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A Study on Dry Eye and Its Associated Risk Factors Among Patients with Pterygium.

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Abstract

Background: Pterygium is a common degenerative ocular surface disorder characterized by fibrovascular growth of conjunctival tissue onto the cornea. Chronic exposure to ultraviolet radiation, dust, wind, and dry environmental conditions has been implicated in its pathogenesis. Tear film abnormalities have been proposed to play an important role in the development of pterygium, although the relationship between pterygium and dry eye remains controversial. ***Objectives:*** To determine the proportion of dry eye among patients with pterygium attending the Department of Ophthalmology, Fathima Institute of Medical Sciences, Kadapa. To identify factors associated with dry eye in these patients. ***Materials and Methods***: A hospital-based cross-sectional study was conducted over a period of 18 months among 100 patients with clinically diagnosed pterygium attending the Ophthalmology outpatient department. Patients with acute ocular conditions or recent ocular surgery were excluded. Dry eye was evaluated using Schirmer's test, Tear Film Break-Up Time (TBUT), and Tear Meniscus Height (TMH). Demographic and clinical data were collected using a pretested questionnaire. Data were analyzed using SPSS version 22.0. Chi-square test and Pearson's correlation analysis were applied, with $p < 0.05$ considered statistically significant. ***Results:*** Among the 100 participants, 64% were females and 69% had outdoor occupations. Dry eye was detected in 20.5% of eyes by Schirmer's test, 33.5% by TBUT, and 59.5% by TMH. Overall, at least 26% of eyes with pterygium had evidence of dry eye based on one or more diagnostic tests. A statistically significant association was observed only between right-eye pterygium and abnormal TBUT ($p=0.024$). No significant association was found between the presence or size of pterygium and Schirmer's test or TMH. Correlation between pterygium size and dry eye parameters was weak or negligible. Advancing age was significantly associated with abnormal Schirmer's test ($p=0.007$) and TBUT ($p=0.050$), while diabetes mellitus showed a significant association with reduced TBUT ($p=0.014$). No significant associations were observed with gender, occupation, smoking, diet, menopausal status, or hypertension. ***Conclusion:*** Dry eye is relatively common among patients with pterygium, with tear film instability being more frequently detected than reduced tear secretion. However, no consistent statistically significant association was found between pterygium and dry eye, except for reduced TBUT in the right eye. Increasing age and diabetes mellitus were important factors associated with tear film dysfunction. Larger prospective studies are required to further clarify the relationship between pterygium and dry eye disease.

Keywords: Pterygium, Dry eye disease, Schirmer's test, Tear Film Break-Up Time, Tear Meniscus Height, Tear film instability.

INTRODUCTION

Pterygium is a common degenerative and proliferative disorder of the ocular surface characterized by a triangular or wing-shaped fibrovascular growth of conjunctival tissue extending onto the cornea. It is one of the most frequently encountered external eye diseases, particularly in tropical and subtropical regions, where environmental exposure plays a significant role in its development.[1] Although pterygium is often considered a cosmetic concern, progressive lesions can induce significant corneal astigmatism, obscure the visual axis, reduce visual acuity, and cause chronic ocular irritation, thereby adversely affecting the patient's quality of life.[2] The exact pathogenesis of pterygium remains incompletely understood and is believed to be multifactorial. Chronic exposure to ultraviolet (UV) radiation, especially UV-B rays, is regarded as the most important etiological factor. Other environmental risk factors include prolonged exposure to dry, dusty, windy, and sunny conditions, particularly among individuals engaged in outdoor occupations.[3] In addition to environmental factors, inflammation, oxidative stress, limbal stem cell dysfunction, and genetic susceptibility have also been implicated in the development of pterygium.

