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Prevalence of dry eye disease in Meibomian gland dysfunction

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Abstract

Purpose

1. To study the prevalence of dry eye disease in meibomian gland dysfunction.
2. To correlate severity of dry eye with severity of meibomian gland dysfunction.

Method: A prospective observational study of 50 patients with meibomian gland dysfunction for the presence of dry eye was conducted in a study period of January 2024 to May 2024. Dry eye symptoms were assessed with OSDI questionnaire. Detailed slit lamp examination and dilated fundus examination was done. Schirmer's and TBUT were performed. Statistical analysis was done to correlate the severity of dry eye with that of meibomian gland dysfunction.

Results: We included a total of 100 eyes of 50 patients, out of which 23 patients (46%) were males and 27 patients (54%) were female. The mean age of the patients was 57.53 ± 13.36 years. Most of the patients with MGD were diagnosed with dry eye disease. Statistical analysis showed a significant correlation between severity of MGD with that of dry eye disease.

Conclusion: This study highlights the significance of dry eye evaluation in MGD patients.

Keywords: Dry eye disease, Meibomian gland dysfunction, Schirmer's test, Tear breakup time, OSDI questionnaire

Introduction

Dry eye is defined as a *multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface*, according to the International Dry Eye Workshop (DEWS) in 2007 ^[1].

Dry eye disease can cause various symptoms like ocular irritation, discomfort, blurred vision and sometimes even blindness in severe cases, thus, hampering the quality of life of the patient ^[2].

Meibomian gland dysfunction is one of the common causes of dry eye disease ^[3]. It is an abnormality of the Meibomian gland that obstruction of the gland and also qualitative changes in the glandular secretion ^[4]. It causes decrease in the lipid layer secretion in the tear film resulting in evaporation of the aqueous layer thus causing evaporative dry eye.

Objectives:

3. To study the prevalence of dry eye disease (DED) in Meibomian gland dysfunction (MGD)
4. To correlate severity of dry eye with severity of meibomian gland dysfunction.

Inclusion criteria

1. Patients with age ≥ 40 years with meibomian gland dysfunction

Exclusion criteria

1. History of diabetes
2. History of systemic disorders like thyroid, autoimmune diseases, Sjogren's syndrome.
3. History of ocular surgery within 6 months.

- History of ocular surgery within 6 months.
- Patients on drugs like antihistamines, beta blockers, anticholinergics, diuretics, tricyclic antidepressants, oral contraceptive pills which effects the tear production.
- History of increased screen time.

Methods

In this prospective observational study, 50 patients who came to ophthalmology outpatient department in BGS Global Institute of Medical Sciences Hospital with meibomian gland dysfunction were included.

Detailed history was taken.

Visual acuity was assessed for both distant and near using Snellen's chart.

Detailed slit lamp evaluation was done where the meibomian glands were assessed. The gland orifices and the secretions were examined and graded. It was graded as follows,

Grade 0: Normal

Grade 1: No obstruction of the Meibomian gland orifices but telangiectasias.

Grade 2: Plugged Meibomian gland orifices with translucent serous secretion when the lid margin was compressed.

Grade 3: Plugged Meibomian gland orifices with viscous or waxy white secretion when the lid margin was compressed.

Grade 4: Plugged Meibomian gland orifices and no secretion when the lid margin was compressed^[5].

Schirmer's test was performed on all the patients using what man filter paper no 41, measuring 5*35 mm which was inserted into the lower fornix at the junction of medial 2/3 and lateral 1/3. At the end of 5 min, the amount of wetting of the paper was noted. Any value less than 10mm was considered abnormal.

TBUT (Tear Breakup Time) was performed using a 2% fluorescein strip. The lower fornix was stained with the fluorescein strip. The patient was seated on the slit lamp and was advised to look straight without blinking. Under broad beam of cobalt blue light, the time taken for the appearance of the random dark spot was noted. A value less than 10 was considered abnormal.

OSDI (Ocular surface disease index) is a questionnaire used to assess the symptoms in dry eye disease and also their effect on vision. It has a 12 items questionnaire which assesses dry eye symptoms and its effect on vision in the past one week.

The questionnaire has 3 subscales: ocular symptoms, vision-related function, and environmental triggers. Patients rate their responses on a 0 to 4 scale with 0 corresponding to "none of the time" and 4 corresponding to "all of the time"^[6].

