All India Ophthalmological Society Guidelines

Meibomian Gland Dysfunction

AIOS Focus Group Meeting
29th July, 2017
AIOS thanks All the Participants and Cipla

List of Participants
AIOS – MGD Guidelines Meeting
Le Meridian, New Delhi  |  29 July 2017

1. Dr. Bharti Lavingia
2. Dr. Jagruti Jadeja
3. Dr. Sidharth Kothari
4. Dr. Paras Mehta
5. Dr. Arundhati Borthakur
6. Dr. A. K. Jain
7. Dr. Rishi Mohan
8. Dr. Rajib Mukherjee
9. Dr. Rajesh Sinha
10. Dr. Abhishek Chandra
11. Dr. Ashok Sharma
12. Dr. Namrata Sharma
13. Dr. J. S. Titlyal
14. Dr. Ikeda Lal
15. Dr. Kishor Narula
16. Dr. Mukesh Taneja
17. Dr. Himanshu Matalia
18. Dr. Lional Raj
19. Dr. Rekha Gyanchandra
20. Dr. Vinay Pillai
21. Dr. Rishi Swarup
22. Dr. Arjun Srirampur
23. Dr. Jayanshu Sengupta
24. Dr. Prafulla K. Maharana
25. Dr. Pranita Sahay
26. Dr. Deepali Singhal
27. Dr. Jayanand Urkude
28. Dr. Kishor Narula

Coordinators:
Dr. Prafulla K Maharana, Dr. Pranita Sahay, Dr. Deepali Singhal, and Dr. Jayanad Urkude

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All India Ophthalmological Society
8A, Karkardooma Institutional Area, Near DSSSB Building,
Manglam Road, Karkardooma, Delhi-110092
Telephone: 011 - 22373701-05
E-mail: aiosoffice@aios.org
Website: www.aios.org

For any suggestions please write to
Hony. General Secretary
AIOS
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MEIBOMIAN GLAND DYSFUNCTION (MGD) IS A MAJOR CAUSE OF OCULAR MORBIDITY IN INDIA. ALTHOUGH THE DISEASE MAY NOT BE VISUALLY DISABLING, ITS CHRONICITY AND SLOW RESPONSE TO THERAPY OFTEN AFFECTS THE LIFESTYLE OF THE PATIENT. IT IS OFTEN UNDER-DIAGNOSED BY MOST OF THE PHYSICIANS. MOST OF THE PATIENTS ARE PRESCRIBED VARIOUS GROUPS OF TOPICAL LUBRICANTS WITHOUT A PROPER UNDERSTANDING OF THE DISEASE PATHOPHYSIOLOGY BY THE TREATING PHYSICIAN.

DESPITE ITS FREQUENT OCCURRENCE, THERE IS NO CONSENSUS REGARDING ITS DEFINITION, DIAGNOSIS AND MANAGEMENT. WE AT AIOS, IN KEEPING WITH OUR PRINCIPLE OF “AIOS FOR ALL”, DECIDED TO COME OUT WITH GUIDELINES DEvised BY AN EXPERT PANEL TO HELP THE GENERAL OPHTHALMOLOGISTS IN OUR COUNTRY ATTAIN A BETTER UNDERSTANDING OF THIS DISEASE. ACCORDINGLY, AN EXPERT PANEL DISCUSSION WAS CONDUCTED, WHICH INVOLVED EXPERIENCED OPHTHALMOLOGISTS WORKING IN THE FIELD OF CORNEA AND OCULAR SURFACE FROM ALL CORNERS OF THE COUNTRY TO ESTABLISH A SIMPLIFIED PROTOCOL FOR THE DIAGNOSIS AND MANAGEMENT OF MGD. WHILE PREPARING THESE GUIDELINES, DUE CONSIDERATION WAS GIVEN TO “THE INTERNATIONAL WORKSHOP ON MEIBOMIAN GLAND DYSFUNCTION BY TEAR FILM AND OCULAR SURFACE SOCIETY” AND “OSMOPROTECTION”

AIOS ACKNOWLEDGES THE EFFORTS OF CIPLA LTD. IN THIS CONDUCTION AND FORMULATION OF THE FOCUS GROUP MEETING.

