Meibomian gland dysfunction
What is it, why does it occur and how may it be treated?

Kelly K. Nichols, Gary N. Foulks, Anthony J. Bron and David A. Sullivan, on behalf of the participants in the International Workshop on Meibomian Gland Dysfunction

Introduction

Although meibomian gland dysfunction (MGD) is a common, chronic, disabling disorder that influences the health and well-being of millions of people worldwide, there has been no global consensus on its definition, classification, diagnosis or therapy. To achieve this, the Tear Film & Ocular Surface Society (TFOS) sponsored the International Workshop on Meibomian Gland Dysfunction (www.TearFilm.org). This Workshop required over two years to complete and involved more than 50 leading experts from around the world. The Workshop Report is now published in IOVS 2011; Vol. 52, No. 4. Some highlights of the Workshop and its recommendations appear below.

What is MGD?

The Workshop defined MGD as follows:

Meibomian gland dysfunction (MGD) is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.

MGD is classified into two major types based on meibomian secretion: 1) Low Delivery States – the most frequent cause, and 2) High Delivery States (Figure 1). Ultimately, MGD can lead to alterations of the tear film, symptoms of eye irritation, inflammation of the ocular surface and dry eye.

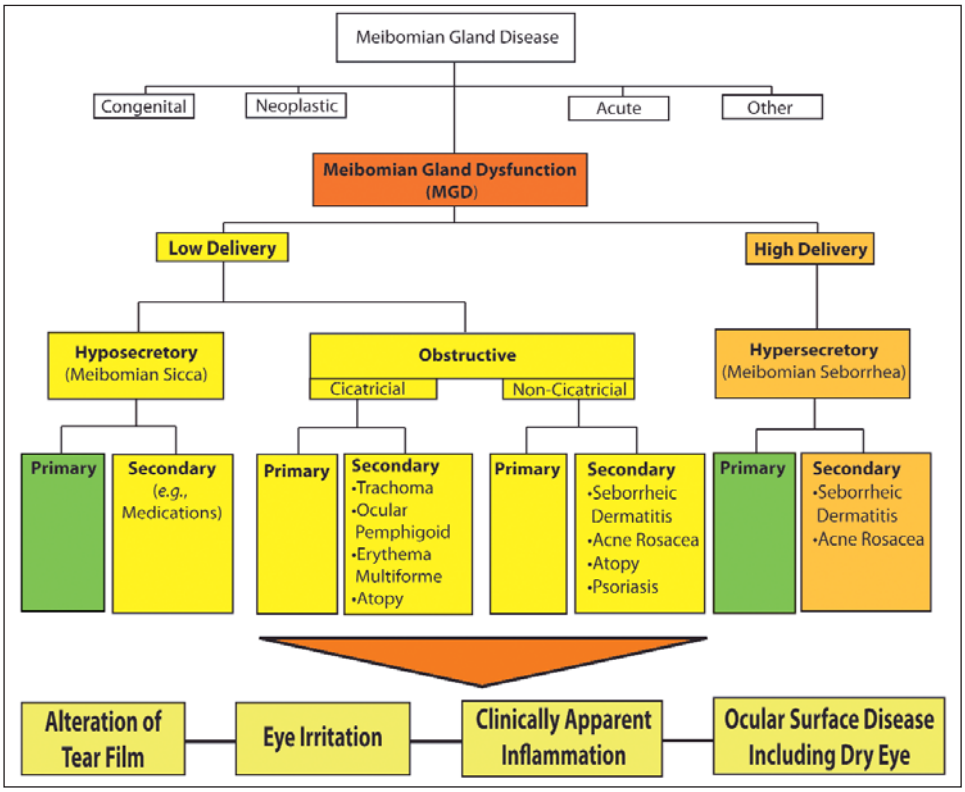

Figure 1. *Classification of MGD*

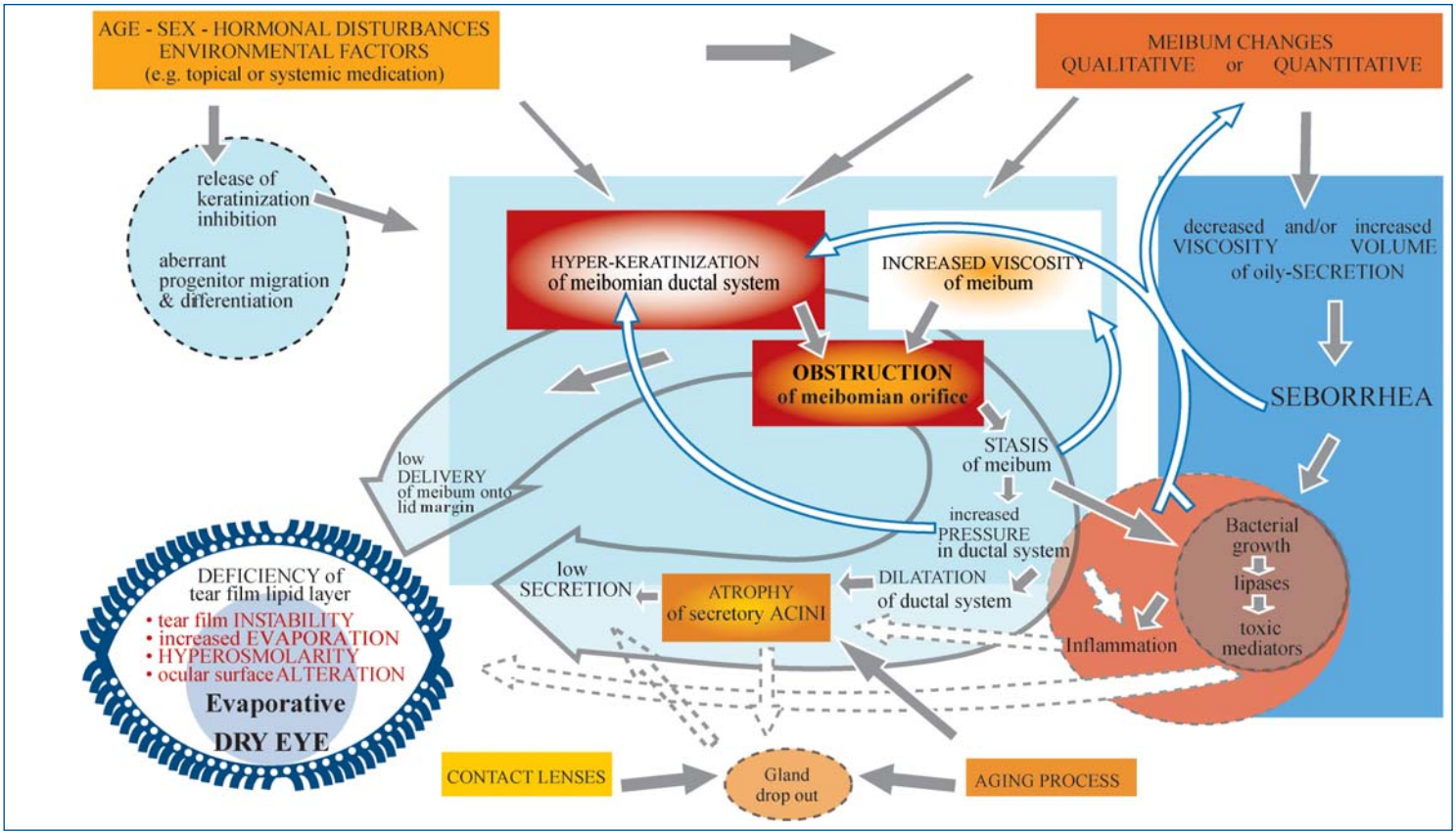

Figure 2. *Pathophysiology of obstructive MGD*

Why does MGD occur?

