



## Original Research Article

## A study of meibomian gland and tear film changes in patients with pterygium in a tertiary care centre

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## ABSTRACT

**Objective:** To find out the correlation of Meibomian gland and Tear film dysfunction with pterygium.

**Design:** Institution based prospective cross sectional study.

**Materials and Methods:** 70 (seventy) patients with unilateral primary progressive nasal Pterygium and 70 healthy adults without any ocular pathology were selected as comparison group from the Ophthalmology outpatient department of Calcutta National Medical College and hospital, Kolkata for a duration of 6 months from January 2020 to June 2020. Meibomian gland dysfunction was measured by meibomian gland expression score and lid margin abnormality score. Tear film changes were measured by Ocular Surface Disease Index (OSDI) Score, Tear break up time (TBUT), Tear meniscus height (TMH), Schirmer's test 1 (ST1) and Corneal fluorescein staining in both pterygium and control group and comparisons were done to find out the significance in differences.

**Statistical Analysis:** The Categorical variables were analyzed with the help of Pearson Chi square test, Spearman rho Correlation, Man Whitney U Test and the continuous variables were analyzed with the help of Independent T test and Pearson Correlation coefficient. The level of significance was considered as 95% of confidence interval i.e. P value <0.05.

**Results:** OSDI score, TBUT, meibomian gland expression score, lid margin abnormality score and corneal fluorescein staining were significantly higher in pterygium group than others (p<0.05) whereas TMH values although showed differences between the two groups but were not statistically significant. ST1 were normal in pterygium group though had significant difference with control.

**Conclusion:** Meibomian gland function was altered in patient with Pterygium which is also associated with uncomfortable ocular symptoms due to tear film abnormalities.

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### 1. Introduction

Pterygium is a common disorder of ocular surface in many parts of the world, affecting one eye or both the eyes, described as an ophthalmic enigma<sup>1,2</sup>. The exact etiology and pathogenesis of pterygium remains unclear. It is a fibrovascular growth of the conjunctiva, commonly encroaching onto the cornea. It causes corneal astigmatism, as well

as ocular discomfort which may be due to dry eye. It is a potentially blinding disease in the advanced stage due to invasion into the visual axis, which can have a significant impact on vision and may require surgery.<sup>3</sup> It also causes cosmetic disfigurement. Its prevalence is high in the "pterygium belt" between 30 degrees north and 30 degrees south of the equator.<sup>4</sup>

Ultraviolet light exposure due to outdoor occupation is a major risk factor. Other factors are age, male gender,

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rural population and having dry eyes.<sup>5,6</sup> Genetic factors, tumor suppressor gene p53 and other genes may be involved in the pathogenesis of pterygium.<sup>7</sup> Pathogenesis of pterygium may be initial disruption of the limbal barrier and progressive active conjunctivalisation of the cornea.<sup>1</sup> Tear film abnormalities are also considered to be responsible in the etiopathogenesis.<sup>8–10</sup> It is generally considered that tear film instability in pterygium patients may arise from two major factors: chronic ocular surface inflammation and altered tear dynamics. Whether tear dysfunction is a precursor to pterygium or pterygium causes tear dysfunction is still not clear.

Meibomian gland (MG) function has been recognized as a critical factor in maintaining the ocular surface health and stability.<sup>11</sup> MG is a tubuloacinar sebaceous gland that lies perpendicularly within the tarsal plate. Clinically, MGD (meibomian gland dysfunction) is a common cause of evaporative dry eye and ocular discomfort. It is observed that pterygium patients are often accompanied by a MGD. Thus, there may be relationship between MGD and dry eye in pterygium patients. Currently, few studies have reported these findings. In our study, an attempt has been made to demonstrate and analyze the relationship between the meibomian gland dysfunction and tear film abnormality in pterygium patients.

## 2. Aims and Objectives

This study was done to determine the association of meibomian gland and tear film dysfunction with Pterygium.

## 3. Materials and Methods

Institution based prospective cross sectional study was done at Out Patient Department of Ophthalmology of Calcutta National Medical College and Hospital over six months, 70 eyes of patients with primary progressive nasal pterygium and 70 eyes of volunteers without ocular pathology were included.

