Clinical Update

Meibomian Gland Dysfunction (MGD)

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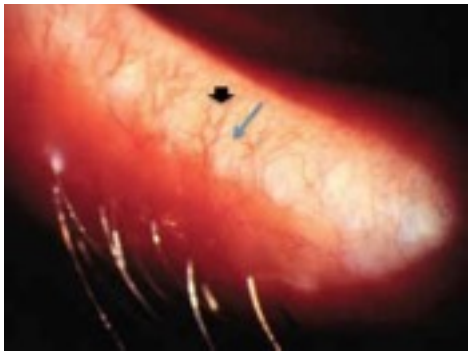
Meibomian Gland Dysfunction, also referred to as the posterior blepharitis, is a very common cause of a myriad of symptoms in the general population, particularly after the age of 45 years which is often neglected and under-diagnosed by the ophthalmic fraternity[1]. Many ocular disorders, including evaporative dry eye, blepharitis, sties, chalazia and ocular rosacea have been linked to abnormal function of the meibomian glands[2]. Health professionals in the USA have now been alerted that MGD is a major contributing factor in ocular surface disease in at least 50 - 75% cases. According to the International Workshop on Meibomian Gland Dysfunction in 2011, sponsored by the Tear Film and Ocular Surface Society, USA[2], there is a paradigm shift in the treatment of dry eyes. As a result of this report, ophthalmologists are now evaluating the lids more carefully, and more often when seeing patients with dry-eye complaints. MGD has also been known to be an important cause contact lens intolerance[3].

Pathogenesis:

Normally there are 40 meibomian glands in the upper lid and 20 in the lower. As the glands make meibum, it is normally pushed outward with each blink by the contraction of Riolan's muscle (pre-tarsal orbicularis) on to the surface of eyelids and spreads over the lid margin making it a smooth surface which can glide and spread the tear film from the tear meniscus in the lower conjunctival fornix, evenly over the cornea, giving it its polished appearance[4].



Bacteria (staphylococci which are the normal flora of the eyelid) invade the meibomian

glands and produce lipases which break down the waxy esters in meibum to short chain free fatty acids[5]. These fatty acids are toxic to the ocular surface and causes its irritation. The lack of waxy esters result in excessive evaporation of aqueous component of the tear film.

The abnormally functioning glands may **over secrete toxic meibum, under secrete or get blocked,** with underlying changes to the eye. Normally the meibum is in a fluid state at normal body temperature but these short chain fatty acids clump together making the meibum viscid [6]. This thick, opaque secretion blocks the meibomian gland orifices, dries up and plugs them (seen in the top pic). When the gland becomes obstructed by thick, inspissated secretion, the glandular epithelium degenerates and stops functioning altogether, leading to minimal or nonexistent production of meibum and loss of meibomian glands. The areas where the meibomian glands have atrophied appears as notches at the grey line (seen in the bottom pic).
Meibomian gland secretion is controlled by Androgens, mainly testosterone. Its deficiency is seen as a part of normal ageing process, particularly. Hence, dry eye syndrome and MGD is more commonly seen in post-menopausal women.[7]

MGD causes two problems, firstly, eyelid inflammation and secondly, excessive evaporation of tears and consequently dry eyes. The tears become hyperosmoler which then stimulate corneal nerves resulting in ocular irritation, dryness, tearing, redness, a foreign body sensation or intermittent blurring of vision.

Examination: In every adult patient who has come to you with any eye complaint, try to assess for MGD and look for the following first:

1) The lids may look normal but the lid margin has to be everted a little bit and the meibomian gland orifices examined; normally the meibum is a clear secretion that flows easily out of the orifices with a tiny pressure at the lid margin with a cotton-tip applicator. However, an opaque secretion is abnormal. Or, the glands could be completely blocked / plugged with thick white secretion which cannot be expressed with pressure on the lid margin.

Scarred and notched grey line indicates loss of glands. So there are different stages of meibomian gland disease.