Low delivery, obstructive MGD is caused primarily by terminal duct obstruction, due to hyperkeratinization of the ductal epithelium, keratinized cell debris and increased meibum viscosity (Figure 2). A cicatricial form is also important.

The obstructive process is influenced by endogenous factors such as age, sex and hormonal disturbances, as well as by exogenous factors such as systemic agents (e.g. retinoids) and possibly contact lens wear. Important secondary associations are skin diseases (e.g. acne rosacea; atopic and seborrhoeic dermatitis) and cicatricial conjunctivitis (e.g. *Erythema multiforme; trachoma*). The obstruction may lead to intraglandular cystic dilatation, meibocyte atrophy, gland dropout and low secretion, effects that do not typically involve inflammation.

The end result is a reduced delivery of meibum to the lid magin and tear film lipid layer, leading to tear film instability, increased evaporation, tear hyperosmolarity, evaporative dry eye and ocular surface inflammation and damage.

Overall, MGD is an important, under-estimated condition, and is very likely the most frequent cause of dry eye disease.

How may MGD be treated?

An evidence-based approach to the management of MGD is shown below. At each treatment level, lack of response to therapy advances treatment to the next level. A [±] sign means that the evidence to support the use of the treatment at that level is limited or emerging, thus use should be based on clinical judgment. A [+] sign indicates the treatment is supported by the evidence at that stage of disease. The quality of expressed meibum and meibum expressibility are key features in the clinical assessment of MGD.

Further details of the management of MGD and MGD-related diseases are discussed in the full Report.

STAGE	CLINICAL DESCRIPTION	TREATMENT
STAGE 1	No ***symptoms*** of ocular discomfort, itching or photophobia ***Clinical signs*** of MGD based on gland expression Minimally altered secretions: Grade ≥2 - <4 Expressibility: 1 No ocular surface ***staining***	*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/ expression as described below (±)
STAGE 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- <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 emollient lubricant or liposomal spray Topical azithromycin Consider oral tetracycline derivatives
STAGE 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- < 13 Expressibility: 2 Mild to moderate conjunctival and peripheral corneal ***staining***, often inferior [DEWS grade 8-23; Oxford grade 4-10]	*All the above, plus* Oral tetracycline derivatives (+) Lubricant ointment at bedtime (±) Anti-inflammatory therapy for dry eye as indicated (±)
STAGE 4	Marked ***symptoms*** of ocular discomfort, itching or photophobia with definite limitations of activities Severe MGD ***clinical signs*** ↑ lid margin features: dropout, displacement Severely altered secretions: Grade ≥13 Expressibility: 3 Increased conjunctival and corneal ***staining***, including central staining [DEWS grade 24-33; Oxford grade 11-15] ↑ Signs of inflammation: e.g. ≥ moderate conjunctival hyperemia, phlyctenules	*All the above, plus* Anti-inflammatory therapy for dry eye (+) **Key:** **Meibum quality** is assessed in each of 8 glands of the central third of the lower lid on a 0-3 scale for each gland: 0=clear meibum; 1=cloudy meibum; 2=cloudy with debris (granular); 3=thick, like toothpaste [range 0-24]. **Expressibility of meibum** is assessed from 5 glands: 0= all glands expressible; 1=3-4 glands expressible; 2= 1-2 glands expressible; 3=no glands expressible. This can be assessed in the lower or upper lid. **Numerical staining** scores refer to a summed score of staining of the exposed cornea and conjunctiva. The Oxford scheme has a scale range of 0-15 and the DEWS scale has a scale range of 0-33.

Acknowledgments: We thank Michelle Dalton (www.dalton-and-associates.com) and Sabrina Zappia and CITYNet (www.citynetonline.it) for their professional assistance with this Workshop highlight report. A listing of Workshop participants, as well as a direct link to the entire TFOS report in IOVS, may be found at: www.tearfilm.org