### 3.1. Inclusion criteria

Primary progressive nasal pterygium, Willing to participate in the study and lack of any systemic disease.

### 3.2. Exclusion criteria

Patients with any previous ocular surgery, already on topical medication for glaucoma and for dry eyes (Lubricating eye drops), local or systemic medications known to cause dry eyes, history of contact lens wear, patients having autoimmune diseases like Rheumatoid arthritis, Sjogren's syndrome, conjunctival or adnexal inflammation and who didn't give consent were excluded from the study. After getting IEC Clearance and Scientific Research Committee approval and informed written consent from the study

subject a detailed history of particulars (age, gender, address, occupation) of both the pterygium and comparison group were taken. After that OSDI scoring was done by OSDI questionnaires. Best corrected visual acuity (BCVA) at presentation was recorded with Snellen's chart. After doing diffuse torch light examination, a thorough ocular examination under slit lamp was done. On slit lamp examination meibomian gland expression and lid margin abnormalities were noted. After that, dry eye parameters were assessed (schirmer's test1, tear meniscus height, tear film break up time and corneal fluorescein staining). Severity of dry eye was classified as per DEWS II criteria.

Meibomian gland expression score was assessed by assigning grades for clarity and ease of meibum expression in a region of the eyelid using a slit lamp. The quality of expression was graded according to the degree of opacity and viscosity on a 0–4 scale<sup>12</sup> (0- indicated normal viscosity; 1-opaque, normal viscosity; 2-opaque, increased viscosity; 3-severe thickening (toothpaste); 4- No expression, glands completely blocked).

Lid margin abnormalities were scored as 0 (absent) or 1 (present) for the four parameters-Vascular engorgement, plugged meibomian gland orifices, anterior or posterior displacement of the mucocutaneous junction, and irregularity of lid margin.<sup>12</sup>

Tear film evaluation was done by Schirmer's test 1 (ST1), Value <10mm were considered abnormal and <5mm severe dry eye. Tear film break up time (TBUT) values <10 sec and <5sec were considered abnormal and severely dry respectively. Tear meniscus height was measured by using slit lamp bio microscopy light beam.

Corneal Fluorescein Staining graded as 0- No staining, 1- Sporadic punctuated staining, 2- Dense punctuated staining, 3- Intense patchy staining.

The analysis of the available data were done by using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA) and Epi info en-US ver 7.2.4.0, CDC, Atlanta. The Categorical variables were analyzed with the help of suitable non parametric tests like Chi square test, Man Whitney U Test. The continuous variables were analyzed with the help of required parametric tests like Independent T test and other suitable statistical test where ever necessary. The level of significance was considered as 95% of confidence interval. So P value <0.05 was considered as statistically significant level.

## 4. Results

In this study, 29(41.4 %) were males and 41(58.6%) were females. It was more in rural population, 37(52.9%) than in urban 33(47.1%) and outdoor workers 45(64.3%) were more affected than indoor workers 25(37.7%). Mean age of pterygium group was 48.100 years and comparison group was 48.086 years. This established good basis for comparison of the different variables between groups. The

Mean of OSDI in pterygium group was 24.80 which was significantly higher than comparison group 13.40 ( $p < .05$ ), indicating pterygium patients suffer from ocular discomfort more than normal individuals. Mean of TBUT in pterygium group was 6.97 sec compared to 10.47 sec in comparison group and the difference is highly significant. It signifies pterygium patients had low TBUT than normal individuals. Mean of ST1 in pterygium group was 10.14mm and in comparison group was 11.01mm. Though the pterygium patients had normal ST1 readings but significant differences were present. It clearly signifies that pterygium patients did not show low ST1 than non-terygium population. It means secretion of lacrimal glands were not disturbed in pterygium patients indicating evaporative dry eye in pterygium. Lid margin abnormality, meibomian gland expression score and corneal fluorescein staining were significantly higher in pterygium group than comparison group ( $p < .05$ ). However, Tear meniscus height (TMH) value were not significantly different in two groups ( $p > .05$ ).