THIS ENDREAVOUR COULD NEVER HAVE BEEN COMPLETED WITHOUT THE SPONSORSHIP AND COMMITMENT OF CIPLA LTD. AND THE INITIATIVE TAKEN BY THE HON. GENERAL SECRETARY, AIOS.

AIOS ALSO ACKNOWLEDGES THE TIME AND EFFORTS PUT IN BY THE RESIDENT DOCTORS – DR. PRAFULLA K MAHARANA, ASST PROFESSOR, RPC, DR. PRANITA S AHAY, DR. DEEPAI SINGHAL, AND DR. JAYANAD URKUDE – IN WRITING THE MANUSCRIPT FOR THE GUIDELINES.

THIS DOCUMENT IS PUBLISHED BY

**Prof. (Dr.) Namrata Sharma**
Hony. General Secretary,
All India Ophthalmological Society

**AIOS HEADQUARTERS:**
8A, Karkardooma Institutional Area,
Near DSSB Building, Manglam Road
Karkardooma, Delhi-110092
Tel.: 011- 22373701-05
Dear Friends,

The All India ophthalmological Society is an academic body meant for dissemination of scientific knowledge amongst all its members. For the same purpose, various conferences have been organized over the last so many years. However, there was always the need for a consensus on the management protocol of various clinical disorders. For the same reasons we started the Focussed group meetings to have a discussion at length amongst the leaders of various subspecialties to arrive at a consensus regarding the management protocol of a particular ocular condition. The basic idea is to enable the practicing ophthalmologists to understand the main ideas and concepts of various clinical entities and to apply them to solve problems in familiar and unfamiliar situations. This consensus can serve as a guideline for the general ophthalmologists not only to manage the patients in their clinical practice but also to explain to the patients that their management has been done as per a set guidelines by the experts in that particular field so that in case of suboptimal response to treatment they can defend themselves. Although such guidelines may not be useful as a document to protect anyone in a court of law, however they can always be produced to support the point of the ophthalmologists that he / she has followed a defined guidelines made by the experts in that specialty and hence no error was done. Apart from all these, it will definitely have a positive impact on the eye care facilities provided to our patients.

To create such guidelines on Meibomian Gland Dysfunction, notable experts in the field of Cornea & Ocular Surface from the entire country were invited. A detailed questionnaire was prepared related to the understanding of the clinical condition and the management protocol of the same. It was then put forward to each expert present in the meeting. There was a detailed discussion on each issue and a consensus was arrived at every point. The whole matter was finally read out and discussed again to fine tune the matter. This was then converted in the form of guidelines and sent for publication. I would like to thank Dr Prafulla K Maharana, Dr Pranita Sahay & Dr Deepali Singhal for the efforts that they have made in compiling the whole guideline.

I hope that the efforts of all the experts in the field of Cornea & Ocular surface and AIOS will be of immense use for the practicing ophthalmologists in managing cases of meibomian gland dysfunction. We are ready with guidelines related to other ophthalmic conditions as well and we have already planned for more focussed group meetings and consensus guidelines on various ophthalmic disorders in future.

Best regards

Rajesh Sinha
Hony. Treasurer, AIOS
Governing Council

Dr. K. S. Santhan Gopal
President
president@aios.org
09844110288

Dr. Ajit Babu Majji
President Elect
presidentelect@aios.org
09391026292

Dr. S. Natarajan
Vice President
vicepresident@aios.org
09920041419

Prof. Namrata Sharma
Hony. General Secretary
secretary@aios.org
09810856988

Prof. Rajesh Sinha
Hony. Treasurer
treasurer@aios.org
09868937900

Dr. Lalit Verma
Chairman Scientific Committee
chairmanscientificcommittee@aios.org
09810299934

Dr. Arup Chakrabarti
Editor Proceedings
editorproceedings@aios.org
09946410540

Dr. Santosh G Honavar
Editor Journal
editorjournal@aios.org
09848304001

Dr. Partha Biswas
Chairman ARC
chairmanarc@aios.org
09830531457

Dr. D. Ramamurthy
Immediate Past President
imppresident@aios.org
09443317791
<table>
<thead>
<tr>
<th>TITLE</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>04</td>
</tr>
<tr>
<td>Classification</td>
<td>05</td>
</tr>
<tr>
<td>Epidemiology and Risk Factors</td>
<td>06</td>
</tr>
<tr>
<td>Pathophysiology</td>
<td>06</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>07</td>
</tr>
<tr>
<td>Investigations in MGD</td>
<td>08</td>
</tr>
<tr>
<td>Management of MGD</td>
<td>11</td>
</tr>
<tr>
<td>Bibliography</td>
<td>14</td>
</tr>
</tbody>
</table>
**Definition**

