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Annals of Ophthalmology and Visual Sciences

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Relationship between OSDI, Tear Break Up Time, Schirmer Test and Pterygium Grades in Pterygium Patients

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Received: Nov 30, 2020

Accepted: Dec 26, 2020

Published Online: Dec 30, 2020

Journal: Annals of Ophthalmology and Visual Sciences

Publisher: MedDocs Publishers LLC

Online edition: http://meddocsonline.org/

Keywords: Pterygium; Dry Eye; OSDI; Schirmer Test; Break Up Time.

Abstract

Aim: To investigate the relationship between OSDI (Ocular Surface Disease Index), the Schirmer test, and tear Break Up Time (BUT) measurements in patients with pterygium and compare this according to pterygium grades.

Methods: The BUT measurements and the Schirmer tests were evaluated in patients with pterygium, and OSDI questionnaires were applied. OSDI scores were calculated, and the patients were grouped according to their OSDI scores. The Pterygium grades were also determined, and the Anova test was used to investigate the relationship between the OSDI scores and the Schirmer tests/BUT measurements, and between the OSDI scores and pterygium grades.

Results: Fifty-two pterygium patients were included in this study. Fourteen (26.9%) of the patients were in the normal OSDI group (Group 1), 17 (32.6%) patients in the mild-moderate OSDI group (Group 2), and 21 (40.3%) of the patients were in the severe OSDI group (Group 3). The difference between the BUT and Schirmer results were statistically significant between Group 1 and Group 2 (p= 0.02, p= 0.01, respectively). Also, the BUT measurement differences between Group 1 and Group 3 were significant (p= 0.02). The OSDI scores were found to be higher in the Grade 3 pterygiums than in the Grade 1 pterygiums. When we considered pterygium grades, BUT was negatively correlated to OSDI (p= 0.022), whereas Schirmer was not correlated with OSDI (p= 0.325).

Conclusion: Most of the pterygium patients showed ocular discomfort signs according to their OSDI scores. BUT measurements are correlated with pterygium grades, whereas Schirmer test results did not correlate with the pterygium grades.

Cite this article: Gokmen O, Genc I. Relationship between OSDI, Tear Break Up Time, Schirmer Test and Pterygium Grades in Pterygium Patients. Ann Ophthalmol Vis Sci. 2020; 3(1): 1008.

Introduction

Pterygium is a wing-shaped fibro vascular proliferation of bulbar conjunctiva, which generally roots from the nasal side of the corneal limbus through the cornea [1,2]. The main proven risk factor for pterygium is Ultraviolet (UV) exposure. Latitude, rural living, older age, male gender, outdoor activity, and low educational levels may be other risk factors [3,4]. The exact pathogenesis of pterygium is incompletely understood, and molecular genetic alterations have also been reported [5,6]. Squamous metaplasia and goblet cell hyperplasia with the underlying breakdown of Bowman's layer are seen in pterygium tissue [7]. Histologic sections of pterygia often show both intra- and subepithelial and intravascular inflammation [8]. Inflammation is also essential in the pathogenesis of dry eye [9]. Since inflammation is a biological response to any harmful stimuli, it is not a surprise to see pterygium and dry eye sharing inflammation as a common underlying mechanism. Dry eye symptoms are common among pterygium patients, and many investigators have noted a link between dry eyes and pterygium, which may be an independent risk factor for dry eyes [10,11]. In a recent study, it is found that pterygium recurrence is associated with greater severity of dry eye [12]. In the lights of these information, we can assume that dry eye accompanies pterygium, and in patients with pterygium, we can find signs of dry eye with OSDI, BUT and Schirmer tests.

The Ocular Surface Disease Index (OSDI) is a 12-item questionnaire designed to assess the symptoms of ocular irritation with dry eye disease and its impact on vision-related functioning [13]. The Schirmer and corneal Break-Up Time (BUT) and the measurements are commonly used for dry eye tests to evaluate the corneal tear film layer [14].

In this study, we aimed to evaluate the reliability of the OSDI questionnaires, Schirmer, and BUT measurements in patients with pterygium.

Methods

This prospective study included patients that were diagnosed with pterygium at the ophthalmology department of Van State Education and Research Hospital and was approved by the local ethics committee. (Date: 14/10/2017, Number: 2017/10) Written informed consent was obtained from all of the participants. The research was adhered to using the tenets of the declaration of Helsinki.