## 5. Discussion

In both pterygium and comparison groups, age ranged from 30 to 68 years with a mean age of 48.10 years in pterygium group and 48.08 years in comparison group. It was quite similar to Chui JJY et al. study.<sup>13</sup> Recent studies by Zhao L, et al.<sup>14</sup> denied any relation of age with the pterygium incidence.

It was found in this study that females (41) were more affected than males (29). Because females were not only involved in house hold activities but also in outdoor activities like 100 days works, road side business along with cooking which was done by wood/coal causing smoke and most of them were from rural areas and from low socioeconomic status with low level of education. Two studies in china<sup>15,16</sup> also show pterygium is more common among female population.

Age and sex were not statistically different between the two study groups of patients and comparison group. This established good basis for comparison of the different variables between groups.

Pterygia are more common among the outdoor workers 64% in comparison to indoor workers (36%) in this study. This is because out door workers had more sun exposure and dusty environment which makes them prone to pterygium formation. Ultraviolet light exposure has been implicated in p53 mutagenesis<sup>17</sup> which is considered as a precursor of pterygium. Pterygium, in Meiktila Eye Study, Barbados Eye Study,<sup>18,19</sup> and Singh PS<sup>20</sup> study was found to have greater correlation with outdoor activity

In this study, 53% of pterygium patients were staying in rural areas and 47% in urban areas.

50% of pterygium patients had grade 2 (opaque, increased viscosity) meibomian gland expression score where as 36% had grade 3 (severe thickening), 13% had grade 1 and

1% had grade 4 score. Mean difference of Meibomian gland expression was 92.86 in pterygium group and 48.14 in comparison group and the differences were highly significant ( $P < .05$ ), indicating that pterygium patients suffer from meibomian gland dysfunction more than normal persons. Fen Y et al.<sup>12</sup> Huping Wu et al.<sup>21</sup> AnaCláudia et al.<sup>22</sup> Ning Li et al.<sup>23</sup> found pre and post-surgery effect on meibomian gland dysfunction, it improved after excision of pterygium.

Lid margin abnormality was present in 67% pterygium patients and absent in 33% patients. Lid margin abnormality was significantly higher in pterygium group with mean rank of 78.50 compared to 62.50 in comparison group. It is a good indicator of meibomian gland dysfunction. Fen Ye et al.<sup>12</sup> also found similar results.

This study found OSDI score was 24.800+/-6.989 in pterygium patients and 13.400+/-3.850 in comparison group with significant difference ( $p < .05$ ). This indicates pterygium patients had moderate OSDI scoring compared to general population.

Fen Y et al.<sup>22</sup> found significantly higher OSDI score (14.2) in pterygium patients. Ning Li<sup>23</sup> found pterygium patients had a significantly elevated OSDI value relative to the controls ( $20.11 \pm 4.27$  and  $12.00 \pm 2.87$ , respectively;  $p < 0.001$ ). Huping Wu et al.<sup>21</sup> found that the OSDI value was significantly higher in pterygium patients than that of volunteers, 20.05 and 12.00 respectively, ( $P < 0.001$ ).

Jiaxinxiao et al.<sup>24</sup> found the hypo secretory MGD group had the highest OSDI score (41.1), suggesting that the actual secretory activity of MG may be an important factor in the development of ocular symptoms.

Mean rank of corneal fluorescein staining in pterygium group was 85.64 and in comparison group, it was 55.36 and the differences were statistically significant indicating that pterygium group was suffering from dry eye disease more than normal population, as corneal fluorescein staining is a good indicator, mentioned in DEWS II criteria for dry eye measurement. Munir Bag et al.<sup>25</sup> found 39% of pterygium patients showed corneal fluorescein staining.