2) **Grading MGD**:
Grade 0: normal, no MGD: clear, thin secretion at the gland orifices, squirts out of orifices with a little pressure on the lid margin.
Grade 1: a viscid secretion flows out easily with minimum pressure.
Grade 2: an opaque secretion flows after exerting a lot of pressure.
Grade 3: gland orifices are plugged / capped and no secretion flows or it comes out like a tooth-paste or a froth is present at the lid margins (due to saponification of fatty acids by bacterial lipases).
Grade 4: atrophic / scarred gland orifices.

NOTE: Toxic secretions cause an inferior conjunctival / corneal staining. If the ducts are blocked with thick meibum plugs, or have atrophied, then there will be no toxic secretions; however, if few ducts are open, then a little bit of corneal staining will be there. Hence seeing corneal staining with open ducts is Grade 2 disease. Seeing corneal staining + majority of ducts being capped/blocked is grade 3 disease. If grey line shows notching, then transillumination confirms atrophic glands at the site of a notch (Grade 4 disease).

3) Oily debris floating in tear film or foam present at the lid margins indicate hyper-secretion; the fatty acids undergo saponification by bacteria and produce toxic foam.

4) Look for Rosacea / recurrent chlazia which indicate MGD.

5) Note the tear-film break up time: this gets reduced with worsening of the disease. Normal being >10 mm.

6) Punctate keratopathy at the inferior limbus and inferior conjunctival staining is usually present. This is due to irritation by toxic meibum present at the lower lid margin.

7) Transilluminate the tarsal plate by a pen-torch held on the skin side of a fully everted lid to look for evidence of atrophy, loss or degeneration of the meibomian glands.

8) Check for aqueous deficiency of tear film with Schirmer's 2 test.

9) Check the tear osmolarity, if possible.
10) In severe MGD, check lipid profile, Blood Sugar.

Don't assume patients will voluntarily mention their symptoms. **Be proactiv**e, and ask every adult patient about ocular irritation and whether it is worse in the morning which points to MGD. A dry eye due to aqueous deficiency is worse in the evening.

Treatment

1) Highest on the list is getting the patient to play an active role by **scrubbing** the lid margins with a baby shampoo twice a day to remove excess oil.

2) **Mobilise the oils** [8] out of the lids onto the eye where you do want them. Achieve this through the use of lid compresses, which are believed to melt plugs composed of dried secretions blocking the gland orifice; Apply hot fomentation to the lids with a hot towel to melt the thick secretions/plugs and then expressing meibomian glands on a daily basis by **massaging** the lower lid upwards and upper lid downwards with a finger or a Q-tip. this should be done 2-3 x per day. This will not work in Grade 4 disease in whom there are no secretions at all due to atrophic glands.

3) **Addressing the source of any inflammation**; avoid aminoglycocides topically as they worsen MGD. Find out and treat any allergies. Topical tetracycline eye ointment massaged into the id margins twice per day. Systemic doxycycline [9] can interfere with the lipases produced by Staphlococci that break down the fatty components to free fatty acids- a common regimen is doxycycline 100 mg od or b.i.d. for four to six weeks, in severe cases. An alternative is Azithromycin 500 mg bid or 1 Gm od per

week for 3 consecutive weeks. Similarly, cyclosporin[10] eye drops 0.5% - 0.75% twice a day preferably in caster oil, or Tacrolimus skin cream 0.03% instilled into the lower conjunctival fornix have the same anti-inflammatory affect.

4) **Neutralise toxic secretions** with artificial tears; drops during day and lubricating ointment at night.

5) Some patients are beyond the point of no return. They don't have any glands left, or the ones they have aren't functioning. For them, heating and massaging won't do anything. They can be given Lipid-based artificial tears.

6) Oral Omega 3 Fatty acids [11] to restore the balance between good and bad lipids.

7) Intra-ductal probing[12] of blocked meibomian glands has been found to be effective in removing dried secretion.

NOTE: MGD is a very common eye problem; try to look for it in every adult who presents at the ophthalmic clinic. Every patient should be specifically asked for symptoms of ocular irritation. An eye examination should commence from the lids.
It is important to familiarise with the normal meibomian secretion by examining the lids of teenagers first and trying to squirt out meibum with a gentle squeeze on the lid margin.

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