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Tear film status in pinguecula



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HIGHLIGHTS

The dry eye was more common in participants with pinguecula compared to subjects without it. The tear film and the presence of pinguecula had a direct relationship with tear film stability and decreased tear secretion.

ABSTRACT

Purpose: The objective of this study was to assess the tear film status in pinguecula.

Methods: This cross-sectional study was conducted in 850 students (male students = 407) with a mean age of 22.06 (±4) years. First, each participant completed the Ocular Surface Disease Index (OSDI) and then underwent slit-lamp biomicroscopy to determine the presence of pinguecula, Schirmer's test (without anesthesia), tear meniscus height (TMH), and tear break-up time (TBUT), and fluorescein corneal staining.

Results: Of 850 students of the School of Rehabilitation Sciences of Iran University of Medical Sciences, 648 (female students = 241) with a mean age of 22.06 (±3.96) years were examined. The rest of the students either withdrew from the study voluntarily or were excluded based on the exclusion criteria. The results showed no significant correlation between the presence of pinguecula and abnormal results of the Schirmer's test, OSDI, and fluorescein corneal staining. However, a significant correlation was found between the presence of pinguecula and abnormal TMH ($p = 0.012$) and abnormal TBUT results ($p = 0.021$).

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Moreover, the prevalence of dry eye was significantly higher in patients with pinguecula compared to those without it (21.89% vs. 11.40%, p = 0.022). The prevalence of pinguecula was significantly higher in men vs. women (p <0.001).
Conclusion: This study showed that dry eye was more common in participants with pinguecula compared to subjects without it. Among different findings, tear film and the presence of pinguecula had a direct relationship with tear film stability and decreased tear secretion. Further research is required to investigate the causal relationship between dry eye and pinguecula.

Key words: pinguecula, tear film, TBUT, Schirmer's test, OSDI, dry eye

INTRODUCTION

Pinguecula is one of the most common degenerative conditions of the conjunctiva with a prevalence of 22.5–90% [1–3]. It manifests itself as a slow-growing yellow papule near the limbus [1, 4]. Although it is usually asymptomatic, it is a common reason for cosmetic complaints. Some researchers believe that this disorder can result in pterygium [5, 6]. It may cause symptoms like eye irritation, foreign body sensation, pain, and epiphora [7]. Although its etiology and pathogenesis are unknown, arid conditions, dust, and exposure to sun/UV light are suggested as risk factors [8, 9]. Since some previous studies found disturbed tear film function in patients suffering from pterygium and other degenerative disorders of the conjunctiva [10], many studies have investigated the relationship between pterygium and dry eye; however, few studies, usually with small sample sizes, have addressed pinguecula and dry eye [11–14].

Dry eye is a multifactorial disease of the ocular surface characterized by disturbed homeostasis of the tear film causing ocular irritation. Tear instability, ocular surface inflammation and injury, and neurosensory abnormalities play a significant role in the etiology of this disease [15]. Dry eye is reported in 5–50% of the global population [16–22], and its prevalence has an increasing trend due to increased longevity resulting from improved health and extensive lifestyle changes towards activities requiring prolonged visual work (like prolonged computer work) [23].

Since the tear film is the first and most important refractive surface of the eye, any disorder in it can disturb the retinal image, reduce the visual quality, and result in visual complaints [24, 25]. Dry eye affects functional vision, especially reading, working with computer, and driving [26–29]. Due to extensive ocular problems, dry eye has negative impacts on the quality of life [30–32]. Pinguecula and dry eye are both ocular surface disorders that seem to be related. Since pinguecula causes changes in the conjunctival tissue and affects its structure and topography, it may have an impact on tear film dynamics in terms of the secretion of tear film components, especially mucin secreted by goblet cells, and tear distribution on the ocular surface [33]. On the other hand, chronic dryness of the ocular surface may affect conjunctival health and result in or accelerate its degeneration process [34]. Therefore, careful assessment of the tear film status in pinguecula can provide valuable information that may be helpful in identifying its etiology. The aim of this study was to evaluate tear film parameters in patients with pinguecula.

METHODS

This cross-sectional study was conducted in all of the students (n = 850, mean age: 22.08 [±3.96] years) of the School of Rehabilitation Sciences, Iran University of Medical Sciences in the academic year 2016–2017. The Ethics Committee of Iran University of Medical Sciences approved the study that was designed and conducted according to the tenets of the Declaration of Helsinki. Before the examinations, the study objectives and protocol were explained to all participants and informed consent was obtained from them. The demographic data of all subjects were recorded in their examination forms and their ocular history was taken.

