<table>
<thead>
<tr>
<th>DEWS</th>
<th>DRY EYE: DIAGNOSTIC TEST TEMPLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAPPORTEUR</td>
<td>A.J. Bron</td>
</tr>
<tr>
<td>18th Oct 2004</td>
<td></td>
</tr>
<tr>
<td>TEST</td>
<td>Mixed tests</td>
</tr>
<tr>
<td>TO DIAGNOSE</td>
<td>Ocular Irritation / Dry Eye</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
<tr>
<td>VERSION of TEST</td>
<td>Multiple tests</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>Evaluation of Subjective and Objective tests for diagnosing tear-film disorders known to cause ocular irritation.</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
<tr>
<td>NATURE of STUDY</td>
<td>40 adults with ocular irritation: (SSATD (11); NSATD (9); inflamm MGD (rosacea) (10); atrophic MGD (10). 10 normals Controls and SSATD were of younger age. SSATD less males than controls or inflamm MGD</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
<tr>
<td>Summary of Results:</td>
<td>Symptoms more severe in the SS group. FBut shorter in ATD, MGD groups than controls. Schirm. Lower in ATD than MGD or controls. Tear Clearance delayed in ATD and MGD Non-invasive grid distortion in ATD not MGD or controls. SS group More: loss of nasolacrimal reflex Schirmer; lower clearance, greater F and RB stain. Schirmer scores correlated inversely with RB stain, corneal fluoresce stain, grid distortion. RB stain correlated with grid distortion and loss of nasolacrimal reflex but not with MGD.</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
<tr>
<td>Statistical Tests used were:</td>
<td>Among group Kruskal wallis; Wilcoxon/Mann-Whitney; ANOVA; Fisher’s least significant difference; Fisher’s exact test; t-test; Kendall’s τ non parametric correlation analysis; Spearman correlation analysis. Schirmer test: worse and fellow eye BUT, Stain, corneal sensation: Scores averaged for two eyes</td>
</tr>
<tr>
<td>CONDUCT of TESTS</td>
<td>Various Tests. On the day of examination, subjects rated their symptoms; Symptom of ocular irritation: Burning/stinging Mucus discharge Itching FB sensation Blurred vision Dryness Soreness (pain) Photophobia 5 point Scale of Symptoms: 0 = No discomfort 1 = trace 2 = mild 3 = moderate 4 = severe</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
</tbody>
</table>

Pflugfelder et al. 1998
- Lid irreg
- Lid/bulb hyperaemia
- Corneal PEE/ adherent mucus/ filaments

**MGD METAPLASIA:** white protruding shaft
Expression from 5 central lower glands:
0 = all 5 expressible  
1 = 3-4 expressible  
2 = 1-2 expressible  
3 = no glands expressible

**MEIBOGRAPHY** of nasal and temporal halves of the lower lid:
- 0 = no drop out  
- 1 = ≤33%  
- 2 = 34-66% drop out  
- 3 = 67-100% drop out

**XEROSCOPY**
Masked evaluation of videotaped NIBUT

**FLUORESCEIN BUT**
Infero-temporal bulbar conjunctiva touched with Fluoret wetted with preservative free saline, then blink. Eyes averaged.

**FLUORESCEIN STAINING**
Staining observed with a blue light without a yellow filter
4 point scale: ‘Standardized for cornea and conjunctiva’
- 0 = none for temp/nasal/inferior bulbar + cornea  
- 1 = mild Max possible score was 12  
- 2 = moderate  
- 3 = severe

**ROSE BENGAL STAINING**
20µl of 1% rose bengal instilled. No source or details of instillation provided.
4 point scale: ‘Standardized for cornea and conjunctiva’
- 0 = none for temp/nasal/inferior bulbar + cornea  
- 1 = mild Max possible score was 12  
- 2 = moderate (Minus inferior score = van Bijsterveld0  
- 3 = severe

**SCHIRMER TEST**
Standard:
Without anaesthesia
Eyes open
Short part placed over lower lid margin at junction of middle and lateral third
Read at 5 minutes

**FLUORESCEIN CLEARANCE TEST**
Instill 5µl of Fluress (conc not stated)
Standard Schirmer strip over lateral lower lid margin for 1 min at 10, 20 and 30 minutes. Strip removed and evaluated for fluorescence under a blue light.