Dry eye disease (DED) is a multifactorial disorder of the ocular surface characterized by loss of tear film homeostasis, accompanied by ocular symptoms such as burning, foreign body sensation, irritation, fluctuating vision, and redness. Tear film instability, hyperosmolarity, ocular surface inflammation, and neurosensory abnormalities contribute to the pathophysiology of dry eye disease. Several studies have reported an association between pterygium and tear film abnormalities. One proposed mechanism suggests that tear film instability and ocular surface dryness lead to localized desiccation of the conjunctiva and cornea, making the ocular surface more susceptible to ultraviolet-induced damage and subsequent pterygium formation. Conversely, the presence of pterygium may disrupt normal tear film distribution and stability, thereby contributing to dry eye symptoms.[4] However, the causal relationship between pterygium and dry eye disease remains controversial, and it is still unclear whether tear dysfunction precedes pterygium development or occurs as a consequence of the disease. Assessment of dry eye among patients with pterygium is therefore important for understanding disease pathogenesis, improving symptom management, and optimizing surgical outcomes. The present study is undertaken to evaluate the prevalence of dry eye among patients with pterygium and to identify the factors associated with dry eye in these patients attending a tertiary care hospital.

Aim

To study the prevalence of dry eye among patients with pterygium attending the Department of Ophthalmology at Department of Ophthalmology
Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh.

Objectives

1. To determine the proportion of dry eye among patients diagnosed with pterygium attending the Department of Ophthalmology,Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh.
2. To identify the demographic, environmental, and clinical factors associated with dry eye among patients with pterygium.

MATERIALS AND METHODS

Study Design

Hospital-based cross-sectional observational study.

Study Setting

Department of Ophthalmology, Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh.

Study Population

Patients clinically diagnosed with pterygium attending the Outpatient Department of Ophthalmology, Fathima Institute of Medical Sciences, Kadapa.

Study Period

18 months.

Sample Size

The sample size was calculated using the formula:
$n = 4pq/d^2$
Where:

- p = Prevalence of dry eye among patients with pterygium = 50%, based on the study by Roka N et al.
- q = 100 − p = 50
- d = Clinically allowable error (20% of prevalence) = 10%

Accordingly,
$n = 4 \times 50 \times 50 / 10^2 = 100$
Considering possible non-response or incomplete data, an additional 10% may be included, if required.
Study Tools

- Pre-tested structured questionnaire
- Visual acuity assessment
- External ocular examination under torchlight
- Slit-lamp biomicroscopy
- Direct ophthalmoscopy
- Schirmer Test I (with and without topical anesthesia)
- Tear Film Break-Up Time (TBUT)
- Tear Meniscus Height (TMH) assessment

- Measurement of pterygium size using slit-lamp biomicroscopy

Inclusion Criteria
- Patients aged 18 years and above with a clinical diagnosis of pterygium.
- Patients willing to participate and provide written informed consent.

Exclusion Criteria
- Patients with acute ocular infections or inflammatory conditions associated with excessive watering, pain, or itching.
- Patients with previous ocular surgery within the preceding one month.
- Patients scheduled for ocular surgery during the study period.
- Patients using topical medications (other than lubricants) that may alter tear film parameters.
- Patients with systemic diseases or autoimmune disorders known to cause dry eye, where applicable.

Methodology
After obtaining approval from the Institutional Ethics Committee and written informed consent, eligible patients fulfilling the inclusion criteria were enrolled consecutively.
A pre-tested structured questionnaire was used to collect demographic and clinical information, including age, sex, occupation, dietary habits, smoking status, duration of symptoms, and ocular complaints.

Schirmer Test I (Without Anesthesia)
Schirmer Test I was performed using Whatman No. 41 filter paper strips. The strip was folded at one end and placed in the lower conjunctival fornix at the junction of the medial two-thirds and lateral one-third of the lower eyelid. Patients were instructed to keep their eyes gently closed or blink normally during the test. After 5 minutes, the strip was removed and the length of wetting was recorded in millimetres.

Schirmer Test I (With Anesthesia)
Following instillation of topical anesthetic drops, excess tears were gently wiped away. The Schirmer strip was similarly placed in the lower fornix and removed after 5 minutes. The wetting length was measured in millimetres to assess basal tear secretion.

Tear Film Break-Up Time (TBUT)
A fluorescein strip moistened with sterile saline was applied to the inferior conjunctival sac. The patient was instructed to blink several times and then keep the eyes open. Using the cobalt blue filter of the slit lamp, the interval between the last blink and the appearance of the first dry spot on the cornea was measured in seconds. Three readings were obtained, and the average value was recorded.

Tear Meniscus Height (TMH)
TMH was measured at the central lower lid margin using slit-lamp biomicroscopy by aligning the graticule with the lower tear meniscus.