The exclusion criterion had an ocular allergy, ocular surface disorders other than pterygium, dry eye disease, Sjogren's syndrome, artificial tear drop usage, and any other ocular surgery history. The participants underwent a complete ophthalmological examination, which included a slit-lamp clinical evaluation, a Schirmer test, a corneal BUT measurement with fluorescein strips, and OSDI questionnaires, which were completed by the patients. The OSDI scores were calculated by the sum of the scores x 25/answered questions, and the patients were divided into three groups according to these scores: normal (group 1), mild-moderate (group 2) and severe (group 3) as described in the OSDI validity study [13]. The BUT and Schirmer scores were obtained from the eye with pterygium if it was unilateral, and in the bilateral eyes with pterygium, the data was obtained from the right eye. The Schirmer tests were performed without an anesthetic drop, and the BUT was measured after the application of the fluorescent strips under a cobalt blue light. The patients were also grouped according to their pterygium grades: If the pterygium was at the limbus edge, they were grouped as Grade 1, if it was between the pupil and the limbus edge, they were grouped as Grade 2, and if it was on the pupillary axis, they were grouped as Grade 3 [15].

The BUT and Schirmer test results were evaluated in each group. The OSDI, BUT, and Schirmer test results were also analyzed in comparison within the pterygium grades. The statistical analysis was performed with the SPSS V.21.0. For each variable, the normality was checked by using the Kolmogorov Smirnov test. The one-way Anova test and post hoc Tukey tests were used to evaluate the statistical differences in the groups. Pearson correlation analyses were performed between groups. The values of $p<0.05$ were considered statistically significant.

Results

A total of 52 patients, 29 males (55.8%), and 23 females (44.2%) were included in this study. The mean age of the patients was 42.5 ± 11.9 years (range between 18-70). Patients were divided into three groups according to OSDI scores. There was no statistical difference between the ages and genders of groups ($p>0.05$). The OSDI scores, break up time scores, Schirmer test results, ages and genders of the three groups are shown in Table 1. In all the participants, 8 (15.3%) of the patients' Schirmer tests were under 5 mm, and 26 (69.2%) of the patients' BUT measurements were under 10 seconds. The differences between the BUT results were statistically significant between Group 1 and Group 2 ($p= 0.02$). Additionally, between Group 1 and, Group 3 there was a statistically significant difference in terms of the BUT results and found to be higher in Group 1 ($p= 0.02$). However, there was no significant difference between Group 2 and 3 ($p= 0.45$).

The Schirmer test results' difference between Group 1 and Group 2 was statistically significant ($p= 0.01$) and was higher in Group 1; however, the differences between Group 2 and Group 3 ($p= 0.11$), and between Group 1 and Group 3 ($p=0.47$) were statistically insignificant (Table 1).

Table 1: Age, Gender, BUT, Schirmer Test and OSDI results according to groups. (Group 1: Normal OSDI group, Group 2: Mild-moderate OSDI group, Group 3: Severe OSDI group. 1vs2: Comparison between group 1 and 2; 1vs3: comparison between group 1 and 3, 2vs3: Comparison between group 2 and 3. P Value: Post Hoc Tukey test results between groups, *: Significant difference).

	Group1 (n=14)	Group2 (n=17)	Group3 (n=21)	*P value*	*P value* (Group 1 vs Group 2)	*P value* (Group 1 vs Group 3)	*P value* (Group 2 vs Group 3)
Age *mean ± SD* (years)	38.3 ± 10.9	42 ± 11.5	45.9 ± 12.4	0.181	0.658	0.159	0.576
Gender *(F/M) n, (%)*	*F:* 6, (42.9%) *M:* 8, (57.1%)	*F:*9, (52.9%) *M:*8, (47.1%)	*F:* 10, (47.6%) *M:* 11, (52.4%)	0.861	0.850	0.961	0.946
BUT *mean ± SD* (seconds)	10.5±3.1	6.4±2.4	7.6±3.4	0.002*	0.002*	0.025*	0.457

Schirmer Test *mean ± SD* (mm)	20.6 ± 10.3	10.1 ± 8.8	16.6 ± 10.3	0.016*	0.013*	0.471	0.119
OSDI scores *mean ± SD*	12.9 ± 4.8	28.6 ± 5.7	52.3 ± 9.4	NA	NA	NA	NA

The OSDI Scores, schirmer test results and breakup time scores according to pterygium grade groups are shown in table 2. Comparisons of the OSDI scores in the pterygium grades were statistically significant (p= 0.04), and the OSDI scores were found to be higher in the Grade 3 pterygiums when compared to Grade 1 (p<0.05). The comparison of the BUT, Schirmer test results, ages and genders of patients according to the pterygium grades were statistically insignificant in all the groups (respectively p= 0.11, p= 0.25). Post-Hoc Tukey test results of the groups are shown in Table 2.