Meibomian gland dysfunction (MGD) has been defined by several authors in different ways. A simple way to define MGD is as below:

“It is a disease of the meibomian gland characterized by its diffuse involvement with alteration in quantity or quality of its secretion, which may or may not be associated with terminal duct obstruction. It leads to symptoms of dry eye, ocular surface irritation and signs of ocular surface inflammation, often chronic, with intermittent acute exacerbation.”

The altered secretion is characterized by the presence of any of the following:

1. Increase in viscosity
2. Altered colour – yellow or white (Figure 1)
3. Turbid secretion (Figure 1)
4. Frothy secretion (Figure 2)
5. Toothpaste-like secretion (Figure 3)
6. Capping of the meibomian gland duct (Figure 4)
It is important to have a thorough understanding of the classification of MGD so that a proper treatment regimen can be planned for the patient. MGD can be classified as follows:

- **Primary:** Only affecting the meibomian gland with no associated ocular or systemic pathology.
- **Secondary:** Meibomian gland disorder secondary to an ocular or systemic pathology

Secondary MGD is further classified as below:

- **Ocular:** Association with trachoma/ocular cicatricial pemphigoid/Stevens-Johnson syndrome (SJS)/cicatrizing conjunctivitis/atopy
- **Systemic:** Association with acne rosacea/seborrhoeic dermatitis/erythema multiforme/atopy/psoriasis/medications (antihistaminics, antidepressants, retinoids, anti-androgens, postmenopausal hormones)

**Figure 5:** The new classification system proposed by the International Workshop on MGD
Epidemiology and Risk Factors

The reported incidence of MGD is 68% in the Chinese population, 69% in the Japanese population, and 3.5–19.9% in Caucasians.(1) There are few studies that have examined the incidence of MGD in India. Basak et al. reported the prevalence of various grades of MGD in India as 31.7%.(3)

The associated risk factors for MGD include the following:

<table>
<thead>
<tr>
<th>Ophthalmic</th>
<th>Systemic</th>
<th>Medication-related factors</th>
<th>Occupational</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Anterior blepharitis</td>
<td>- Ageing</td>
<td>- Benign prostatic hyperplasia (BPH) on anti-androgens</td>
<td>- Outdoor workers</td>
</tr>
<tr>
<td>- Contact lens wear</td>
<td>- Androgen deficiency</td>
<td>- Postmenopausal hormone therapy (e.g. oestrogens and progestins)</td>
<td>- Continuous indoor work in air conditioning</td>
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<tr>
<td>- Demodex folliculorum</td>
<td>- Menopause</td>
<td>- Antihistaminics</td>
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<tr>
<td>- Dry eye disease</td>
<td>- Sjogren's syndrome</td>
<td>- Antidepressants</td>
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<td>- Cholesterol levels</td>
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<td></td>
<td>- Diabetes mellitus</td>
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Figure 6: The associated risk factors for MGD

Pathophysiology

Clinical Anatomy

Meibomian glands are modified sebaceous glands present in the tarsal plate of both the upper and lower eyelids. Nearly 30–40 meibomian glands are present in the upper lid while only 10–20 in the lower lid. The glands are densely innervated and their secretion ‘meibum’ is regulated by various hormones such as androgens, oestrogens, progestins, retinoic acid, growth factors and, possibly, by neurotransmitters. Meibum primarily consists of polar and non-polar lipids, which serve the major function of preventing evaporation of the tear film.

Underlying Mechanisms

Role of infection: Though the role of infection in the causation of MGD is controversial, infection with commensals such as Staphylococcus aureus and Propionbacterium acne has been reported in the pathogenesis of MGD. These microbes are associated with the release of esterase and lipase, which cause surface inflammation, leading to hyperkeratinization as well as alteration in the composition of meibum due to the release of free fatty acids. This causes an increase in the melting point of the meibum, which causes its stagnation.(4) Also, Demodex infection in the pathogenesis of MGD has been reported by several authors.(5)
**Duct obstruction:** Duct obstruction is one of the most important factors implicated in the pathogenesis of MGD. It can occur due to either hyperkeratinization of the ducts or due to altered viscosity of the meibum, leading to its stagnation.