Diagnostic Criteria for Dry Eye
Dry eye disease was considered to be present if one or more of the following criteria were observed:
- Schirmer Test I (without anesthesia): <10 mm in 5 minutes
- Tear Film Break-Up Time (TBUT): <10 seconds
- Tear Meniscus Height (TMH): <0.5 mm

Outcome Measures
Primary Outcome
- Proportion (prevalence) of dry eye among patients with pterygium.

Secondary Outcomes
- Association of dry eye with age, sex, occupation, smoking status, dietary habits, and pterygium size.
- Relationship between severity of pterygium and tear film parameters (Schirmer test, TBUT, and TMH).

Statistical Analysis
Data will be entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 22.0.
Descriptive statistics will be presented as mean ± standard deviation for continuous variables and frequency with percentages for categorical variables. Associations between categorical variables will be analyzed using the Chi-square test

or Fisher's exact test, wherever appropriate. Continuous variables will be compared using the Student's t-test or Mann–Whitney U test, depending on the distribution of data.

A p-value ≤ 0.05 will be considered statistically significant.

RESULTS

TABLE 1: Distribution of study participants by sex, age, occupation, and smoking.

Sex	Frequency	Percentage
Male	36	36.0
Female	64	64.0
Age group		
< 35 years	6	6
36 - 45 years	21	21
46 - 55 years	23	23
56 - 65 years	31	31
> = 66 years	19	19
Occupation		
Outdoor	69	69.0
Indoor	31	31.0
Smoking		
Smoking	12	12.0
Nonsmoking	88	88.0
Total	100	100.0

TABLE 2: Distribution of study participants by diet, diabetes, hypertension.

DIET	Frequency	Percent
DIABETES		
Diabetes present	21	21.0
Diabetes absent	79	79.0
HYPERTENSION		
Hypertension present	26	26.0
Hypertension absent	74	74.0
Total	100	100.0

TABLE 3: Distribution of study participants according to dry eye tests.

RSCHIRMER TEST	Frequency	Percent
Yes (<10)	23	23.0
No (>=10)	77	77.0
LSCHIRMER TEST	Frequency	Percent
Yes (<10)	18	18.0
No(>=10)	82	82.0
RTBUT TEST	Frequency	Percent
Yes (<10)	36	36.0
No (>=10)	64	64.0
LTBUT TEST	Frequency	Percent
Yes (<10)	31	31.0
No (>=10)	69	69.0
RTMH TEST	Frequency	Percent
Yes (< 0.5)	59	59.0
No (>=0.5)	41	41.0
LTMH TEST	Frequency	Percent
Yes (<0.5)	60	60.0
No (>=0.5)	40	40.0
Total	100	100.0

Table 4: Number of Patients with different types of Pterygium.

Distribution of types of Pterygium		
	RPTRGY>0	**LPTRGY>0**
TYPE 1	32	31
TYPE 2	43	40
TYPE 3	1	1

Type 1: < 2 mm over cornea Type 2: 2 – 4 mm over cornea Type 3: > 4 mm over cornea

Table 5: Mean values of Dry eye tests of the study population.

Dry eye examination: Mean value						
	RSCHIRMR	**LSCHIRMR**	**RTBUT**	**LTBUT**	**RTMH**	**LTMH**
Overall	16.94	17.85	10.14	10.72	0.39	0.38
Males	15.88	17.77	9.94	11.41	0.4	.39
Female	17.53	17.89	10.2	10.3	0.38	0.38
Overall						
< = 35	22.0	21.80	13.33	14.16	0.48	0.15
36 - 45	18.47	18.09	10.0	11.09	0.40	0.17
46 - 55	21.30	20.60	10.80	10.13	0.43	0.21
56 - 65	13.90	16.20	9.0	9.45	0.34	0.20
>= 66	13.20	15.60	10.20	12.0	0.36	0.19
Male						
< = 35	14.50	14.50	15.0	15.0	0.35	0.35
36 - 45	19.10	19.81	9.81	11.60	0.47	0.44
46 - 55	19.50	19.66	10.80	9.60	0.46	0.33
56 - 65	13.20	16.70	10.0	11.70	0.32	0.37
>= 66	11.90	15.40	7.8	11.10	0.37	0.41
Female						
< = 35	25.70	25.50	12.50	13.75	0.55	0.42
36 - 45	17.70	16.20	10.20	10.50	0.33	0.36
46 - 55	21.20	20.90	10.80	10.29	0.42	0.42
56 - 65	14.20	15.90	8.50	8.38	0.35	0.39
>= 66	14.0	15.80	11.6	12.50	0.36	0.31

