**How common is MGD in your population of patients seeking refractive procedures? Have you studied this or do you have an informal understanding of rates in your practice?**

MGD is the leading cause of evaporative dry eye

By reading different studies on epidemiology regarding the surface ocular problem, it ‘s very difficult to find a consistency on results. In fact, several criteria need to be considered; as age, sex, ethnic group…..The ocular surface report presented at the SFO 2015, demonstrate that around 1/4 (a quarter) of patients coming to consult have OSD. (1). This rate is representative of what we can find in a general ophtalmolgic consultation.

Considering only the refractive patient candidates, a poster based on 148 eyes studied and presented in the SAFIR 2016 in Paris (2) show that we have 68 % of our patients not having any dry eye symptoms but having some alteration of the meibomian structure. Those patients can be considered as the one described in the “Nonobvious obstructive meibomian gland dysfunction group “(3).

Furthermore, we observed in that study, that 26 % of the patients have dry eye symptoms before the surgery. This fact needs to be considered and the exam must be more accurate in order to identify the cause of the symptomatology so that it can be fixed before surgery.

Finally only 6 % of them have neither symptoms nor alteration of the structure.

In conclusion 85 % of patient seeking refractive surgery and studied here had an MGD. The population on this study had an average of 52 year old (19 – 68 years old). The percentage can be different if we consider either presbyopic patients or intolerance contact lenses wearers who are quite frequent candidates for refractive surgery.

In a study published in 2002, up to 75% of patients seeking refractive surgery may have signs and symptoms of preexisting ocular surface disease (Clinical assessment of the ocular surface with special attention to ocular surface staining, tear volume and quantity, and TFBUT is recommended. (18)

Toda reported that signs or symptoms of dry eye after LASIK were found in 50% of patients at 1 week postoperatively, 40% at 1 month, and 20–40% at 6 months (3). Some patients have clinical signs of tear dysfunction without any symptoms. It is as if post-LASIK tear dysfunction were a qualitatively different disease entity. (5)

**Why is it important to look for MGD in refractive surgery candidates?**

The MGD can impact on two critical parameters:

1 **Unstable tear film can negatively impact** the accuracy of the preoperative corneal measurements. So to be sure having the more accurate measurement ( keratometry, topography, aberrometry ,HOA, and refraction …) to consider if the patient is good candidate, the ocular surface needs to be stabilized for considering those measures.

2 The **visual recovery** after the surgery.

 In fact the dry eyes disease is considered as the more common disorder in post op refractive surgery. It can have an impact on the confort of the patient (gritty feeling in the eyes, burning sensation, foreign body sensation ……) but more importantly it can have an impact on the visual performance (blurred vision , visual fluctuation ….)

Dry eyes syndrome after refractive surgery was reported as severe in 3.7 % of the cases in a study based on 1067 candidates to the refractive surgery. (4)

An ocular surface disorder in preoperative increases the risk to develop a dry eyes disease in post op, that the reason why it is crucial to screen an MGD before surgery.

Patients with pre existing tear dysfunction have poorer postoperative ocular surface health and more severe symptoms of tear dysfunction after LASIK; furthermore, their corneal sensitivities take longer to recover compared to patients without dry eye.(6)(7)

One retrospective cohort study investigating preoperative characteristics associated with dry eye symptoms at the 9-month postoperative examination found that the chronic dry eye cohort had statistically significantly lower preoperative Schirmer test scores than the non-dry eye group ([46](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3579556/#R46)). Other studies have shown that preoperative Shirmer scores below 10 mm are associated with postoperative tear dysfunction.

Long term contact lens wear may also predispose to poorer tear metrics both pre- and postoperatively. ([6](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3579556/#R4))(8)

Furthermore, long-term contact lens wear is associated with decreased corneal sensitivity, (9) and some patients with tear dysfunction have been found to have relatively less sensitive corneas. (10)

It is possible that contact lens intolerance is a surrogate marker for pre operative tear dysfunction. Although older age and female gender, especially post-menopausal, have been found to be risk factors for tear dysfunction, there are conflicting reports on whether female gender is a risk factor for post-LASIK tear dysfunction.