**Hormonal influence:** Various hormones are implicated in the development of MGD, such as androgen, oestrogen, progesterone, and retinoic acid and growth factors.

**Secondary to dry eye disease:** Severe dry eye such as OCP (Ocular cicatricial pemphigoid) and SJS (Stevens-Johnson Syndrome) can lead to keratinization and hypertrophy of the meibomian gland ducts, leading to subsequent duct opening obstruction and MGD.\(^2\)

**Diagnosis**

**Clinical Examination**

To begin with the clinical examination of a case of MGD, prior to slit-lamp examination, it is essential to assess the features of a dry eye as follows:

1. **Assessment of blink rate and inter-blink interval:** Normal blink rate varies from 14 to 18 times/min.

2. **Examination of the eyelid and its margin:** Compromised eyelid morphology (tylosis, entropion, ectropion, trichiasis and dystichiasis) can predispose to MGD (Figures 7 and 8).

Also, the surrounding skin is assessed for features of rosacea, such as telangiectasia, as it is an important precursor for MGD. The meibomian gland duct orifices are assessed, whether open or capped (Figures 9 and 10).

![Figure 7: Tylosis with lid margin notching](image1)

![Figure 8: Tylosis with distichiasis](image2)

![Figure 9: Patient's meibomian gland with clear meibum](image3)

![Figure 10: Meibomian gland duct openings being assessed under cobalt blue light with fluorescein dye](image4)
3. Assessment of tear film: Normal tear meniscus height is more than 0.25 mm.

4. Tear film breakup time (TBUT): On fluorescein staining, normal time taken by tear film to break up is >10 secs. A TBUT <10 secs is suggestive of dry eye. The stability of tear film is largely dependent upon its lipid layer, which is secreted by the meibomian glands, but it can also be altered in aqueous-deficient dry eye. Therefore, TBUT cannot differentiate between MGD and DED (Dry Eye Disease).

5. Ocular surface staining: The corneal surface is best assessed with fluorescein, whereas lissamine green is best for the conjunctiva. The ocular surface staining pattern is given a clinical score that is useful not only for diagnosis but also for follow-up assessment of the patient. The most commonly used scoring system is the National Eye Institute (NEI) grading system.

6. Meibomian gland expression: Expressibility of the central gland is assessed along with the nature of the meibum – clear (Figure 9), cloudy (Figure 1) or toothpaste-like (Figure 3).

Investigations in MGD

MGD is primarily a clinical diagnosis but a series of tests may be required for confirming evaporative dry eye and for monitoring the disease, and also for research purposes. The tests can be divided into two categories:

- Routine tests suitable for general ophthalmologists
- Specialized tests

A suitable order of tests is required to be performed to minimize the extent to which one test may influence the other one. The recommended sequence of general tests with the most invasive tests is as follows:

- Symptom questionnaire
- Blink rate and blink interval
- Tear meniscus height
- Tear osmolarity
- Instillation of fluorescein and measurement of the TFBUT and Ocular Protection Index (OPI)
- Grading of corneal and conjunctival fluorescein staining
- Lid examination and expression
- Meibography
- Schirmer’s test or alternative (phenol red-thread test)

Specialized tests:

- Interferometry – Lipiview
- IVCM (In-vivo confocal microscopy)

1. Measurement of blink rate and blink interval

Blink rate is measured as the number of blinks in 1 minute. Inter-blink interval (IBI) is calculated as 60 divided by the blink rate. These values are used to calculate the OPI. The OPI is calculated by dividing the TFBUT by the IBI. If the OPI score is <1, a patient’s cornea is at risk for exposure due to evaporative
dry eye and if the OPI score is 1, it is not. This approach has proven to be useful in assessing factors that cause dry eye and evaluating the response to treatment.

