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

Shilpi Sharma¹, Partha Pratim Pal², Pinaki Sengupta³, Piyali Sarkar¹,*

¹ Dept. of Ophthalmology, Calcutta National Medical College, Kolkata, West Bengal, India
² Dept. of Community Medicine, Institute of Post Graduate Medical Education and Research, Kolkata, West Bengal, India
³ Regional Institute of Ophthalmology, Kolkata, West Bengal, India

A R T I C L E  I N F O
Article history:
Received 04-02-2021
Accepted 15-02-2021
Available online 25-08-2021

Keywords:
Pterygium
Meibomian Gland Dysfunction
Tear Film

A B S T R A C T
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 I (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 in both pterygium group and control group were significantly higher 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.

This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

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".¹,² 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.³ It also causes cosmetic disfigurement. Its prevalence is high in the “pterygium belt” between 30 degrees north and 30 degrees south of the equator.⁴

Ultraviolet light exposure due to outdoor occupation is a major risk factor. Other factors are age, male gender,
rural population and having dry eyes. Genetic factors, tumor suppressor gene p53 and other genes may be involved in the pathogenesis of pterygium. Pathogenesis of pterygium may be initial disruption of the limbal barrier and progressive active conjunctivalisation of the cornea. Tear film abnormalities are also considered to be responsible in the etiopathogenesis. 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. 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 test I, tear meniscus height, tear film break up time and corneal flourescein 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 (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.

Tear film evaluation was done by. Schirmer’s test I(ST1), Tear film break up time (TBUT) values <10 sec and <5 sec 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.

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-pterigium 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>0.05).

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. Recent studies by Zhao L, et al.14 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 china15,16 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 mutagenesis17 which is considered as a precursor of pterygium. Pterygium, in Meiktila Eye Study, Barbados Eye Study,18,19 and Singh PS20 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.12 Huping Wu et al.21 AnaCláudia et al.22 Ning Li et al.23 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.12 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.22 found significantly higher OSDI score(14.2) in pterygium patients. Ning Li23 found pterygium patients had a significantly elevated OSDI value relative to the controls (20.11 ± 4.27 and 12.00 ± 2.87, respectively; p<0.001).Huping Wu et al.21 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.24 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.25 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.26

In this study, schirmer’s test 1 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.27 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 |
|-------------------|-----------------|------------------|-----------------|
| Gender            |                 |                  |                 |
| Male              | 29(41.4)        | Male 26(37.1)    | χ² 0.27 Df 1 P >0.05 |
| Female            | 41(58.6)        | Female 44(62.9)  |                 |
| Living status     |                 |                  |                 |
| Rural             | 37(52.9)        | Rural 32(45.7)   | χ² 0.72 Df 1 P >0.05 |
| Urban             | 33(47.1)        | Urban 38(54.1)   |                 |
| Occupation        |                 |                  |                 |
| Indoor work       | 25(37.7)        | Indoor work 33(47.1) |                 |
| Outdoor work      | 45(64.3)        | Outdoor work 37(52.9) |                 |

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 +/- 1.148| 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 * |
|----------------------------|-----------------|------------------|------------------|
| TMH                        | 65.50           | 75.50            | P >0.5 (0.084)   |
| Lid margin abnormality     | 78.50           | 62.50            | P<0.05 (0.007)   |
| Meibomian gland expression | 92.86           | 48.14            | P<0.05 (0.000)   |
| score                      |                 |                  |                 |
| Corneal fluorescein staining| 85.64           | 55.36            | P<0.05 (0.000)   |

* Mann-Whitney test

eys 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.12 found mean ST1 was 15.2mm in pterygium group. Mithal et al.28 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 setup, 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.

References

1. Coroneo MT, Girolamo D, Wakefield N, D. 1999.
2. Coster D. Pterygium-an ophthalmic enigma. Br J Ophthalmol. 1995;79(4):304–5. doi:10.1136/bjo.79.4.304.
3. Solomon A, Pires RT, Tseng SC. Amniotic membrane transplantation after extensive removal of primary and recurrent pterygia. Ophthalmology. 2001;108(3):449–60. doi:10.1016/s0161-6420(00)00567-4.
4. Lu P, Chen X, Kang Y. Pterygium in Tibetans: a population-based study in China. Clin Exp Ophthalmol. 2007;35(9):828–33. doi:10.1111/j.1442-9071.2007.01630.x.
5. Saw SM, Banerjee K, Tan D. Risk factors for the development of pterygium in Singapore: a hospital-based case control study. *Acta Ophthalmol Scand*. 2000;78(2):216–20. doi:10.1111/j.1755-3768.1982.tb00023.x

6. Ishioka M, Shimamura S, Yagi Y, Tsubota K. Pterygium and dry eye. *Ophthalmologica*. 2001;215(3):209–11. doi:10.1036/s0002-9394(01)00304-0

7. Wong TY, Foster PJ, Johnson GJ, Seah SK, Tan DT. The prevalence and risk factors for pterygium in an adult Chinese population in Singapore: the Tanjong Pagar survey. *Am J Ophthalmol*. 2001;131(2):176–83. doi:10.1016/s0002-9394(01)00702-x

8. 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(1):16–23. doi:10.3126/nepjoph.v5i1.7816

9. Julio G, Lluch S, Pujol P, Alonso S, Merindano D. Tear osmolarity and ocular changes in pterygium. *Cornea*. 2012;31(12):1417–21. doi:10.1097/ICO.0b013e318265f2f8

10. Choo MM, Martin FJ, Theam LC, Reddy SC, Nair SP. Alteration of tear function test in 50 patients with unilateral pterygium. *Int J Ophthalmol*. 2009;2(1):2060–2.