Although one prospective study found no association with gender ([16](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3579556/#R16)),  two retrospective studies found significant associations between female gender and chronic post-LASIK tear dysfunction.( 11) (12)

Also, age has not proved to be an important risk factor for post-LASIK tear dysfunction. (13) (14)

Ethnicity may modulate a patient’s risk of developing post-LASIK tear dysfunction. The prevalence of chronic post-LASIK tear dysfunction was reported to be higher with Asian patients. (15)

**In terms of MGD detection, what is your protocol?**

**Questionnaires, physical exam, imaging?**

We first are looking for symptoms, we ask each patient to fill in a SPEED questionnaire evaluating the frequency and the severity of dry eyes in their lives.

A score of 8 is the threshold between asymptomatic and symptomatic cases.

For all SYMPTOMATIC patients (SPEED Score > 8) and for contact lenses wearers, we perform a full investigation to detect a MGD.

* **LIPID LAYER**, using the **LIPIVIEW** interferometry system
* **BLINKING** quantity and quality (in order to detect incomplete blinking)
* **ATROPHY GRADE** based on the analysis of the images provided by the LIPIVIEW Meibography / (DMI)
* **MEIBOMIAN FUNCTION** using the MGE from Tearscience which evaluates the number of meibomian glands which express meibum (usually an average of 15 glands are stimulated) and also the quality of the secretion
* **AQUEOUS LAYER** with the Red Phenol test and/or Shirmer
* **BUT** :The Break-Up Time test (BUT) evaluates the quality and stability of the tear film

**What is the value of each of these in the overall analysis?**

The goal is to define the sources of the symptoms or the cause of the non tolerance of the contact lenses. So it is crucial to know if there is an AQUEOUS DEFICIENCY or/and a MGD or/and a BLINKING ALTERATION. This will allow to fine tune the treatment in order to improve the surface alteration before the surgery if possible

**Do you look for MGD in all refractive surgery candidates?**

At the beginning we were investigating only the candidates over 45 years old, but after experimenting the MGD approach, we think it is very valuable to take all the patients seeking refractive surgery into consideration of MGD. Especially the contact lenses wearers and the symptomatic patients who are risk groups.

Since we have been using the Lipiview, we have been surprised that a significant number of young patients show an atrophy of the meibomian glands, which could be explained by a combination of factors (the decrease of blinking in front of screens, the decrease of the corneal sensitivity due to contact lenses, make-up with high liners and other possible causes).

**Could you describe your tiered approach to classifying severity of MGD? Please also describe how this system helps you manage patients?**

We use the Meibograde, developed by Donald Korb and Caroline Blackie. It is very helpful because it combines structure and function analysis. At the end of the preop assessment, we arrange the candidates into 4 groups identified by a colored flag:

The **green flag** patients don’t have any symptom and have an atrophy under or equal to grade 1 and have a function above 6.We can say that they don’t have MGD.

The **orange flag** patients are not symptomatic. They have either a grade 2 atrophy or a lowered function (<6)

 *don’t have symptom they can have : no atrophy but a function under 6 or a grade 2 atrophy and a function above 6 .*

We can consider that these patients have a moderate MGD

The **red flag** patients are symptomatic and have a meibomian function under 6. We can consider that these patients have a severe MGD.

The **blue flag** is reserved for patients who have symptoms of dry eyes but have a good meibomIan function and their atrophy is under grade 1. We consider that these patients have an aqueous deficiency

This classification helps managing the patient because it systematizes the approach by giving an overall explanation of how MGD is present and progresses.

**Do you initiate treatment for MGD in all cases or only when symptoms are present? Why or why not?**

Preoperative management of the ocular surface is essential. Tear dysfunction is a multi-factorial disease, so identifying and managing comorbid conditions, such as blepharitis, rosacea, drug toxicity, and exposure keratopathy, is helpful. Treatment of tear dysfunction and lid margin disease may restore the ocular surface to a healthy condition.

The traditional treatments of MGD consist of warm compresses and lid hygiene for removing an obstructed meibum, as well as antibiotics and anti-inflammatory agents to improve the quality of the meibum.