**NASAL-LACRIMAL REFLEX TEARING**
Method:
After removing the Schirmer strip following the 30 min clearance test:
Nasal mucosa stimulated with a dry cotton swab (time?) on the side with the lowest Schirmer value.
Then **Schirmer strip inserted for 1 minute**.
A Schirmer value greater than 1 mm more than the 30 min value.

Serum tests
ANA ≥ 1: 160; RhF ≥1:160; +ve Anti Ro and Anti La

<table>
<thead>
<tr>
<th>RESULTS of STUDY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Many symptoms were experienced by subjects in all 4 groups.</td>
<td></td>
</tr>
<tr>
<td><strong>Film</strong>: SSATD : Greater debris and mucus than all other groups</td>
<td></td>
</tr>
<tr>
<td><strong>Lid hyperaem</strong> All dis except SSATD had &gt; hyperaemia (p≤0.033) than control. Inflam MGD &gt; SSATD (p≤0.008)</td>
<td></td>
</tr>
<tr>
<td><strong>Lid irreg</strong>: Inflam MGD . SSATD or control (p≤0.009; and p≤0.023)</td>
<td></td>
</tr>
<tr>
<td><strong>Tarsal injn</strong>: Inflam MGD&gt; SSATD (p=0.03)</td>
<td></td>
</tr>
<tr>
<td><strong>Tarsal injn</strong>: InflamMGD&gt;atrophMGD (p≤0.020) or control (p≤0.003)</td>
<td></td>
</tr>
<tr>
<td><strong>Mucus adher</strong>: SSATD &gt; MGD or control</td>
<td></td>
</tr>
<tr>
<td><strong>MGMetaplas</strong>: NSATD and MGD &gt; controls (p≤0.033)</td>
<td></td>
</tr>
<tr>
<td>MGD &gt; SSATD (p≤0.03)</td>
<td></td>
</tr>
<tr>
<td><strong>MGExpressn</strong>:</td>
<td></td>
</tr>
<tr>
<td><strong>Lower lid</strong>: All disease group had fewer expressible glandsthan controls (p≤0.006).</td>
<td></td>
</tr>
<tr>
<td><strong>Upper lid</strong>: All but SSATD had fewer expressible. (p≤0.009) (note younger age of SS pts)</td>
<td></td>
</tr>
<tr>
<td>Both lids: InflamMGD fewer expressible than SSATD</td>
<td></td>
</tr>
<tr>
<td>Upper lid: Atroph MGD fewer expressible MG than SSATD</td>
<td></td>
</tr>
<tr>
<td><strong>Drop out</strong>: All nasal and temp drop out values greater for MGD than for controls (p≤0.0001) and nonSSATD (p=0.004).</td>
<td></td>
</tr>
<tr>
<td><strong>InflamMGD</strong> greater loss than nonATD (p=0.05)</td>
<td></td>
</tr>
<tr>
<td>NonSSATD and MGD more med lat loss than SSATD (p≤0.03)</td>
<td></td>
</tr>
<tr>
<td>Grid distortion: number assessed from each group unclear?</td>
<td></td>
</tr>
<tr>
<td><strong>FBUT</strong>:</td>
<td></td>
</tr>
<tr>
<td>All ATD and MGD shorter BUT than controls (p≤0.001)</td>
<td></td>
</tr>
<tr>
<td>SSATD shorter BUT than atrophMGD(p≤0.016) and nonSSATD was shorter than inflame (p≤0.049) and atrophMGD(p≤0.011)</td>
<td></td>
</tr>
<tr>
<td><strong>FLUORESCIN STAIN</strong>: Scores were meaned for each site</td>
<td></td>
</tr>
</tbody>
</table>
for 2 eye
SSATD staining > all other groups. (p≤0.009) 
Global staining: NonSSATD > CONTROLS. (p≤0.021) 
Global staining: InflamMGD > controls. (p≤0.021) 
Nasal Stain: SSATD > all groups staining > all other groups. 
(p≤0.009) 
Infer Stain: SSATD > MGD and controls staining > all other 
groups. (p≤0.045) 
Cornea Stain: SSATD > all other groups. (p≤0.034) (Controls 
less than nonSSATD and inflamMGD)

