Dry Eye in The Digital Age
COPE ID # 64484-AS
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Disclosures
1. Alcon Speakers Bureau
2. Tear Lab - Research & Site Training

Dry Eye in the Digital Age

RINGS OF TIME FOR THE INFORMATION AGE
The Scope of the Problem

- 90% of American adults report using digital devices > 2 hrs/day
- 60% of Americans use digital devices for at least 5 hrs/day
- 71% of Americans use digital devices > 7 hrs/day
- 67% use 3 or more devices simultaneously
- 27% report experiencing dry eye
- Older subjects and people spending more than 4 hrs/day on VDT are at major risk for developing DED

Impact on Children

- 70% of adults report their children spend > 2 hrs/day on digital devices
- 25% of children report playing on digital devices as their favorite activity
- 34% spend > 6 hrs/day on digital devices
- Children 8 to 12 are getting > 6 hrs/day of screen time
- Approx 10% of youth report dry eye symptoms
- 2016 study found that children who spend more time on their smartphones have more dry eye symptoms

DED Pathophysiology Specific to Digital Device Use

- Ocular dryness is often accompanied by alteration in conjunctival epithelial cell morphology & conjunctival goblet cell density
- Digital device use reduces blink rate to 5 to 6 / minute vs normal of 14 blinks/min
- Patients have higher incomplete blink rates when reading from digital devices (75%) vs 4% when reading from hard copy
- Blink rate, blink amplitude & tear film stability were compromised during VDT use

DED Pathophysiology Specific to Digital Device Use

- Visual fatigue greater w/ LCD displays vs. E-ink and hard copy
- Eye dryness is common after prolonged computer use & the prevalence ranges from 30% to 68.5%
- Low Mucin SAC concentration in the tears w/ prolonged VT use
- The oxidative stress marker hexanoyllysine (HFL) was significantly increased @ 4 hours of smartphone use than @ baseline and @ 1 hour
- Thomas Allen Unified Theory of Digital Device Use
- Myopia, dry eye and macular degeneration are linked to digital device use
Contact Lens Wear Compounds DED with Digital Device Use

- Contact lens wear is a risk factor for abnormal tear physiology.
- Contact lens wearers are 12x more likely than emmetropes, and 5x more likely that spectacle wearers to report dryness symptoms.\(^{17}\)
- Among computer users, 83% of male & 87% of female contact lens wearers reported at least one dryness symptom compared to 68% of male & 73% of female non-contact lens wearers.\(^{18}\)
- For contact lens wearers, dryness symptoms were more prominent among those using digital devices for 3 to 6 hours than among those using devices for less than 3 hours.\(^{18}\)


Dry Eye Diagnosis

OK, COVER YOUR OTHER EYE & READ THE THIRD LINE ON THE SMART PHONE

Tear Film & Ocular Surface Society (TFOS)
Dry Eye Workshop II (TFOS DEWS II) | Dry Eye Disease (DED)

2007 TFOS DEWS Definition
"Dry Eye is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual dysfunction, or both, and in the pathogenesis of corneal and conjunctival diseases. It is characterized by a quantitative and/or qualitative deficiency of either the lipid, aqueous, or mucin layers of the tear film and/or abnormalities of the ocular surface. It is accompanied by increased instability of the tear film and abnormalities of the ocular surface.

2017 TFOS DEWS II Definition
"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 a neurotransmitter imbalance exists in the ocular surface, inflammation and damage, and tearoscopy, aberration of the anterior ocular surface, and abnormality of the tear film.

DTS Study Group
Most Commonly Used Diagnostic Tests

<table>
<thead>
<tr>
<th>Diagnostic Test</th>
<th>Respondents Regularly Using Them (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescein staining</td>
<td>100</td>
</tr>
<tr>
<td>Tear breakup time</td>
<td>94</td>
</tr>
<tr>
<td>Schirmer test</td>
<td>71</td>
</tr>
<tr>
<td>Ocular surface staining</td>
<td>65</td>
</tr>
<tr>
<td>Corneal topography</td>
<td>63</td>
</tr>
<tr>
<td>Tear osmolarity</td>
<td>24</td>
</tr>
<tr>
<td>Tear fluorescein clearance</td>
<td>24</td>
</tr>
<tr>
<td>Ocular Surface Disease Index Questionnaire</td>
<td>18</td>
</tr>
<tr>
<td>NEI VFQ-25*</td>
<td>6</td>
</tr>
<tr>
<td>Tear osmolarity</td>
<td>6</td>
</tr>
<tr>
<td>Conjunctival biopsy</td>
<td>6</td>
</tr>
</tbody>
</table>