BUT and Schirmer test results were negatively correlated with OSDI scores, but correlations were not statistically significant (p= 0.270, p= 0.469). BUT and Schirmer test results were found to be correlated with each other in all groups (p<0.01). When we considered pterygium grades, BUT was negatively correlated to OSDI (p= 0.022), whereas Schirmer was not correlated with OSDI (p= 0.325). Correlation analysis between subgroups is shown in Table 2.

Table 2: Pearson correlation coefficiencies of OSDI, BUT and Schirmer test results between Pterygium grades and OSDI groups and p values.

CORRELATİONS					
OSDI Groups			***BUT***	***Schirmer***	***OSDI***
1,00	***BUT***	Correlation	1	0.509	-0.162
		P values		0.063	0.580
	Schirmer	Correlation	0.509	1	-0.316
		P values	0.063		0.272
	OSDİ	Correlation	-0.162	-0.316	1
		P values	0.580	0.272	
2,00	***BUT***	Correlation	1	0.713**	-0.229
		P values		0.001	0.377
	Schirmer	Correlation	0.713**	1	-0.035
		P values	0.001		0.893
	OSDİ	Correlation	-0.229	-0.035	1
		P values	0.377	0.893	
3,00	***BUT***	Correlation	1	0.277	-0.346
		P values		0.225	0.124
	Schirmer	Correlation	0.277	1	-0.284
		P values	0.225		0.211
	OSDİ	Correlation	-0.346	-0.284	1
		P values	0.124	0.211	
Pterygium Grades			***BUT***	***Schirmer***	***OSDİ***
1,00	***BUT***	Correlation	1	0.508*	-0.365
		P values		0.044	0.165
	Schirmer	Correlation	0.508*	1	-0.091
		P values	0.044		0.738
	OSDİ	Correlation	-0.365	-0.091	1
		P values	0.165	0.738	
2,00	***BUT***	Correlation	1	0.501**	-0.465*
		P values		0.006	0.011
	Schirmer	Correlation	0.501**	1	-0.258
		P values	0.006		0.177
	OSDİ	Correlation	-0.465*	-0.258	1
		P values	0.011	0.177	
3,00	***BUT***	Correlation	1	0.533	-0.244
		P values		0.218	0.597
	Schirmer	Correlation	0.533	1	-0.119
		P values	0.218		0.799
	OSDİ	Correlation	-0.244	-0.119	1
		P values	0.597	0.799	

Discussion

Ocular discomfort is among the most common complaints heard by the ophthalmologist and may be present not only with dry eye but also with other ocular diseases such as pterygium [16]. Pterygium may also mimic dry eye symptoms. OSDI questionnaires, BUT measurements, and Schirmer tests are frequently used as diagnostic tests in dry eyes [17-19]. We aimed to see the correlation between these tests in pterygium patients.

In our study, we found that 26 (69.2%) of patients' BUT measurements were under 10 seconds, which means there was decreased BUT in the majority of the pterygium patients. Decreased BUT in pterygium patients was also shown by previous studies, and that finding may have a correlation between the pathogenesis of pterygium [16,20,21]. There are also some studies that have shown no difference in the BUT between patients with pterygia and controls [22]. In any case, BUT measurements seem to be prolonged after pterygium excision [23]. That disagreement may be due to the multifactorial nature of the condition. When we considered the correlation between the OSDI and BUT measurements, we could only find a statistically significant difference between Group 1 (normal) and Group 2 (mild/moderate) patients and Group 1 and Group 3 (severe) patients. Kyei et al. determined that the results of BUT showed no significant association with OSDI, although the BUT measurements increased with the decrease in the OSDI scores [24]. Our study also supports that conclusion.