ROSE BENGAL STAIN: 2 eye Scores were meaned for 
each site. 
Global score: SSATD > all groups (p≤0.038) 
Infer stain: nonSSATD > control (p≤0.032) 
Corn stain: nonSSATD > control (p≤0.001) 
    inflamMGD > control (p≤0.015) 
    atrophMGD > control (p≤0.032) 
Van Bijsterveld score: 
Global score: nonSS > controls (p≤0.037)

<table>
<thead>
<tr>
<th>Group</th>
<th>Conjunctiva</th>
<th>Cornea</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nasal</td>
<td>Temp</td>
<td>Inf</td>
</tr>
<tr>
<td>SSATD</td>
<td>7.8±2.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSSATD</td>
<td>2.2±1.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InflMGD</td>
<td>1.4±1.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AtrMGD</td>
<td>1.3±1.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td>0.5±0.50</td>
</tr>
</tbody>
</table>

Rose bengal data:

“Total” scores out of 12.

STAIN CORRELATIONS: (Fig 11)
Global Fluor score strongly correlated with RB score 
(Spearman correlation coeff = 0.807; p , 0.001).
RB score correlated with grid distortion (p≤0.001 t-test) 
RB score correlated with loss of naso-lacrimal reflex 
(p≤0.001 t-test) 
RB score not correlated with MGD features.

SCHIRMER TEST: 
Worse eye Schirmer scores lower for nonSS- and SSATD 
groups than for MGD and controls (p≤0.001)
Fellow eyes similar, but SSATD fellow eyes scores lower 
than for nonSSATD (p=0.02). 
Inflam Sch scores < atrophicMGD scores (p=0.04)

SCHIRMER CORRELATIONS: 
Schirmer scores correlated inversely with: 
Total fluorescein scores (Kendall’s τ – 0.505; p< 0.001) (Pflugfelder et al. 1997)
Total Rose bengal scores (Kendall’s τ = 0.474; p< 0.001) (Stain and Schirmer scores meaned from both eyes?)

MUCIN Previous study showed normal goblet cell densities and epithelial mucin (Pflugfelder et al. 1997)

CLEARANCE
Controls: Zero % showed retention at 20 minutes
SSATD :100%
NonSSATD :77.8%
AtrMGD :70%
InflMGD :40%

Video need
Yes: [ ]  No: [ ]

Materials:
- Wech Allyn Finhoff transilluminator for meibography
- Xeroscope
- Smith and Nephew Fluorets (now Chauvin)
- Unisol Alcon Preservative-free saline
- Schirmer papers: Iolab Corporation
- Fluress fluorescein soln: Sola Barnes-Hind

Standardization
Different requirements for each test.

Repeatability
Intra-observer agreement. [ - ]
Inter-observer agreement. [ - ]

Sensitivity
(true positives) [ - ]

Specificity
(100 – false positives) [ - ]

Test problems
Note: simple staining scoring.
Note: averaging of non-parametric data.
SS patients younger than other groups

Glossary
ATD = aqueous tear deficiency
SSATD = Sjogren’s Syndrome ATD
MGD = here used for Meibomian gland disease, not dysfunction

References

