Recent diagnostic modalities of ocular surface disorders

Sihem Lazreg
Algeria

Ocular surface

- Functional unit:
  - Lids (Blink)
  - Conjunctiva
  - Cornea, limbus
  - Tear film
  - Meibomian glands
Ocular surface

Normal tear film

Normal evaporation rate is 33%
• Dry eye is a multifactorial disease of the **ocular surface** characterized by a loss of homeostasis of the tear film and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, **ocular surface inflammation and damage**, and neurosensory abnormalities play etiological role.

What is the purpose of a diagnosis?
Dry Eye testing

What tests do I need to do to confirm this?
NIBUT

Fluorescein
Lissamin green

Coloration of mucous, apoptotic cells and tissues.

Schirmer test I

Quantitative value of the tear film.

> 10 mm : normal

6 à 10 mm : moderate dry eye

< 6 mm : severe dry eye
Osmolarity

- Higher of both eye and difference
- Variability questioned
- Cut-offs (Sullivan et al., 2010, Keech et al., 2013):
  - normal (302.2 ± 8.3 mOsm/L)
  - mild to moderate (315.0 ± 11.4 mOsm/L)
  - severe (336.4 ± 22.3 mOsm/L)

<table>
<thead>
<tr>
<th>Electrolyte</th>
<th>Concentration (mMol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>132</td>
</tr>
<tr>
<td>Potassium</td>
<td>24</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>32.8</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.8</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.61</td>
</tr>
</tbody>
</table>
The revenge of ocular surface: imaging

The importance of ocular imaging in the diagnosis of dry eye disease

- Diagnosis /etiology
- Etiological arguments
- Severity
- Follow up and treatment

- NIBUT
- Meniscometry
- Meibography
- Interferrometry
- Blink analysis

Tear film stability evaluation

Key element in the pathophysiology of dry eye

BUT has limits ......

Can be modified by the quantity of fluorescein
> Poor reproducibility +++
> High variability between doctors and in the same patient;
**Tear film stability**

Non invasif break up time (NIBUT) : The solution?

- Height deviation...
- Poor reproducibility according to devices ...
- Automatic versus manual?

**Tear volume**

Ménisc = tear volume + basal secretion

Variable according to the blinking interval and drops instillation (diagnosis)

- Height +++
- Conjunctivochalasis

Lacrydiag, Quantel medical

<table>
<thead>
<tr>
<th>Test</th>
<th>SD of repeated measures</th>
<th>Healthy population mean</th>
<th>Clinical difference to detect</th>
<th>Minimum sample size per group</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIBUT</td>
<td>7.0 (36)</td>
<td>11.2 ± 6.8 (36)</td>
<td>10.8 ± 6.2 (36)</td>
<td>5 s</td>
</tr>
</tbody>
</table>

Lee et al. Clin Ophth, 2016
Wolffsohn et al. DEWS 2, 2017

Without fluorescein > more reliable ??

NOT DEFINED YET ..........

Meibomian glands: Structure

Infrared meibography: what can we analyse?

- **Shortening**
- **Tortuosity**
- « Dropout » or meibomian gland atrophy


Infrared Meibography: automatisation

- Automated detection of MG atrophy
- Age modifications +++

No normative data yet.....

Arita et al. BJO, 2013
Lipid layer reflect the function of MG

La couche lipidique forme des franges interférométriques

**Meibomian glands**: Function = interferometry

Lipid layer reflect the function of MG

**Automated measure of the lipid layer thickness**: Interférométrie (Normal > 75nm) Reproducible

**MGD diagnosis**: Sensitivity / Spécificity: 65%

Fins et al. Cornea, 2013
Arita et al. Exp Eye Res 2017
Interferometry

Lacrydiag, Quantel medical

Pas toujours facile...
Comparaison semi-quantitative
Normale > 30

We need some time to understand ...

Blink Detection

It has been established that ocular blinking plays an important role in ocular surface health, especially during the use of contact lenses. Inefficient blinking in use of contact lenses may be related to a low Blink Rate, and it can often be a reason for dry eye symptoms and ocular surface disease.
Blinking analysis: version 2.0

MGD + incomplete blinking + abnormal Bell’s phenomena...

Blinking exercises

Daily Exercices

DEMODEX

Cylindrical dandruff and blepharitis
How to study inflammation of eyelids and Demodex brevis

BLEPHARITIS
The human skin surface is known to house millions of bacteria, though some people have more than the average number. Blepharitis is an inflammation caused by some bacteria that lie at the base of eyelashes.

They produce dandruff-like flakes in the skin, which lead to infection and inflammation. Problems with the meibomian oil glands (meibomianitis) in the eyelids can also cause blepharitis. The development of inflammation is also associated with risk factors such as dandruff, dry eyes, acne rosacea, or bacteria. This is a common eye disorder affecting all age groups. When the patient is found with blockage of the oil glands in the eyelids, poor quality of tears, and redness of the lining of the eyelids, the type is Meibomian blepharitis. If a hard, matted crust is formed on the eyelashes, and while removing these some small sores are formed on the eyelashes that ooze and blisters, it is called Ulcerative blepharitis

Management
The type of blepharitis can be determined based on the appearance of the eyelid edges. If the symptoms frequently exhibited by the patients are mild existing eyelids, thickened lid margins, and missing/meburnt eyelashes, then the type of blepharitis is said to be Staphylococcal. If the patients show mild redness of the eyelids or scales around the base of eyelashes, then it is Demodex blepharitis.

OTHER POSSIBLE EXAMINATIONS

AN ASSESSMENT OF GRADED SCALES FOR MEBIOGRAPHY IMAGES
The evaluation of the Meibomian gland dysfunction appears to be of increasing interest in research and clinical practice. Consequently, the need for a reliable and reproducible grading system is essential for both researchers and clinicians.

WHITE TO WHITE MEASUREMENT
Evaluation of corneal diameter from limbus to limbus (white-to-white distance, WTW).

5/9/2019
OTHER POSSIBLE EXAMINATIONS

PUPILLOMETRY
The measurement of pupil diameter has become increasingly important in the field of refractive surgery. Larger scotopic pupil sizes may be partially responsible for the occurrence of postoperative symptoms such as halos, glare, and monocular diplopia.

BULBAR REDNESS CLASSIFICATION
Detected the fluidity of the blood vessels of the conjunctiva, evaluating the degree of redness, it will be possible to compare the classification sheets of the degree of redness of bulbar and limbal.

Automated diagnosis ???

Lacrydiag

Oculus keratograph 5M
eyecarewithfocus.com
RESULT OF DIAGNOSIS

PDF report
24th ESCRS Winter Meeting
MARRAKECH
In conjunction with SAMIR (Moroccan Society of Implant & Refractive Surgery)

21 – 23 FEBRUARY 2020
Marrakech, Morocco

www.escrs.org