However, when we consider the Schirmer tests, we found that only 8 (15.3%) of the patients' Schirmer test results were under 5 mm. Other studies in the literature also found no correlation between the Schirmer test and pterygium [5,11,16,22]. Biedner et al. showed that there was no difference in terms of tear secretion between the pterygium eye and the fellow eye, [25] whereas Chaidaron et al. showed that the Schirmer test values decreased in the pterygium eye when compared to the fellow eye [26]. When evaluated in terms of the correlation between the OSDI and the Schirmer test, Kyei et al. found that there was no significant association between them [24]. Unlu et al. also showed that there was no correlation between OSDI and Schirmer [27]. Accordingly, we found no difference between Group 1 and Group 3.

Osmolarity measurement is the best single method for evaluating dry eye disease [28]. Julio et al. showed the importance of increased tear osmolarity and decreased goblet cell density in pterygium, which may affect the BUT results [5]. In another study by Berchicci et al. it was found that tear osmolarity is inversely correlated with BUT in patients with graft versus host disease, and BUT is the most concordant dry eye test with tear osmolarity [29]. Although we did not evaluate tear osmolarity in our study, in light of this evidence, the decreased BUT in 69.2% of the pterygium patients may be explained by the increased tear osmolarity; however, further osmolarity studies are also required in pterygium to prove this hypothesis.

As the pterygium grade increases, so does ocular discomfort; hence, the OSDI scores increase. Most of the patients in this study complained that they had ocular discomfort. OSDI is based on the symptomatology, which means it is subjective and has an intrinsic bias. The BUT and Schirmer tests, however, are more objective. Consequently, the lack of relationship between the OSDI and BUT or Schirmer test can be understood to some degree. When we considered pterygium grades, BUT was negatively correlated to OSDI (p= 0.022), whereas Schirmer was not correlated to OSDI (p= 0.325). Although we could predict a decrease in both the tests as the pterygium grade increase, since the grading is objective, we did not find a correlation between the pterygium grade and the BUT/Schirmer test results. That is probably due to the multifactorial nature of the disease process.

Conclusion

In conclusion, utilizing clinical tests or symptom-based evaluation alone may be problematic. Pterygium pathogenesis has different aspects, and each of these approaches can evaluate one side of the disease. Further studies are necessary to increase our understanding of both the pterygium pathogenesis and the impact of the dry eye on it.

Study Limitations

A relatively small number of cases and the cross-sectional design of the study may be the limitations of this study since pterygium may have different clinical aspects in different geographic regions. Also, dry eyes may be affected by regional factors. The absence of a correlation between tear osmolarity may be another limitation of the study, which could be investigated in future studies.

Most of the pterygium patients showed ocular discomfort signs according to their OSDI scores. BUT measurements are correlated with pterygium grades, whereas Schirmer test results did not correlate with the pterygium grades.

Conflict of Interest: The Authors declare no conflicts of interest related to this study.

Financial Disclosure: The authors declared that this study has been made without financial support.

References

1. Sarkar P, Tripathy K. Pterygium. StatPearls. Treasure Island (FL). 2020.

2. Young AL, Cao D, Chu WK, Ng TK, Yip YWY, et al. The Evolving Story of Pterygium. Cornea. 2018; 37: S55-S57.

3. Rezvan F, Khabazkhoob M, Hooshmand E, Yekta A, Saatchi M, et al. Prevalence and risk factors of pterygium: a systematic review and meta-analysis. Survey of ophthalmology. 2018; 63: 719-735.

4. Lin YH, Sun CC, Yeung L, Yu YW, Sun MH, et al. Epidemiologic study of pterygium in Taiwan. Japanese journal of ophthalmology. 2019; 63: 297-303.

5. Julio G, Lluch S, Pujol P, Alonso S, Merindano D. Tear osmolarity and ocular changes in pterygium. Cornea 2012; 31: 1417-421.

6. Detorakis ET, Spandidos DA. Pathogenetic mechanisms and treatment options for ophthalmic pterygium: Trends and perspectives (Review). Int. J. Mol. Med. 2009; 23:439-447.

7. Di Girolamo N, Chui J, Coroneo MT, Wakefield D. Pathogenesis of pterygia: Role of cytokines, growth factors, and matrix metalloproteinases. Progress in retinal and eye research 2004; 23: 195-228.

8. Chui J, Coroneo MT, Tat LT, Crouch R, Wakefield D, et al. Ophthalmic pterygium: a stem cell disorder with premalignant features. The American journal of pathology. 2011; 178: 817-827.