Table 6. Association between Right Eye Pterygium and Dry Eye Tests (n = 100)

Dry Eye Test	Abnormal Result	No Pterygium n (%)	Pterygium Present n (%)	χ^2	p-value	Significance
Schirmer Test	<10 mm	8 (33.3)	15 (19.7)	1.904	0.160	NS
	≥10 mm	16 (66.7)	61 (80.3)			
TBUT	<10 sec	4 (16.7)	32 (42.1)	5.123	0.024	S
	≥10 sec	20 (83.3)	44 (57.9)			
TMH	<0.5 mm	13 (54.2)	46 (60.5)	0.305	0.638	NS
	≥0.5 mm	11 (45.8)	30 (39.5)			

Table 7. Association between Left Eye Pterygium and Dry Eye Tests (n = 100)

Dry Eye Test	**Abnormal Result**	**No Pterygium n (%)**	**Pterygium Present n (%)**	χ^2	**p-value**	**Significance**
Schirmer Test	<10 mm	4 (14.3)	19 (26.4)	1.668	0.197	NS
	≥10 mm	24 (85.7)	53 (73.6)			
TBUT	<10 sec	13 (46.4)	23 (31.9)	1.836	0.175	NS
	≥10 sec	15 (53.6)	49 (68.1)			
TMH	<0.5 mm	19 (67.9)	40 (55.6)	1.261	0.261	NS
	≥0.5 mm	9 (32.1)	32 (44.4)			

Table 8. Association between Bilateral Pterygium and Dry Eye Tests (n = 100)

Dry Eye Test	Dry Eye Status	Unilateral Pterygium n (%)	Bilateral Pterygium n (%)	χ^2	p-value	Significance
Schirmer Test	Dry eye present	17 (32.7)	14 (29.2)	0.145	0.703	NS
	No dry eye	35 (67.3)	34 (70.8)			
TBUT	Dry eye present	21 (40.4)	22 (45.8)	0.302	0.582	NS
	No dry eye	31 (59.6)	26 (54.2)			
TMH	Dry eye present	36 (69.2)	35 (72.9)	0.164	0.685	NS
	No dry eye	16 (30.8)	13 (27.1)			

Table 9. Pearson's Correlation between Pterygium and Dry Eye Parameters

Correlation Between	Correlation Coefficient (r)	Interpretation
Right Schirmer Test – Right Pterygium	0.313	Weak positive correlation
Right TBUT – Right Pterygium	0.191	Very weak positive correlation
Right TMH – Right Pterygium	0.035	Negligible correlation
Left Schirmer Test – Left Pterygium	-0.137	Very weak negative correlation
Left TBUT – Left Pterygium	0.020	Negligible correlation
Left TMH – Left Pterygium	-0.105	Very weak negative correlation
Right Schirmer Test – Left Schirmer Test	0.636	Strong positive correlation
Right TBUT – Left TBUT	0.621	Strong positive correlation
Right TMH – Left TMH	0.619	Strong positive correlation
Right Pterygium – Left Pterygium	**0.760**	**Strong positive correlation**

Table 10. Association between Age and Dry Eye Parameters (n = 100)

Age Group (years)	Schirmer <10 mm n (%)	TBUT <10 sec n (%)	TMH <0.5 mm n (%)
<35	0/6 (0.0)	0/6 (0.0)	2/6 (33.3)
36–45	5/21 (23.8)	8/21 (38.1)	14/21 (66.7)
46–55	3/23 (13.0)	9/23 (39.1)	16/23 (69.6)
56–65	12/31 (38.7)	19/31 (61.3)	24/31 (77.4)
≥66	11/19 (57.9)	7/19 (36.8)	15/19 (78.9)
χ^2 (df = 4)	**13.957**	**9.398**	**5.552**
p-value	**0.007**	**0.050**	**0.235**
Significance	**Significant**	**Significant**	**Not Significant**

Table 11. Association between Gender and Dry Eye Parameters (n = 100)