Artificial tears, especially preservative-free formulations, are useful. Some emulsion eyes drops containing lipids can decrease the tear evaporation

Punctual occlusion and nutritional supplements containing omega-3 fatty acids may be appropriate especially in case of aqueous deficiency. Some suggest the use of cyclosporine A 0.05% drops to optimize the ocular surface preoperatively, as it has been found to increase goblet cell density ([16)](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3579556/#R83) and to accelerate the return of corneal sensitivity post operatively. (17)

Intraductal meibomian gland probing proposed by Maskin is a relatively nontraumatic method to relieve the symptoms of MGD, which could mechanically open and dilate the natural orifices and ducts of the meibomian glands to remove abnormal meibum secretions

LipiFlow® thermal pulsation system is also a new valuable option , as a temperature- and pressure-controlled device, this novel treatment for obstructive meibomian gland dysfunction has combined the benefits of both heat therapy and physical expression

The treatment proposed to the patient depends on the cause of the disease and can be classify as follow :

**AQUEOUS DEFICIENCY:**

PRT/SHIRMER under 10 mm: temporary dissolvable or permanent punctual plugs.

Punctual plugs are tiny, biocompatible devices inserted into tear ducts to block drainage. This increases the eye's tear film.

**MGD:**

Depending on the severity of the MGD, we use a different approach. We used to classify them as ORANGE or RED Flag.

For the **ORANGE FLAG**, usually we inform the patient of the start of his MGD and explain him why it is important to take it into consideration for the future. We raise his awareness to eyelid hygiene ( warm compresses/massage,) and deal with the traditional treatments of MGD

 If the symptoms are too uncomfortable after surgery and/or if we observe a degradation of the eye’s surface, we can consider a LIPIFLOW after the refractive surgery.

For the **RED FLAG:** usually these patients have a blockage of the meibomian glands which induces an alteration of function (less than 6 secreting glands with MGE and a thin lipidic layer). For these patients it is very important to unblock the glands in order to restore a better stability of the tear film, in particular the LIPIDIC LAYER.

We achieve this with the Vectored Thermal Pulsation (VTPTM) technology, called LipiFlow. This system uses a patented algorithm of precise heat applied to the inner eyelids and directed gentle massage to remove blockages from the meibomian glands. This treatment is designed to restore the natural oil flow of the tear film that covers the eye’s surface.

We are used to performing the Lipiflow before the refractive surgery. 2 to 3 months after this treatment, we check the meibomian function in order to be sure that the stability of the tear film has improved and that the patient has moved down to the orange or green flag band. Only after this has been checked we can plan the surgery.

**BLINKING ALTERATION**:

The blinking is very critical to analyze. Without a good quality and quantity of blink, the tear film and more precisely the lipid layer is not optimized. This is due to the fact that an incomplete blink will not apply the pressure needed to stimulate the meibomian system .

With the LIPIVIEW a video of 20 second is done to analyze the ratio between complete and incomplete blinking. This help us to identify the patients who need a rehabilitation of their blinking. (We ask them to train with the reeducation 10 times a day). The blinking alteration can be alone or associated with an MGD or AQUEOUS DEFICIENCY .

**If you determine that MGD is present will you delay surgery? Does it depend on the severity of the presentation in any way?**

As discuss, before the surgery during the pre op exam , and like for topography, we classify MGD by colored flag and depending on the severity of the MGD we chose a different approach. We classify them as ORANGE or RED Flag.

**If you do not delay surgery …… what is your rationale for proceeding? When do you not delay surgery?**

The Orange ones are not always delayed as the treatment can also be performed after the surgery if required. However in some cases, we prefer to offer a lipiflow before surgery, therefore postponing the surgery.

Red flag patients are always postponed until a LIPIFLOW has been performed and a significant improvement has been observed.

**If you do delay surgery …**

**… what is your rationale? When do you delay surgery?**

We are used to performing the Lipiflow before the refractive surgery. 2 to 3 months after this treatment and sometimes up to 6 months in case of severe atrophy, we check the meibomian function in order to be sure that the stability of the tear film has improved and that the patient has moved down to the orange or green flag band. Only after this has been checked we can plan the surgery.

**What are the implications of MGD for the preop evaluation?**

**Does untreated MGD have any effect on postop outcomes?**

The MGD can impact on two critical parameters:

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