9. Wei Y, Asbell PA. The core mechanism of dry eye disease is inflammation. Eye & contact lens. 2014; 40: 248-256.

10. Lee AJ, Lee J, Saw SM, Gazzard G, Koh D, et al. Prevalence and risk factors associated with dry eye symptoms: a population based study in Indonesia. The British journal of ophthalmology 2002; 86: 1347-51.

11. Ye F, Zhou F, Xia Y, Zhu X, Wu Y, et al. Evaluation of meibomian gland and tear film changes in patients with pterygium. Indian journal of ophthalmology. 2017; 65: 233-237.

12. Tan J, Vollmer-Conna U, Tat L, Coroneo M. Dry-Eye Disease in Recurrent Pterygium. Ophthalmic research. 2019; 61: 199-203.

13. Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the Ocular Surface Disease Index. Archives of ophthalmology. 2000; 118: 615-621.

14. Clayton JA. Dry Eye. The New England journal of medicine 2018; 378: 2212-2223.

15. Mahar PS, Manzar N. Pterygium recurrence related to its size and corneal involvement. Journal of the College of Physicians and Surgeons--Pakistan: JCPSP. 2013; 23: 120-123.

16. Ishioka M, Shimmura S, Yagi Y, Tsubota K. Pterygium and dry eye. Ophthalmologica. Journal international d'ophtalmologie. International journal of ophthalmology. Zeitschrift fur Augenheilkunde. 2001; 215: 209-211.

17. Dougherty BE, Nichols JJ, Nichols KK. Rasch analysis of the Ocular Surface Disease Index (OSDI). Investigative ophthalmology & visual science. 2011; 52: 8630-8635.

18. Asiedu K. Rasch Analysis of the Standard Patient Evaluation of Eye Dryness Questionnaire. Eye & contact lens. 2017; 43: 394-398.

19. McAlinden C, Gao R, Wang Q, Zhu S, Yang J, et al. Rasch analysis of three dry eye questionnaires and correlates with objective clinical tests. Ocul Surf. 2017; 15: 202-210.

20. Rahman A, Yahya K, Fasih U, Waqar ul H, Shaikh A. Comparison of Schirmer's test and tear film breakup time test to detect tear film abnormalities in patients with pterygium. JPMA. The Journal of the Pakistan Medical Association 2012; 62: 1214-1216.

21. Balogun MM, Ashaye AO, Ajayi BG, Osuntokun OO. Tear breakup time in eyes with pterygia and pingueculae in Ibadan. West Afr. J. Med. 2005; 24:162-166.

22. Ergin A, Bozdogan O. Study on tear function abnormality in pterygium. Ophthalmologica. Journal international d'ophtalmologie.

International journal of ophthalmology. Zeitschrift fur Augenheilkunde. 2001; 215: 204-208.

23. Li M, Zhang M, Lin Y, Xiao Q, Zhu X, et al. Tear function and goblet cell density after pterygium excision. Eye. 2007; 21: 224-228

24. Kyei S, Dzasimatu SK, Asiedu K, Ayerakwah PA. Association between dry eye symptoms and signs. Journal of current ophthalmology. 2018; 30: 321-325.

25. Biedner B, Biger Y, Rothkoff L, Sachs U. Pterygium and basic tear secretion. Ann. Ophthalmol. 1979; 11: 1235-1236.

26. Chaidaroon W, Pongmoragot N. Basic tear secretion measurement in pterygium. Journal of the Medical Association of Thailand = Chotmaihet thangphaet. 2003; 86: 348-352.

27. Unlu C, Guney E, Akcay BI, Akcali G, Erdogan G, et al. Comparison of ocular-surface disease index questionnaire, tearfilm break-up time, and Schirmer tests for the evaluation of the tearfilm in computer users with and without dry-eye symptomatology. Clinical ophthalmology. 2012; 6: 1303-1306.

28. Willshire C, Buckley RJ, Bron AJ. Estimating basal tear osmolarity in normal and dry eye subjects. Contact lens & anterior eye: the journal of the British Contact Lens Association 2018; 41: 34-46.

29. Berchicci L, Iuliano L, Miserocchi E, Bandello F, Modorati G. Tear osmolarity in ocular graft-versus-host disease. Cornea. 2014; 33: 1252-1256.