Gender	Schirmer Dry Eye n (%)	TBUT Dry Eye n (%)	TMH Dry Eye n (%)
Male (n = 36)	**12 (33.3)**	**14 (38.9)**	**26 (72.2)**
Female (n = 64)	**19 (29.7)**	**29 (45.3)**	**45 (70.3)**
χ^2	**0.143**	**0.388**	**0.041**
df	**1**	**1**	**1**
p-value	**0.705**	**0.533**	**0.840**
Significance	**NS**	**NS**	**NS**

Table 12. Association between Occupation and Dry Eye Parameters (n = 100)

Occupation	Schirmer Dry Eye n (%)	TBUT Dry Eye n (%)	TMH Dry Eye n (%)
Outdoor (n = 69)	23 (33.3)	28 (40.6)	48 (69.6)
Indoor (n = 31)	8 (25.8)	15 (48.4)	23 (74.2)
χ^2	0.567	0.532	0.223
df	1	1	1
p-value	0.452	0.466	0.637
Significance	NS	NS	NS

Table 13. Association between Smoking and Dry Eye Parameters (n = 100)

Smoking Status	Schirmer Dry Eye n (%)	TBUT Dry Eye n (%)	TMH Dry Eye n (%)
Smokers (n = 12)	6 (50.0)	7 (58.3)	9 (75.0)
Non-smokers (n = 88)	25 (28.4)	36 (40.9)	62 (70.5)
χ^2	2.301	1.308	1.106
df	1	1	1
p-value	0.129	0.253	0.745
Significance	NS	NS	NS

Table 14. Association between Diabetes Mellitus and Dry Eye Parameters (n = 100)

Diabetes Status	Schirmer Dry Eye n (%)	TBUT Dry Eye n (%)	TMH Dry Eye n (%)
Present (n = 21)	8 (38.1)	14 (66.7)	16 (76.2)
Absent (n = 79)	23 (29.1)	29 (36.7)	55 (69.6)
χ^2	1.626	6.075	0.348
df	1	1	1
p-value	0.429	**0.014**	0.555
Significance	NS	**Significant**	NS

Table 15. Association between Hypertension and Dry Eye Parameters (n = 100)

Hypertension Status	Schirmer Dry Eye n (%)	TBUT Dry Eye n (%)	TMH Dry Eye n (%)
Present (n = 26)	7 (26.9)	12 (46.2)	17 (65.4)
Absent (n = 74)	24 (32.4)	31 (41.9)	54 (73.0)
χ^2	0.273	0.143	0.538
df	1	1	1
p-value	0.601	0.706	0.463
Significance	NS	NS	NS

Table 16. Summary of Association between Risk Factors and Dry Eye Parameters

Risk Factor	Schirmer Test	TBUT	TMH
Age	**Significant (p = 0.007)**	**Significant (p = 0.050)**	**Not Significant (p = 0.235)**
Gender	**Not Significant (p = 0.705)**	**Not Significant (p = 0.533)**	**Not Significant (p = 0.840)**
Occupation	**Not Significant (p = 0.452)**	**Not Significant (p = 0.466)**	**Not Significant (p = 0.637)**
Diet	**Not Significant**	**Not Significant**	**Not Significant**
Menopausal status	**Not Significant**	**Not Significant**	**Not Significant**
Smoking	**Not Significant (p = 0.129)**	**Not Significant (p = 0.253)**	**Not Significant (p = 0.745)**
Diabetes mellitus	**Not Significant (p = 0.429)**	**Significant (p = 0.014)**	**Not Significant (p = 0.555)**
Hypertension	**Not Significant (p = 0.601)**	**Not Significant (p = 0.706)**	**Not Significant (p = 0.463)**

DISCUSSION

Pterygium is a common ocular surface disorder in tropical and subtropical regions and is strongly associated with chronic exposure to ultraviolet (UV) radiation, dust, wind, and dry environmental conditions. Tear film instability has been proposed as an important factor in the pathogenesis of pterygium, although it remains unclear whether dry eye predisposes to pterygium or develops secondary to it. Abnormal tear film exposes the ocular surface to environmental damage, resulting in inflammation and fibrovascular proliferation.