2. **Tear meniscus height (TMH)**

The TMH can be measured on a slit lamp, with or without fluorescein instillation (Figure 11).\(^1,2\)

A normal TMH has been stated to be between 0.2 and 0.3 mm.\(^1,2\) TMH can be measured using a Topcon SL6E slit-lamp biomicroscope with a video recorder. This technique can be used to obtain a substantially magnified image of the lower marginal tear strip and the TMH is measured as the distance between the darker edge of the lower eyelid and the top of the reflex from the tear strip.\(^6\) Recently, meniscus height measurement has been described by using anterior-segment optical coherence tomography (OCT; RTVue, Optovue), which has the advantage of being a non-invasive in vivo technique for the quantitative measurement of the tear film and tear menisci. They reported the sensitivity and specificity of TMH for dry eye diagnosis to be 80.56% and 89.33%, respectively.\(^6\)

3. **Tear film osmolarity**

It indicates the balance between tear secretion and evaporation. Hyper-osmolarity is a good indicator of the severity of ocular surface damage in dry eye. This can be determined by a sampling of tears using the TearLab Osmolarity System (Figure 12). Tear osmolarity is graded within the ranges of mOsmls/l: normal (275–300), mild (303–310), moderate (320–335), and severe (350).\(^7\)

4. **TBUT (Tear-film Break-up Unit Time)**

TBUT is an indicator of tear film stability. It is defined as the interval between the last blink and the appearance of the first randomly distributed dry spot. This may be affected in cases of lipid layer deficiency, leading to evaporative dry eye. So, it is a good indicator of dry eye in MGD though it may be affected in some cases of aqueous deficiency dry eye. A TBUT value of <10 seconds is considered to be abnormal.\(^2\)

5. **Ocular surface staining**

It is an important indicator of ocular surface damage due to dry eye though not specific for MGD. This has been described by using a 2% flourescien stain or a lissamine green 1% for conjunctiva or a rose bengal stain.\(^7\) Various grading systems have been proposed, such as the National Eye Institute (NEI) grading and Bijstervald grading, for evaluating the severity of damage as well as for monitoring the treatment response. It has been reported that staining along the upper and lower lid margins is more likely to be associated with MGD or some form of blepharitis, and central staining is more likely to be related to an aqueous-deficient dry eye.\(^2\)
6. **Schirmer’s test**

This test should be the final test to be performed in routine practice since it can influence the results of staining tests. A score of <5 mm in 5 minutes (without anaesthesia) is an indicator of severe dry eye. This test mainly indicates aqueous-deficient DED, whereas patients with evaporative DED may also have reflex or reduced tear production. (1,2,4) This test may be used to differentiate between primary MGD (normal test) and conditions associated with decreased tear production along with instability, such as rosacea and aqueous-deficient DED (Figure 13).

7. **Meibography**

This is a specialized technique developed solely for directly observing the morphology of the meibomian glands in vivo.(1,2,4) This technique is important for the documentation of glands at baseline examination, as well as for monitoring the treatment response during follow-up. Thus, it allows for both qualitative and quantitative measurements of the meibomian gland morphology and gland loss. Whereas traditional meibography (contact method using a probe) is difficult to apply to the upper eyelid, non-contact meibography, which is a recent technique, allows for observation of both the upper and lower eyelids.(1,2,4)

Recently, a portable, non-contact infrared meibography system based on a charge-coupled device (CCD) video camera has been described. Commercially available instruments include the BG-4M (Topcon, Tokyo, Japan) for the slit-lamp examination, which is based on an infrared illumination system with an external infrared CCD camera; the Meibom Pen (Japan Focus Corp., Tokyo, Japan), which is a mobile pen-shaped meibography device; and, the Keratograph 5M (Oculus, Wetzlar, Germany).(1,2,4) Quantitative grading of MG loss is described with the use of the Meiboscore, which varies from grade 0 to 3 depending upon the area of loss.(1,2,4) An autorefractometer can also be used for meibomian gland assessment by general ophthalmologists (Figure 14).