Ocular Surface Disease Index® (OSDI®)²

Ask your patients the following 12 questions, and circle the number in the box that best represents each answer. Then, fill in boxes A, B, C, D, and E according to the instructions beside each.

| Have you experienced any of the following during the last week? | All of the time | Most of the time | Half of the time | Some of the time | None of the time |
|---|-----------------|------------------|------------------|------------------|------------------|
| 1. Eyes that are sensitive to light? .. | 4 | 3 | 2 | 1 | 0 |
| 2. Eyes that feel gritty? | 4 | 3 | 2 | 1 | 0 |
| 3. Painful or sore eyes? | 4 | 3 | 2 | 1 | 0 |
| 4. Blurred vision? | 4 | 3 | 2 | 1 | 0 |
| 5. Poor vision? | 4 | 3 | 2 | 1 | 0 |

Subtotal score for answers 1 to 5 (A)

| Have problems with your eyes limited you in performing any of the following during the last week? | All of the time | Most of the time | Half of the time | Some of the time | None of the time | N/A |
|---|-----------------|------------------|------------------|------------------|------------------|-----|
| 6. Reading?..... | 4 | 3 | 2 | 1 | 0 | N/A |
| 7. Driving at night? | 4 | 3 | 2 | 1 | 0 | N/A |
| 8. Working with a computer or bank machine (ATM)?..... | 4 | 3 | 2 | 1 | 0 | N/A |
| 9. Watching TV? | 4 | 3 | 2 | 1 | 0 | N/A |

Subtotal score for answers 6 to 9 (B)

| Have your eyes felt uncomfortable in any of the following situations during the last week? | All of the time | Most of the time | Half of the time | Some of the time | None of the time | N/A |
|--|-----------------|------------------|------------------|------------------|------------------|-----|
| 10. Windy conditions?..... | 4 | 3 | 2 | 1 | 0 | N/A |
| 11. Places or areas with low humidity (very dry)? | 4 | 3 | 2 | 1 | 0 | N/A |
| 12. Areas that are air conditioned?... | 4 | 3 | 2 | 1 | 0 | N/A |

Subtotal score for answers 10 to 12 (C)

Add subtotals A, B, and C to obtain D (D = sum of scores for all questions answered) (D)

Total number of questions answered (do not include questions answered N/A) (E)

Please turn over the questionnaire to calculate the patient's final OSDI® score.

Fig 1: Ocular Surface Disease Index Questionnaire

A final score is calculated which ranges from 0 to 100 with scores 0 to 12 representing normal, 13 to 22 representing mild dry eye disease, 23 to 32 representing moderate dry eye disease, and greater than 33 representing severe dry eye disease.

Statistical Analysis

Kruskal Wallis test was used to find the median difference in Schirmer, TBUT, OSDI values on both the eyes & age among the different grades of MGD at p value < 0.05 and was found to have statistically significant difference in the median values of Schirmer, TBUT & OSDI values.

Results

In our study, we included a total of 100 eyes of 50 patients, out of which 23 patients (46%) were males and 27 patients (54%) were female. The mean age of the patients was 57.53 ± 13.36 years.

Meibomian gland dysfunction was present in all the patients with majority of patients i.e. 21 patients or 42 eyes (42%) having grade 1 MGD. 19 patients or 38 eyes (38%) had grade 2 MGD, 7 patients or 14 eyes (14%) had grade 3 MGD and the remaining 3 patients or 6 eyes (6%) had grade 4 MGD.

Table 1: Meibomian gland dysfunction grade and the no of patients in each

| Meibomian gland dysfunction grade | No of patients |
|-----------------------------------|----------------|
| Grade 1 | 21 |
| Grade 2 | 19 |
| Grade 3 | 7 |
| Grade 4 | 3 |

Schirmer's Test

Table 2: Schirmer's test in right eye

| | | MGD Right Eye | | | | |
|----------|---------|---------------|---------|---------|---------|-------|
| | | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Total |
| Schirmer | Dry eye | 13 | 19 | 7 | 3 | 42 |
| | Normal | 8 | 0 | 0 | 0 | 8 |
| | Total | 21 | 19 | 7 | 3 | 50 |

In the right eye, in total of 21 patients having Grade 1 MGD, 13 patients had Schirmer's < 10mm and 8 patients had Schirmer's > 10mm. All the patients with Grade 2, Grade 3 and Grade 4 MGD i.e. 19 patients, 7 patients and 3 patients respectively had Schirmer's < 10mm.

Statistically significant number of patients had dry eye disease in right eye according to Schirmer's test. (P value < 0.009)

Table 3: Schirmer's test in left eye

| | | MGD Left Eye | | | | |
|----------|---------|--------------|---------|---------|---------|-------|
| | | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Total |
| Schirmer | Dry eye | 12 | 19 | 7 | 3 | 41 |
| | Normal | 9 | 0 | 0 | 0 | 9 |
| | Total | 21 | 19 | 7 | 3 | 50 |

In the left eye, in total of 21 patients having Grade 1 MGD, 12 patients had Schirmer's < 10mm and 9 patients had Schirmer's > 10mm. All the patients with Grade 2, Grade 3 and Grade 4 MGD i.e. 19 patients, 7 patients and 3 patients respectively had Schirmer's < 10mm.