In this study, TBUT was 6.971+/-1.605 sec in pterygium group and 10.471+/-1.603 in comparison group. It indicates that pterygium patients suffer from tear film instability more than normal person. Study already supports that shorter TBUT is associated with tear film instability.<sup>26</sup>

In this study, schirmer's test I was performed and it was 10.14mm in pterygium group and 11.04mm in control group. In pterygium group, ST1 was normal though having significant difference with comparison group. ST1 detects both basal and reflex secretion of tear. In pterygium tear secretion is not decreased, but reflex tear secretion may increase causing normal or increased ST1 test result. Ann Tresa Antony et al.<sup>27</sup> found in their study that the mean +/- standard deviations of Schirmer's 1 test results in pterygium

**Table 1:** Demographic profile of the Pterygium and Comparison group., N (n1+n2)=140(70+70)

Item	Pterygium group		Comparison group		Test statistics
<b>Gender</b>	Male 29(41.4)	Female 41(58.6)	Male 26(37.1)	Female 44(62.9)	$\chi^2$ 0.27 Df 1 P >0.05
<b>Living status</b>	Rural 37(52.9)	Urban 33(47.1)	Rural 32(45.7)	Urban 38(54.)	$\chi^2$ 0.72 Df 1 P >0.05
<b>Occupation</b>	Indoor work 25(37.7)	Outdoor work 45(64.3)	Indoor work 33(47.1)	Outdoor work 37(52.9)	$\chi^2$ 2.188 Df 1 P >0.05

**Table 2:** Mean +/-standard deviation of ocular surface parameters of Pterygium and Comparison group N (n1+n2) = 140(70+70).

Parameters	Pterygium group	Comparison group	Test statistics*
ODSI	24.800+/-6.989	13.400+/-3.850	P<.05 (0.000)
TBUT	6.971+/-1.605	10.471+/-1.603	P<.05(0.000)
Schimer's Test 1	10.143+/-728	11.014+/-1.148	P<.05(0.000)

\* Independent t test done

**Table 3:** Difference between mean rank of Tear meniscus height, Meibomian gland expression score, Lid margin abnormality, Corneal fluorescein staining of Pterygium and Comparison group N (n1+n2) =140(70+70)

Parameter	Pterygium group	Comparison group	Test statistics *
<b>TMH</b>	65.50	75.50	P >0.5(0.084)
Lid margin abnormality	78.50	62.50	P<0.05(0.007)
Meibomian gland expression score	92.86	48.14	P<0.05(0.000)
Corneal fluorescein staining	85.64	55.36	P<0.05(0.000)

\*Mann-Whitney test

eyes and the opposite normal eyes were 12.4 +/- 4.3 and 17.0 +/- 4.3mm, respectively (t = 7.47, p < 0.001) which was statistically significant. Fen Y et al.<sup>12</sup> found mean ST1 was 15.2mm in pterygium group. Mithal et al.<sup>28</sup> found ST1 to be 12.6 mm and 5.2 mm in normal healthy eyes and the eyes of patients with pterygium respectively.

## 6. Conclusion

This study has clearly demonstrated that there is a strong clinical association present between meibomian gland dysfunction which was measured by meibomian gland expression score and lid margin abnormality and altered tear film measured by presence of moderate OSDI score, moderate decrease in tear break up time, moderate corneal fluorescein staining, normal tear meniscus height and normal schirmer's test 1 with pterygium leading to evaporative type of dry eye in pterygium patients. The meibomian gland alteration aggravates the tear instability and ocular surface damage possibly because of the changes in the lipid layer of the tear film. Thus treatment of dry eye and meibomian gland hygiene should also be a part of pterygium management. All the tests of dry eye as well as lid margin with meibomian gland should be observed meticulously in pterygium patients and appropriate tear substitutes with proper advice to take care of lid health and hygiene should be prescribed.

## 7. Limitations of the Study

It would have been better if sample size was larger and the study duration was longer. Randomization could not

be applied so all consecutive patients were included within stipulated period. Results would have improved if it could be conducted in multi-centric way. In our hospital set up, beneficiaries mostly belong to low Socio economic status. It would have been better if community based study could be organized. Fourier Domain- Optical Coherence Tomography (FD-OCT) facility was not available in our set up, so tear meniscus depth and area could not be measured. Meiboscores could not be measured as keratography 5M was not available.

## 8. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

## 9. Source of Funding

None.

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