Yagi Y, Tsubota K. Pterygium and dry eye. *Ophthalmologica* 2001;215:209-11.
22. Lekhanont K, Rojanaporn D, Chuck RS, Vongthongsri A. Prevalence of dry eye in Bangkok, Thailand. *Cornea* 2006;25:1162-7.
23. Ergin A, Bozdogan O. Study on tear function abnormality in pterygium. *Ophthalmologica* 2001;215:204-8.
24. Roka N, Shrestha SP, Joshi ND. Assessment of tear secretion and tear film instability in cases with pterygium and normal subjects. *Nepal J Ophthalmol* 2013;5:16-23.
25. Wang S, Jiang B, Gu Y. Changes of tear film function after pterygium operation. *Ophthalmic Res* 2011;45:210-5.

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