The inclusion criterion was being a student in the School of Rehabilitation Sciences, Iran University of Medical Sciences, in the academic year 2016–2017. The exclusion criteria were unwillingness to participate in the study, eyelid disorders, nasolacrimal duct obstruction, previous use of antihistamines and antidepressants, ocular surgery, and contact lens wear. All subjects who met the inclusion criteria completed the Ocular Surface Disease Index (OSDI) [35] and then underwent slit lamp biomicroscopy (Haag-Streit, Koeniz, Switzerland) to evaluate the presence of pinguecula. During slit-lamp examination, tear meniscus height (TMH), Schirmer's test, fluorescein corneal staining, and tear break-up time (TBUT) were also measured and a washout period was considered between the tests. Examinations were done in one room in similar conditions.

Clinical tests and examinations

Any lipid nodule larger than 0.2 mm found on slit-lamp biomicroscopy (10× magnification) was recorded as pinguecula [9]. Then, the height of the tear meniscus was measured using a 0.2 mm linear light (parallelepiped yellow light at 45°),

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and a tear meniscus height less than 0.2 mm was considered pathological [36]. Then, a Schirmer strip (35 × 5 mm) was placed in the conjunctival fornix and the wet portion was recorded after 5 min. A value of 5 mm or less was considered as an abnormal result [24]. A washout period of 30 min was considered before TBUT. For this test, a strip impregnated with fluorescein was moisturized with a drop of normal saline and the inferior bulbar conjunctiva was gently touched with the strip tip. The cornea was examined under cobalt blue filter on the slit lamp using 10× magnification. The patient was instructed to close and open his/her eyes and then avoid blinking until told otherwise. The time between the last blink and the appearance of a dry spot was measured in seconds using a stopwatch. To avoid possible measurement errors, each test was done in triplicate and the mean value was recorded as the tear break-up time. A TBUT less than 10 s was considered abnormal [25]. Then, fluorescein eye stain was done using the cobalt blue filter on the slit lamp, and the Oxford Schema [37] was used to grade the staining status of the exposed areas of the cornea and conjunctiva.

Statistical analysis

An OSDI score ≥23 [38], TMH ≤0.2 mm, TBUT ≤10 s, Schirmer's test ≤5 mm, and fluorescein corneal staining ≥1 were considered as abnormal values [15]. Dry eye syndrome was defined as an abnormal OSDI and either TBUT ≤10 s or fluorescein corneal staining ≥1.

Data were entered into an Excel spreadsheet (Microsoft Excel 2007) and were analyzed using the SPSS software. Multiple regression analysis was applied to find correlations.

Ethical issues

The Ethics Committee of Iran University of Medical Sciences approved the study protocol, which was conducted in accord with the tenets of the Helsinki Declaration. All participants signed a written informed consent.

RESULTS

Of 850 students of the School of Rehabilitation Sciences of Iran University of Medical Sciences, 648 (female students = 241) with a mean age of 22.06 (±3.96) years (range: 18–40 years) were examined. The rest of the students either withdrew from the study voluntarily or were excluded based on the exclusion criteria. The prevalence of pinguecula and dry eye was 47.22% and 16.36% in the study population. The prevalence of abnormal test results is presented in table 1. Table 2 shows the mean and standard deviation of variables.

TABLE 1

Prevalence of pinguecula, dry eye, and abnormal results of tear tests in the study population.

		N	Pinguecula (N)	OSDI ≥23 (%)	TBUT ≤10 (%)	Schirmer ≤5 mm (%)	Corneal fluorescein staining ≥1 (%)	TMH ≤0.2 mm (%)	DES (%)
Pinguecula	women	83	-	42.2	84.3	48.2	32.5	56.6	**24.1**
	men	223	-	27.8	65.5	20.6	43.5	40.4	**21.1**
	both genders		-	31.7	70.6	28.1	40.5	44.8	**21.9**
Healthy eyes	women	158	-	38.6	66.5	21.5	51.3	45.6	**21.5**
	men	184	-	27.7	54.9	10.3	13.0	26.1	**2.7**
	both genders		-	32.7	60.2	15.5	30.7	35.1	**11.4**
Total	women	241	34.4	33.2	67.2	22.1	36.4	49.4	**22.4**
	men	407	54.8	27.4	63.9	20.3	33.6	33.9	**12.8**
	both genders	648	47.2	32.2	65.1	21.4	35.3	39.7	**16.36**

DES – dry eye syndrome; OSDI – ocular surface disease index; TBUT – tear break up time; TMH – tear meniscus height.

TABLE 2

Mean and standard deviation of variables.

