<table>
<thead>
<tr>
<th><strong>DEWS</strong></th>
<th><strong>DRY EYE: DIAGNOSTIC TEST TEMPLATE</strong></th>
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<tbody>
<tr>
<td><strong>RAPPORTEUR</strong></td>
<td>Maurizio Rolando</td>
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<tr>
<td><strong>TEST</strong></td>
<td>Tear ferning test (TFT)</td>
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<td><strong>TO DIAGNOSE</strong></td>
<td>Quality of tears (electrolyte concentration), KCS, Hyperosmolarity</td>
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<tr>
<td><strong>VERSION of TEST</strong></td>
<td>[V1] Tear ferning test (tear collection by rod) [V2] Tear collection by glass capillary)</td>
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<tr>
<td><strong>DESCRIPTION</strong></td>
<td>A drop of tear is collected from the lower meniscus and dropped onto a microscope slide and allowed to dry by evaporation. Different forms of crystallization patterns can be observed and classified.</td>
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**CONDUCT of TEST**

1. The subject is seated, with the head resting comfortably, in a dim light.
2. With the eyes in upgaze, by means of a micropipette, nearly 1 microliter of tears is collected by capillarity from the lacrimal river of the lower meniscus.
3. The fluid is then dropped onto a microscope slide and exposed to evaporation at 20+/- 3 C° for 10 minutes
4. The sample is then observed under a microscope at x 100-400 enlargement (better visibility is acheived with phase contrast microscopy)
5. The patterns of crystallization (ferning) are classified in 4 classes: Type 1: uniform large arborization, Type 2: ferning abundant but of smaller size; Type 3: partially present incomplete ferning; Type 4: no ferning. Types 1 & 2 are reported to be normal and Types 3 & 4 reported to be abnormal

**Materials:**

- capillary glass
- clean microscope slides
- light microscope (Phase contrast useful but not necessary)

**Standardization**

- Time of day [ any ]
- Temperature [20-28 °C ]
- Humidity [high humidity slows down the time of appearance of the ferns]
- Air speed: [the effect of excessive air speed has not been studied but increasing the evaporation rate could affect the pattern of ferning].
- Illumination: [the level of illumination seems irrelevant in the development of ferning patterns once the sample has been collected and dropped ]
- Other: [Avoid excessive light and lid margin contact in order to decrease reflex tearing.]

**Variations of technique**

- In the original version, [V1 ] tear collection was acheived by capillary attraction by means of a 0.5 mm rod loop placed in contact with tears pooled in the lower fornix of the cul de sac. The second version uses a capillary tube in contact with the fluid of the lowers meniscus. This increases reproducibility, with a coefficient of variation of 6.4%.

**Diagnostic value**

- This version : [ ]
- Other version: [ ]
- prognostic value 86.6%

**Repeatability**

- Intra-observer agreement. [Intraobserver agreement of 94.50% (kappa = 0.76; CI = 0.67-0.86). - ]
- Inter-observer agreement. [Interobserver agreement 92.10% (kappa = 0.65; CI = 0.56-0.75)]

**Sensitivity**

- (true positives) [ 82.2% ]
- [Cut off: Type III or worse according to the previously reported classification 6-7])

**Specificity**

- (100 – false positives) [ 92.5% ]
Other Stats

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
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<tr>
<td>94%</td>
<td>75%</td>
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<tr>
<td>Cut off: Type III or worse according to the previously reported classification 6-7</td>
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<tr>
<td>92%</td>
<td>83%</td>
</tr>
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Norn 1994
Rolando 1986

Test problems

Care should be taken not to elicit reflex tearing during collections.
Light microscopy is often unavailable in the office.
In spite of a good clinical ability of separating normal from dry eyes, the real meaning of the results is not known.
Test affected by extreme conditions of temperature and humidity.

Test solutions

FORWARD LOOK

It would be interesting to explore the correlation between the patterns of crystallization (test types I to IV) and the level of tear film osmolarity.

Glossary

Tear Ferning: the branching pattern appearance of tear fluid once collected and dropped on a microscopy slide.
Tear Ferning Test: separation of normal from dry eyes on the basis of ferning patterns of tear crystallization.

References