In the present study, dry eye was evaluated using Schirmer's test, Tear Film Break-Up Time (TBUT), and Tear Meniscus Height (TMH). Based on Schirmer's test, dry eye was observed in 20.5% of eyes with pterygium, while 33.5% showed abnormal TBUT and 59.5% had reduced TMH. These findings indicate that tear film instability was more frequently detected by TBUT and TMH than by Schirmer's test.

The mean Schirmer test values (16.94 mm right eye and 17.85 mm left eye) and TBUT values (10.14 seconds right eye and 10.72 seconds left eye) were comparable to reports from previous studies. Several investigators, including Roka et al.,5 Amer et al.,6 and Kampitak et al.,7 have demonstrated significantly reduced TBUT and, in many studies, reduced Schirmer values among patients with pterygium, suggesting tear film dysfunction.

However, other investigators such as Goldberg et al.8 and Jie et al.9 reported no significant association between dry eye and pterygium. Thus, the available literature remains inconsistent.

In the present study, only right-eye TBUT showed a statistically significant association with the presence of pterygium (p = 0.024), whereas Schirmer's test and TMH did not show significant associations. Similarly, no significant association was observed between bilateral pterygium and any of the dry eye parameters. These findings are consistent with the observations of Goldberg et al., Balogun et al.,10 and Jie et al., but differ from studies by Roka et al., Mithal et al.,11 Ishioka et al., and Lekhanont et al.,12 which reported a strong association between pterygium and dry eye.

Correlation analysis demonstrated only weak or negligible correlations between pterygium size and dry eye parameters, indicating that increasing pterygium size was not associated with worsening tear film function. This finding agrees with Kampitak et al., who also reported no correlation between pterygium size and Schirmer or TBUT values. In contrast, strong positive correlations were observed between corresponding dry eye test values of the right and left eyes, indicating good inter-eye agreement.

Age was significantly associated with abnormal Schirmer test (p = 0.007) and TBUT (p = 0.050), suggesting that tear film function deteriorates with advancing age. This observation is consistent with reports by Hashemi et al.,13 and other epidemiological studies showing increased prevalence of dry eye in older individuals.

No significant association was observed between dry eye and gender, occupation, smoking, hypertension, diet, or menopausal status. Similar findings regarding gender and occupation have been reported by Roka et al. Although outdoor exposure is a recognized risk factor for pterygium, it did not independently influence dry eye parameters in the present study.

Diabetes mellitus showed a significant association only with TBUT (p = 0.014), indicating increased tear film instability among diabetic patients. This finding agrees with studies by Aljarousha et al.,14 Gupta et al.,15 Yoon et al.,16 and Ozdemir et al.,17 who reported significantly reduced TBUT in diabetic individuals. However, no significant association was observed between diabetes and Schirmer's test or TMH in the present study.

Overall, the present study suggests that although tear film abnormalities are common among patients with pterygium, a statistically significant association was demonstrated only for TBUT in the right eye and for diabetes with TBUT. The findings support the role of tear film instability in pterygium but also indicate that the relationship between pterygium and dry eye is complex and may vary across populations and study methodologies. Further prospective studies with larger sample sizes and objective tear film assessments are required to clarify this relationship.

CONCLUSION

This cross-sectional study assessed the prevalence of dry eye among patients with pterygium using Schirmer's test, Tear Film Break-Up Time (TBUT), and Tear Meniscus Height (TMH).

At least 26% of eyes with pterygium (unilateral or bilateral) had evidence of dry eye based on one or more diagnostic tests. The prevalence of dry eye varied according to the assessment method, being 20.5% by Schirmer's test, 33.5% by TBUT, and 59.5% by TMH.

No statistically significant association was observed between the presence or size of pterygium and dry eye, except for a significant association between right-eye pterygium and reduced TBUT. Correlation between pterygium size and dry eye parameters was weak or negligible.

Among the risk factors studied, advancing age was significantly associated with abnormal Schirmer's test and TBUT, while diabetes mellitus showed a significant association with reduced TBUT. No significant associations were found between dry eye and gender, occupation, smoking, menopausal status, diet, or hypertension.

Overall, the study suggests that tear film abnormalities are common in patients with pterygium, particularly tear film instability, although a consistent statistical association between pterygium and dry eye could not be demonstrated. Further longitudinal studies with larger sample sizes are recommended to better define the relationship between pterygium and dry eye disease.

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