		N	Age (years)	OSDI	TBUT (s)	Schirmer (mm)
Pinguecula	women	83	22.23 (±3.64)	22.48 (±14.21)	7.36 (±2.14)	7.54 (±4.99)
	men	223	22.12 (±2.74)	17.28 (±8.12)	7.43 (±3.77)	12.69 (±9.99)
	both genders	306	22.15 (±3.01)	18.69 (±10.37)	7.41 (±3.41)	11.29 (±9.20)
Healthy eyes	women	158	22.80 (±6.30)	21.95 (±14.57)	7.78 (±2.83)	11.35 (±9.29)
	men	184	21.35 (±2.35)	15.96 (±7.19)	8.81 (±2.70)	12.59 (±8.83)
	both genders	342	22.02 (±4.66)	18.73 (±11.59)	8.34 (±2.80)	12.02 (±9.05)
Total	women	241	22.61 (±5.22)	22.13 (±14.42)	7.64 (±2.62)	10.04 (±8.26)
	men	407	21.77 (±2.59)	16.69 (±7.73)	8.05 (±3.40)	12.64 (±9.47)
	both genders	648	22.08 (±3.96)	18.71 (±11.02)	7.90 (±3.14)	11.67 (±9.12)

OSDI – ocular surface disease index; TBUT – tear break up time.

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The results of this study showed that the prevalence of dry eye was higher in subjects with pinguecula compared to individuals without it. The prevalence of the abnormal values of all tests except for OSDI was also higher in pinguecula patients (fig. 1).

According to the results of multiple logistic regression, there was no significant correlation between the presence of pinguecula and abnormal values of the Schirmer's test, OSDI, and fluorescein corneal staining, while a significant correlation was found between TMH and TBUT and the presence of pinguecula (p = 0.012 and p = 0.021), and the prevalence of dry eye was significantly higher in subjects with pinguecula (p = 0.022). Table 3 presents the results of logistic regression for the relationship between different variables and the presence of pinguecula.

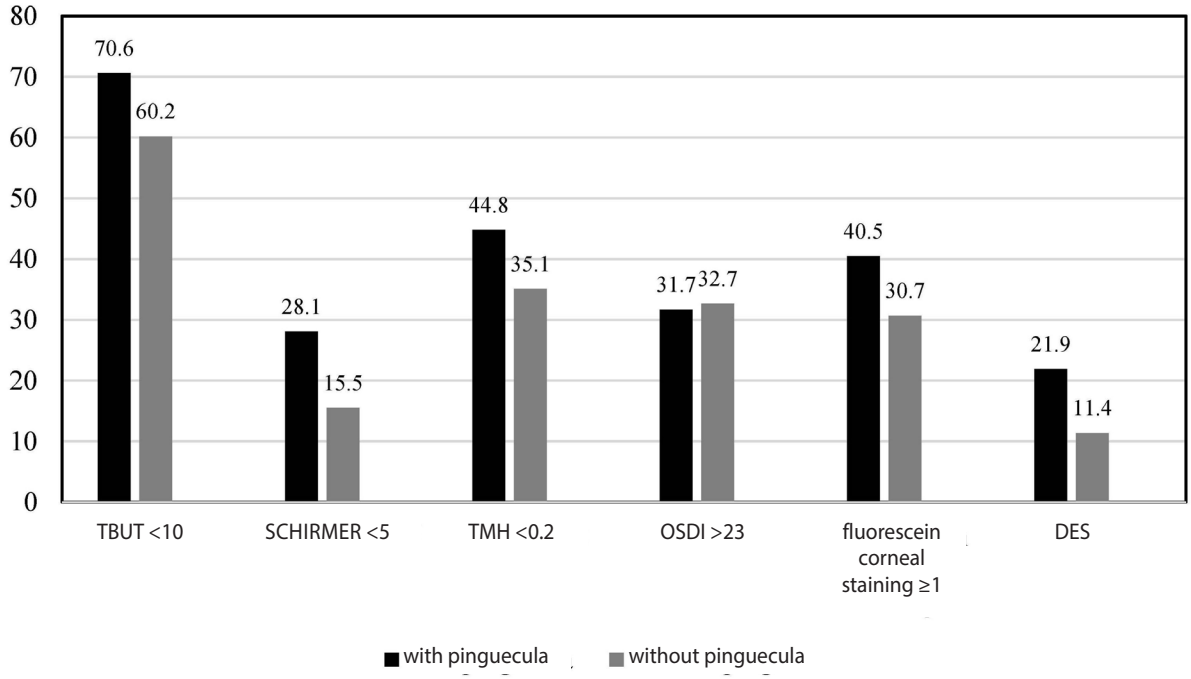
DISCUSSION

Several studies have investigated the tear film and pterygium but few studies have evaluated the tear status in pinguecula. This study was conducted in a young population and is one of the few studies of the tear film status in pinguecula. The results of this study can be of significant clinical use.