11. Foukis GN, Nichols KK, Bron AJ, Holland EJ, McDonald MB, Nelson JD, et al. Improving awareness, identification, and management of meibomian gland dysfunction. *Ophthalmology*. 2012;119(10):1–12. doi:10.1016/j.ophtha.2012.06.004

12. Ye F, Zhou F, Xia Y, Zhu X, Wu Y, Huang Z, et al. Evaluation of meibomian gland and tear film changes in patients with pterygium. *Indian J Ophthalmol*. 2017;65(3):233–7.

13. Chui JYJ, Coroneo MT. Pterygium pathogenesis, acinic damage, and recurrence. In: Hovanesian J, editor. Pterygium: Techniques and Technologies for Surgical Success. vol. 2012. Thorofare, NJ: Slack Incorporated; p. 1–26.

14. Zhao L, You QS, Xu L, Ma K, Wang YX. Ten-year incidence and associations of pterygium in adult Chinese. *The Beijing Eye Study. Invest Ophthalmol Vis Sci*. 2013;54:1509–14.

15. Wu K, He M, Xu J, Li S. Pterygium in aged population in Doumen County, China. *Yun Ke Xue Bao*. 2002;18(3):181–4.

16. Moran DJ, Hollows FC. Pterygium and ultraviolet radiation: a positive correlation. *Br J Ophthalmol*. 1984;68(5):334–6. doi:10.1136/bjo.68.5.334

17. Durkin SR, Abbury S, Newland HS, Casson RJ, Aung T, Selva D, et al. The prevalence, severity and risk factors for pterygium in central Myanmar: the Meiktila Eye Study. *Br J Ophthalmol*. 2008;92(1):25–9. doi:10.1136/bjo.2007.119584

18. Luthra R, Nemesure BB, Wu SY. Frequency and Risk Factors for Pterygium in the Barbados Eye Study. *Arch Ophthalmol*. 2001;119(12):1827–32. doi:10.1001/archopht.119.12.1827

19. Jensen OL. Pterygium, the dominant eye and the habit of closing one eye in sunlight. *Acta Ophthalmol (Copenh)*. 1982;60(4):568–74. doi:10.1111/j.1755-3768.1982.tb00023.x

20. Singh PS, Singh TR, Singh KB. Prevalence of Pterygium in Imphal, Manipur and its Associated Risk Factors. *Ann Int Med Res*. 2017;3(3):1–4.

21. Wu H. Meibomian Gland Dysfunction Correlates to the Tear Film Instability and Ocular Discomfort in Patients with Pterygium. *Sci Rep*. 2017;7:45115. doi:10.1038/srep45115

22. Wanzeler ACV, Barbosa IAF, Duarte B, Barbosa EB, Borges DA, Alves M, et al. Impact of pterygium on the ocular surface and meibomian glands. *Ophthalmology*. 2013;120(2):307–13.

23. Li N, Wang T, Wang R, Wang R. Tear Film Instability and Meibomian Gland Dysfunction Correlate with the Pterygium Size and Thickness Pre- and Postexcision in Patients with Pterygium. 2019;5935239. doi:10.1155/2019/5935239

24. Jiaxine X. Functional and Morphological Evaluation of Meibomian Glands in the Assessment of Meibomian Gland Dysfunction Subtype and Severity. *Am J Ophthalmol*. 2020;209:160–7.

25. Baigunmir M. Dry Eye Disease and Pterygium. *Pak J Ophthalmol*. 2019;35(3):192–202.

26. Ozcura F, Aydin S, Helvaci MR. Ocular surface disease index for the diagnosis of dry eye syndrome. *Ocul Immunol Inflamm*. 2007;15(5):389–93. doi:10.1080/09273940701486803

27. Ann A, Tresa. Pterygium and Dry Eye- A Clinical Correlation. *J Med Clin Res*. 2017;5(6):23654–9. doi:10.18535/jmscr/v5i6.141

28. Viso E, Gude F, Rodriguez-Ares MT. Prevalence of pinguecula and pterygium in a general population in Spain. *Eye (Lond)*. 2011;25(3):350–7. doi:10.1038/srep45115

29. Ishioka M, Shimmura S, Yagi Y, Tsubota K. Pterygium and dry eye. *Acta Ophthalmol Scand*. 2000;78(2):216–20. doi:10.1111/j.1755-3768.1982.tb00023.x

Cite this article: Sharma S, Pal PP, Sengupta P, Sarkar P. A study of meibomian gland and tear film changes in patients with pterygium in a tertiary care centre. *Panacea J Med Sci* 2021;11(2):336–340.