FLUORESCEIN CLEARANCE TEST
(TEAR DYNAMIC FUNCTIONAL TEST)

1. Ocular Surface Center Code: T 3001

2. Introduction:

The ocular surface is covered by a thin layer of preocular tear film, of which the aqueous fluid is secreted by the lacrimal gland, spread over the entire ocular surface by lid blinking, and then cleared from the eye into the nose through the nasolacrimal drainage system. Therefore, a complete knowledge of all hydrodynamic elements, i.e., tear secretion (flow), tear volume, and tear clearance or turnover, is important for complete evaluation of tear dynamic function.

Clinically, measurement of tear secretion relies on the Schirmer test. However, one common way of measuring tear clearance is to judge the speed of disappearance from the ocular surface of exogenously added fluorescein, a method originally use by Nover and Jaeger 1. Various methods have been developed and can be grossly subdivided into two major groups. The first group detects how fast the dye appears in the nasal cavity. This is accomplished by the use of a Q tip in the traditional Jones I test 2, or by direct visualization through endoscopy 3. The second group measures how slow the dye is still retained on the ocular surface. This can be achieved by visual semiquantitation 4,5, wetting with Schirmer strips 1, or fluorophotometry 6, of which the latter can be directed to the marginal strip 6,7 or to the precorneal tear film 8-11.

3. Method of Operation:

As reported 12-15, the fluorescein clearance test (FCT) is performed as follows. After applying one drop of 0.5 % proparacaine (Alcon Laboratories, Inc., Humacao, PR) to each eye, the inferior fornix was carefully dried with tissue paper. An aliquot of 5 µl of Fluoress R (Akorn Inc., Abita Springs, LA) containing 0.25 % fluorescein and 0.4 % benoxinate hydrochloride was then applied to the inferior fornix of each eye through an Eppendorf pipette (Rainin Instrument Co., Woburn, MA) without directly touching the conjunctival surface. The patient continued to sit in the examination room under the ambient light and was asked to blink normally. After a lapse of 10 min, determined by a timer, a Schirmer paper strip (Alcon Laboratories, Inc., Fort Worth, TX) was inserted into the inferior fornix of each eye at a position approximately one third lateral to the temporal caruncle. After one min, during which time the eye is closed. This maneuver was repeated for a total of 3 times over a period of 30 min, i.e., every 10 min. At the end of the 30 min, i.e., the last test, Schirmer strip was inserted after nasal stimulation with a Q-tip.

4. Interpretation:
The FCT allows one to determine the following three important tear dynamic functions, i.e., basal tear secretion, reflex tear secretion under nasal stimulation, and tear clearance, at the same time.

**5. Clinical Uses:**

1) To determine aqueous tear deficiency (dry eye) with higher accuracy
2) To differentiate dry eye into with or without reflex tearing. Sjogren syndrome or primary lacrimal gland diseases are characterized by the loss of reflex tearing, thus helping establish the severity of dry eye
3) To guide physicians to perform punctal occlusion with plugs or permanent cauterization
4) To determine if punctal occlusion is performed with efficacy
5) To determine subclinical DTC as a cause of ocular irritation, medicamentosa and other ocular surface disorders, and help direct more effective treatments such as non-preserved methylprednisolone

**6. Literature:**

Normal ATD with Reflex

<table>
<thead>
<tr>
<th>Wetting length:</th>
<th>&gt; 3 mm throughout</th>
<th>&lt; 3 mm when anesthetized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased wetting length in the end</td>
<td>Increased wetting length in the end</td>
<td></td>
</tr>
<tr>
<td>Dye disappears by 15 min</td>
<td>Dye disappears by 15 min</td>
<td></td>
</tr>
</tbody>
</table>

ATD with Reflex ATD without Reflex

<table>
<thead>
<tr>
<th>Wetting length:</th>
<th>&lt; 3 mm only in the beginning</th>
<th>&lt; 3 mm throughout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dye clears before 15 min</td>
<td>Delayed dye clearance</td>
<td></td>
</tr>
</tbody>
</table>

Unilateral DTC Bilateral DTC

<table>
<thead>
<tr>
<th>Wetting length:</th>
<th>&gt; 3 mm throughout</th>
<th>&gt; 3 mm throughout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dye never clears, but dilutes with time</td>
<td>Dye never clears, and nearly not diluted</td>
<td></td>
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</tbody>
</table>

[Note]: Normal: Normal tear secretion and normal tear clearance.
ATD: Aqueous tear deficiency
Reflex: With reflex tearing
DTC: Delayed tear clearance