**Specialized tests**

1. **Interferometry**

This technique is used to analyse the lipid layer of the tear film.(8,9) Tearscope (Keeler Ltd Windsor, UK), which was the first device used for this purpose, projects a cylindrical white fluorescent light on the tear film lipid layer (TFLL) and the interference images generated are used to evaluate the tear film. (10) These patterns can also be captured using the DR-1 camera (Kowa, Nagoya, Japan) and severity can be graded according to the Yokoi dry eye grading system.(11)
The most recent invention is the Lipiview interferometer (Tear Science Inc., Morrisville, NC, USA), which uses white-light interferometry to form a pattern that is termed an interferogram. This technique measures the lipid layer thickness, which, if found to be low, would indicate MGD. Quantitative results for TFLL can be obtained by using the dynamic lipid layer interference patterns (DLIP) test, which measures the interference pattern of the lipid layer on the central area of the tear film in between blinks.\(1,2,4\)

2. **In vivo confocal laser microscopy**

It is a contact procedure that has been evaluated for the examination of meibomian glands. It can be used to assess the acinar density and diameter, secretion reflectivity and peri-glandular inflammation in patients with MGD.\(1,2,4\) It has been reported that patients with MGD had an increased acinar unit diameter due to the collection of secretions with decreased acinar unit density. This emerging technology can be used as a diagnostic adjunct tool for in vivo examination of the meibomian glands. It can also be used to image the resident Demodex mites in the meibomian gland orifices.\(5\)

### Management of MGD

1. **Conventional treatment (warm compresses and lid massage)**

The conventional treatment includes two components, i.e. warm compresses followed by an eyelid massage. Even though it is recommended by ophthalmologists, there are variations in the technique and duration. Another grey area in following this simple yet effective traditional technique is patient understanding and compliance. We recommend a method to generalize the technique. Warm compresses need to be done at a temperature of 40°C for 2 minutes and then repeated for 2 minutes, i.e. a total of 4 minutes each twice daily. Warm compresses can be done with a warm wet cloth and should be immediately followed by an eyelid massage.

The technique of eyelid massage is as follows:

- The traction should be given on the lateral canthus to tighten the lamella of both the upper and lower lid associated with downward and upward movement of index or middle finger against the eyeball from medial to lateral canthus.
- Pinching upper lid to lower lid can help in expression of cheesy material out of ducts.
- A spatula can also be used underneath tarsal plate to exert pressure of lid while milking out meibomian glands secretions.

Conventional treatment is a crucial component in the management of MGD. Warm compresses liquefy the lipid in the obstructed meibomian glands and its combination with lid massage helps in expression of the meibomian glands, thus relieving the symptoms of MGD. It can be done during all stages of MGD except in cases of cicatricial MGD and meibomian gland atrophy.

**Eyelid hygiene**

Eyelid cleaning may be done after using warm compresses and doing a lid massage. The eyelid cleaning can be done using Johnson’s shampoo (mild baby shampoo) or a lid scrub. In chronic cases, it is advisable to send the conjunctival swab to check for any microorganism responsible for the chronicity of this disorder.\(1,2,4\)
2. **Role of artificial lubricants**

Artificial lubricants have a great role to play in the management of MGD. MGD leads to a cascade of inflammation in the ocular surface, leading to tear film abnormality and, ultimately, dry eye, which further contributes to the severity of symptoms. It is difficult to differentiate the types of dry eye associated with MGD as there can be components of both aqueous-deficient and evaporative dry eye. Therefore, we need to address the final common pathway, i.e. supplementation of the tear film. Artificial tears help in tear supplementation and distribution over the ocular surface. They also protect the epithelium from the wiper effect of the lids while blinking. Another very important role of artificial tears is in washing out the hyper-osmolarity by removing the toxins from the ocular surface (Osmodrops, Cipla Ltd). In MGD, the artificial tears described are the ones with a long-lasting action such as high-viscosity agents or the gel/ointment formulation. Artificial tears with a lipid-based formulation, along with topical preparations containing castor oil, should be used as the lipid layer is abnormal in MGD patients. A phospholipid spray also helps in reducing the severity of MGD. Gel and ointments can also be prescribed but the unwanted effect of blurring of vision associated with these formulations limits their use.

3. **Role of topical antibiotics**

The role of topical antibiotics in the management of MGD is not yet clear. There is no evidence stating the role of microbes in the pathophysiology of MGD. The presence of microbes in the lid margin in MGD could be due to the altered tear film and ocular surface environment, making it more hospitable for colonization by bacteria. The various topical antibiotics, their dosage and the frequency that can be used are described below:

- **Bacitracin**: It works with dual action by both the direct and indirect pathways. The direct pathway involves the lipase action, which helps to liquefy cheesy material within the obstructed duct of the meibomian glands. It acts indirectly by its anti-inflammatory action.