This study evaluated the relationship between the OSDI and pinguecula for the first time, which was not significant. Since the OSDI is used to assess dry eye symptoms and their effects on vision [39], it can be concluded that although pinguecula is associated with tear instability and decreased tear production in the young population, it does not cause dry eye symptoms. The reason for inconsistency between objective and subjective findings may be the weak correlation of these tests, which was reported in previous dry eye studies [40, 41]. Another reason may be that although the correlation between abnormal values of TBUT and TMH and the prevalence of pinguecula was statistically significant, the difference in the values of these 2 tests was clinically non-significant between the 2 groups. Therefore,

FIGURE 1

Comparison of prevalence of dry eye and abnormal results of tear tests between 2 groups of patient and health.



DES – dry eye syndrome; OSDI – ocular surface disease index; TBUT – tear break up time; TMH – tear meniscus height.

TABLE 3

Results of logistic regression.

	S.E.	P-value	Exp(B)
Age	0.021	0.708	**1.008**
Gender	0.182	0.000*	**0.376**
TBUT	0.032	0.021*	**0.930**
Schirmer	0.10	0.703	**1.004**
OSDI	0.80	0.911	**0.999**
TMH ≤0.2 mm	0.189	0.012*	**0.623**
Fluorescein corneal staining ≥1	0.226	0.659	**1.105**
DES	0.305	0.022*	**0.498**

* significant relationship.
DES – dry eye syndrome; OSDI – ocular surface disease index; S.E. – spherical equivalent; TBUT – tear break up time; TMH – tear meniscus height.

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from a clinical point of view, it could be stated that subjective and objective tear film findings have no significant difference between pinguecula patients and normal subjects.

While most of the previous studies [3, 42–44] showed an increase in the prevalence of pinguecula with age, the results of this study showed no significant correlation, which could be due to the limited age range of the participants. In this study, like many previous studies [2, 43–45], the prevalence of pinguecula was significantly higher in men compared to women, which could be due to the fact that men do more outdoor activities and are more exposed to UV light [4].

The results of this study regarding the relationship between pinguecula and TBUT were not consistent with the results of a study by Le et al. [13], which could be due to the older age range of the participants in this study; however, our findings were in line with studies conducted by Oguz et al. [12], Oh et al. [46], and Kucuk et al. [14] that reported a significant correlation between decreased TBUT and pinguecula, which could be due to the corneal tension caused by rapid thinning of the tear film [47]. Vice versa, the reason for the decreased TBUT may be incorrect blinking and the irregular epithelium caused by pinguecula [48]. The authors of this study believe that the first hypothesis is more likely because pinguecula does not seem to affect blinking markedly due to its small size.

In this study, similar to a study by Oguz et al. [12], no significant correlation was found between Schirmer's test and pinguecula. Since the Schirmer's test is of significance for the aqueous phase assessment [49], the results indicate lack of relationship between pinguecula and the aqueous phase of the tear film. On the other hand, a significant correlation was found between the TMH and pinguecula, suggesting a relationship between tear quantity and pinguecula.

In this study, similar to a study by Oh et al. [46], no significant correlation was found between fluorescein corneal staining and pinguecula while Oh [46] found a significant correlation between Rose bengal staining and pinguecula. Fluorescein staining reveals cell-by-cell disorders, while Rose bengal staining shows tear film disruption and is more sensitive [50], which could be the reason for this difference.

In this study, the prevalence of dry eye was markedly higher in subjects with pinguecula; however, since dry eye is a multifactorial disease and the mechanisms involved in the relationship between dry eye and pinguecula may be complex, it is not clear whether pinguecula causes dry eye or vice versa.

In this study, like most of the previous studies [19, 38, 50–52], the prevalence of dry eye in both groups (healthy and with pinguecula) was significantly higher in women than men, which is because of the hormonal changes, especially estrogen-related changes, in women [53].

The diagnostic and therapeutic point of this study is that in patients with pinguecula, lacrimal layer must be thoroughly examined and TBUT and TMH levels should be given more attention. It is recommended that if the TBUT value is less than 10 s and the TMH value is less than 0.2 mm, dry eye treatment should be performed for the patient.

CONCLUSION

This is one of the studies investigating tear status in patients with pinguecula. A significant correlation was found between pinguecula and TMH and TBUT, indicating a direct relationship between decreased production and instability of the tear film and pinguecula. The results showed no significant correlation between OSDI score and pinguecula, suggesting that although pinguecula has a relationship with decreased production and instability of the tear film, it does not cause dry eye symptoms.

This study found that dry eye was more prevalent in participants with pinguecula compared to subjects without it. The prevalence of pinguecula was also significantly higher in men. More studies are required to evaluate the causal relationship between pinguecula and dry eye.

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Conflict of interest:
None.

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Ethics:
The content presented in the article complies with the principles of the Helsinki Declaration, EU directives and harmonized requirements for biomedical journals.

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