Statistically significant number of patients had dry eye disease in left eye according to Schirmer's test. (P Value 0.001)

Tear break up time (TBUT)

Table 4: Tbut in right eye

| | | MGD RIGHT EYE | | | | |
|------|---------|---------------|---------|---------|---------|-------|
| | | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Total |
| TBUT | Dry eye | 20 | 19 | 7 | 3 | 49 |
| | Normal | 1 | 0 | 0 | 0 | 1 |
| | Total | 21 | 19 | 7 | 3 | 50 |

In the right eye, in total of 21 patients having Grade 1 MGD, 20 patients had TBUT < 10 seconds and 1 patient had TBUT > 10 seconds. All the patients with Grade 2, Grade 3 and Grade 4 MGD i.e. 19 patients, 7 patients and 3 patients respectively had TBUT < 10 seconds.

Statistically significant number of patients had dry eye disease in right eye according to TBUT. (P Value < 0.001)

Table 5: Tbut in left eye

| | | MGD LEFT EYE | | | | |
|------|---------|--------------|---------|---------|---------|-------|
| | | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Total |
| TBUT | Dry eye | 21 | 19 | 7 | 3 | 50 |
| | Normal | 0 | 0 | 0 | 0 | 0 |
| | Total | 21 | 19 | 7 | 3 | 50 |

In the left eye, all the patients i.e. 21 of Grade 1 MGD, 19 patients with Grade 2 MGD, 7 patients with Grade 3 MGD and 3 patients with Grade 4 MGD had TBUT < 10 seconds. All the patients had dry eye in the left eye according to TBUT ($p < 0.001$).

OSDI Questionnaire

In our study, according to the OSDI questionnaire, out of 21 patients with MGD Grade 1, 4 patients were normal, 15 patients had mild dry eye, 1 patient had moderate and 1 with severe dry eye.

Out of 19 patients with MGD Grade 2, 1 patient had mild dry eye, 17 had moderate dry eye and 1 patient had severe dry eye.

Out of 7 patients with MGD Grade 3, 2 patients had moderate dry eye and 5 patients had severe dry eye. All the 3 patients with MGD Grade 4 had severe dry eye.

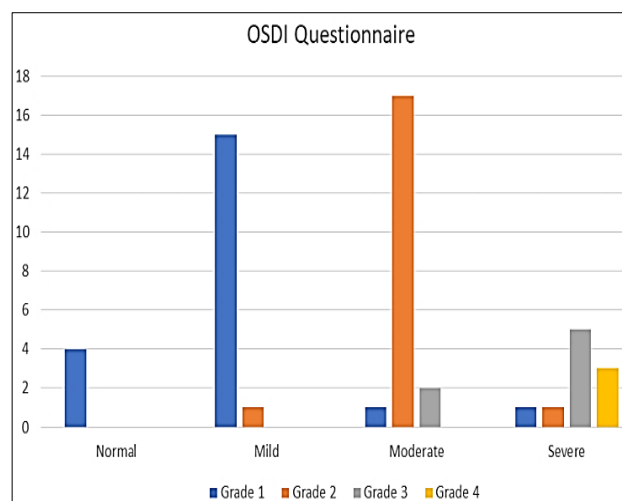


Fig 2: OSDI Questionnaire

Discussion

In our study 50 patients i.e. 100 eyes were included with the mean age group of 57.54 ± 13.36 years ranging from 17-90 years. The number of female patients were 27 (54%) and the number of male patients were 23 (46%).

Schirmer's test

Out of 50 patients, in the right eye 84% had Schirmer's values < 10 mm and in the left eye, 82% patients had Schirmer's values < 10 mm. The Schirmer's values are statistically significant. ($P=0.009$ and 0.001 in right eye and left eye respectively). Hence, there is a positive correlation between MGD and Schirmer's test.

A study by Louis Tong *et al.*, on screening for MGD and its relation to dry eye subtypes in a tertiary referral in Singapore showed a similar correlation between Schirmer's test and MGD [7].

Tear film Break up Time (TBUT)

In the total of 50 patients, TBUT < 10 seconds was seen in 98% patients in the right eye ($p < 0.001$) and in all the patients i.e. 100% in the left eye ($P=0.001$). The tear film break up time was statistically significant.

This shows a positive correlation between MGD and TBUT. There are no relatable study comparing the Grade of MGD with TBUT values.

OSDI questionnaire

In our study, most of the patients with Grade 1 MGD had mild dry eye according the OSDI questionnaire, whereas majority of the patients with grade 2, 3 and 4 MGD had moderate to severe dry eye according to the questionnaire.

In a study by Yi Ran Chiou *et al.* on differential characteristics asymptomatic and symptomatic meibomian gland dysfunction and those with dry eye had OSDI of asymptomatic MGD, symptomatic MGD and MGD coexisting with DED were 8.5 ± 2.9 , 28.5 ± 12.8 and 27.9 ± 10.5 , respectively [8].

Hence, we may infer that the meibomian gland dysfunction has a major effect on ocular irritation and also the quality of vision in the patients.

Conclusion

We can conclude that there is high prevalence of dry eye disease in patients with meibomian gland dysfunction. We have also seen in our study that the severity of dry eye disease correlates with the severity of meibomian gland dysfunction.

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