- **Fluoroquinolones**: These are broad-spectrum agents working against both Gram-positive and Gram-negative organisms. They are being prescribed routinely but considering the emerging resistance, their use should be avoided in patients with blepharitis.

- **Topical azithromycin 1%**: This is the best antibiotic for MGD patients. It has been shown to have an antibiotic as well as an anti-inflammatory effect. The half-life of topical azithromycin in the lid is 72 hours. It is given as a twice-daily dose for 2 days followed by a once-daily dose for 12 days. The usual duration of treatment is 3 months. Azithromycin can be prescribed in MGD stage 2 and above.(1,2,4)

4. **Role of systemic antibiotics**

Tetracyclines have been found to be effective in various ocular conditions such as rosacea-related ocular diseases, blepharitis, MGD and dry eye. They act by various mechanisms, i.e. anti-inflammatory, anti-apoptotic and lipase inhibitory action. These antibiotics, thus, help in breaking the vicious cycle of pathophysiology of MGD. Tetracyclines are to be given orally at sub-antimicrobial doses ranging from 250 mg one to four times a day in cases of tetracycline and oxytetracycline, and 50 to 100 mg once or twice a day for doxycycline and minocycline. The recommended dosage for oral doxycycline is 100 mg b.d. for 2 weeks followed by 100 mg o.d. for 2–3 months. It is to be given 1 hour before or 2 hours after a meal.(1,2,4) Oral azithromycin is a new addition to this group of drugs. The recommended dosage is 500 mg on day 1 followed by 250 mg/day for 4 days (total course of 5 days). Initial studies have shown that both oral azithromycin and doxycycline improve the symptoms of MGD. However, a 5-day course
of oral azithromycin is recommended for its better effect on improving the signs, better overall clinical response and shorter duration of treatment.(11)

5. **Role of topical steroids**

The role of topical steroids is controversial. The potential complications associated with prolonged steroid use such as cataract formation, raised intraocular pressure, glaucoma, etc., limit its use in MGD, which is not a sight-threatening condition. But a short course of steroids can be recommended during the acute stage of inflammation or flare-ups. Topical steroid use should be avoided, as far as possible, in combination with antibiotic as it increases the chances of antibiotic resistance.

6. **Role of newer modalities**

Amongst the steroid-sparing agents, NSAIDs are not recommended because of the associated epitheliopathy. Calcineurin inhibitors such as cyclosporine (Imudrops, Cipla Ltd) have been used for its anti-inflammatory action in MGD, especially when associated with dry eye and inflamed ocular surface. Tacrolimus ointment is also being explored as an option to the use of steroids.

Dietary modification has been seen to be effective in reducing the risk of MGD. The inclusion of rich sources of essential fatty acids (omega-3-FA) such as mustard oil and fish along with lifestyle changes is being recommended as a treatment option. The dose recommended for omega-3-FA is 1,200 mg o.d. for 1 year (Ocugard 500, Cipla Ltd). Omega-6-FA should be avoided. Hormone replacement therapy in post-menopausal females has been seen to reduce the signs and symptoms of MGD and dry eye. Testosterone supplementation can also be tried in these cases.

7. **Role of surgery**

Intraductal probing (100 microns) is as an effective treatment modality for MGD, but it is painful and can lead to bleeding and scarring. Besides the above procedure, the other surgical modalities are mainly used to treat the complications or sequelae of MGD such as entropion, ectropion, trichiasis and lid laxity. The treatment of these conditions improves the patient’s symptoms but the effect on MGD per se is uncertain.

8. **Demodex**

Demodex mites are the most common ectoparasites found in humans. D. folliculorum is found mainly in the lash follicles and D. brevis in the sebaceous glands. Demodex leads to anterior blepharitis but its role in MGD is not yet established. It can be a cause of recurrent chalazion. Eyelid scrubbing and treatment with 50% tea tree oil mixed with olive oil has shown good results, especially in anterior blepharitis patients. Another effective treatment that can be used as an alternative to tea tree oil is ivermectin 1% cream.(5)


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<tr>
<th>Stage</th>
<th>Clinical Description</th>
<th>Treatment</th>
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</thead>
</table>
| 1     | No symptoms of ocular discomfort, itching, or photophobia | - Inform patient about MGD, the potential impact of diet, and the effect of work/home environments on tear evaporation, and the possible drying effect of certain systemic medications  
- Consider eyelid hygiene, including warming/expressibility as described below (±) |
|       | Clinical signs of MGD based on gland expression  
Minimally altered secretions: grade ≥2 to 4 expression  
Expressibility: 1  
No ocular surface staining | |
| 2     | Minimal to mild symptoms of ocular discomfort, itching, or photophobia  
Minimal to mild MGD clinical signs  
Scattered lid margin features  
Mildly altered secretions: grade ≥4 to <8  
Expressibility: 1  
None to limited ocular surface staining: DEWS grade 0–7; Oxford grade 0–3 | - Advise patient on improving ambient humidity; optimizing workstations and increasing dietary omega-3 fatty acid intake (±)  
- Institute eyelid hygiene with eyelid warming (a minimum of four minutes, once or twice daily) followed by moderate-to-firm massage and expression of MG secretions (±)  
All the above  
plus (±)  
Artificial lubricants (for frequent use, non-preserved preferred)  
Topical azithromycin  
Topical emollient lubricant or liposomal spray  
Consider oral tetracycline derivatives |
| 3     | Moderate symptoms of ocular discomfort, itching, or photophobia with limitations of activities  
Moderate MGD clinical signs  
†lid margin features: plugging, vascularity  
Moderately altered secretions: grade ≥8 to <13  
Expressibility: 2  
Mild-to-moderate conjunctival and peripheral corneal staining, often inferior: DEWS grade 8–23; Oxford grade 4–10 | All of the above  
plus  
Oral tetracycline derivatives (+)  
Lubricant ointment at bedtime (±)  
Anti-inflammatory therapy for dry eye as indicated (±) |
<table>
<thead>
<tr>
<th>Stage</th>
<th>Clinical Description</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>Marked symptoms of ocular discomfort, itching or photophobia with definite limitation of activities</td>
<td>All the above plus Anti-inflammatory therapy for dry eye (+)</td>
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<tr>
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<td>Severe MGD clinical signs</td>
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<td>↑lid margin features: dropout, displacement</td>
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<tr>
<td></td>
<td>Severely altered secretions: grade ≥13</td>
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<td>Expressibility: 3</td>
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<td>Increased conjunctival and corneal staining, including central staining: DEWS grade 24–33; Oxford grade 11–15</td>
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<td>↑signs of inflammation: ≥moderate conjunctival hyperaemia</td>
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<td></td>
<td>Phlyctenules</td>
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<tr>
<td>5</td>
<td>Specific conditions occurring at any stage and requiring treatment. May be causal of, or secondary to, MGD or may occur incidentally</td>
<td>1. Pulsed soft steroid as indicated</td>
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<tr>
<td></td>
<td>1. Exacerbated inflammatory ocular surface disease</td>
<td>2. Bandage contact lens/scleral contact lens</td>
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<tr>
<td></td>
<td>3. Phlyctenular keratitis</td>
<td>4. Epilation, cryotherapy</td>
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<tr>
<td></td>
<td>4. Trichiasis (e.g. in ocular cicatricial pemphigoid)</td>
<td>5. Intrallesional steroid or excision</td>
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<td>5. Chalazion</td>
<td>6. Topical antibiotic or antibiotic/steroid</td>
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<td></td>
<td>6. Anterior blepharitis</td>
<td>7. Tea tree oil scrubs</td>
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<td></td>
<td>7. Demodex-related anterior blepharitis, with cylindrical dandruff</td>
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</tr>
</tbody>
</table>
Recommended in stage 2, 3 & 4 of MGD by The International Workshop on Meibomian Gland Dysfunction

- Improves meibum quality
- Improves tear film stability and decreases the inflammation of lid margins
- An effective adjunctive treatment for improvement of quality of life in patients with MGD

References:
The aim of these guidelines is to assist the ophthalmic surgeon in the diagnosis and management of MGD. These guidelines are merely suggestions and cannot be used in a court of law to safeguard against or for any legal proceedings. AIOS has no financial or any other interest in the formulation of these guidelines.

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