A Survey of Dry Eye Practice Patterns 2017 *

101 Ophthalmologists surveyed, including 43 Corneal Specialists!

Their top 3 most common “traditional” dry eye tests performed:
- Corneal Fluorescein Staining (89%)
- Tear Break-Up Time (78%)
- Anesthetized Schirmer’s Test (51%)

Conjunctiva lissamine green and/or rose bengal were performed by <25%

The top 3 most common “newer” dry eye tests performed:
- Tear Osmolarity assessment (23%)
- MMP-9 testing (17%)
- Lipiview (13%)

ODs Choice of Dry Eye Diagnostic Tests*

- Tear Osmolarity assessment (23%)
- MMP-9 testing (17%)
- Lipiview (13%)
- Corneal staining
- Tear break-up time
- Tear film assessment
- Schirmer’s test
- Rose bengal staining
Dry Eye Surveys

Ocular Surface Disease Index (OSDI)
Rapid, repeatable, and gives a quantifiable result
Validity has been substantiated by clinical research*
Helpful not only diagnostically, but also as a measure of therapeutic progress


Ocular Surface Disease Index

OSDI: Symptoms, Functions, Environmental Triggers

Please answer the following questions by checking the box that best represents your answer.
Have you experienced any of the following during the last week?

<table>
<thead>
<tr>
<th>Eye problems that limited you during the last week?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

OSDI SCORE

<table>
<thead>
<tr>
<th>Dry Eye Severity Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity and frequency of discomfort</td>
<td>Mild and episodic</td>
<td>Moderate, episodic</td>
<td>Severe, frequent or constant</td>
<td>Severe and constant</td>
</tr>
<tr>
<td>OSDI SCORE</td>
<td>13 - 22</td>
<td>23 - 32</td>
<td>33 - 42</td>
<td>63 - 100</td>
</tr>
</tbody>
</table>

Standard Patient Evaluation of Eye Dryness (SPEED) Questionnaire

- Evaluates the frequency and severity of symptoms
- Developed as an easy to use fast screening tool for dry eye disease
- SPEED questionnaire is one of the tools used to identify candidates for LipiView®

DEQ - 5

- How often did your eyes feel discomfort:
  - Never 0 1 2 3 4 Constantly
- When your eyes felt discomfort, how intense was this feeling of discomfort at the end of the day?
  - Never 0 1 2 3 4 5 Very intense
- How often did your eyes feel dry?
  - Never 0 1 2 3 4 Constantly
- When your eyes felt dry, how intense was this feeling of dryness at the end of the day, within 2 hours of going to bed?
  - Never 0 1 2 3 4 5 Very intense
- How often did your eyes look or feel excessively watery?
  - Never 0 1 2 3 4 Constantly

SANE Questionnaire

Dry Eye Questionnaires

- "The best-validated screening definition of dry eye probably comprises these three?"*
- "How often do your eyes feel dry (not wet enough)?" (constantly, often, sometimes, never)
- "How often do your eyes feel irritated?" (constantly, often, sometimes, never)
- "Have you ever been diagnosed by a clinician as having dry eye syndrome?"*

TIER 1

- Basic Care w/o New Investment
- Corneal Fluorescein Staining
- Tear Break- Up Time
- Anesthetized Schirmer’s Test
- Lissamine green and /or rose bengal

TIER 1

- Educational materials

OD First-choice in Dry Eye Treatments*

**TIER 2**
- Diagnostic Devices & Staff Participation
  - Point of Care Testing
  - Staff Time
  - More Advanced Treatment

**TIER 3**
- A Dry Eye Center!
  - Point of Care Testing
  - Some New Testing
  - Advanced Treatment
  - Staffing & Scheduling Changes

**Other Treatment Considerations**
- General considerations
  - Drink water
  - Avoid excess caffeine
  - Quit smoking!
  - Turn off overhead fans @ night
  - Humidifier

**Treatment Considerations**
Treatment Considerations

• Digital-Specific Recommendations
  • Blink! Sticky note on computer
  • 20-20-20 rule
  • Adjust device brightness
    • Consider changing background color from bright white to cool grey

1. https://www.thevisioncouncil.org/content/digital-eye-strain

20-20-20 Rule

Follow the 20-20-20 Rule
Every 20 minutes, look at something 20 feet away for 20 seconds

Treatment Considerations

• Digital-Specific Recommendations
  • Ergonomics
    • Adjust screen directly in front of face below eye level.
    • Do not tilt screen
    • Distance from you to screen. Hand out!
    • Lessen overhead and surrounding light
    • Increase font size

1. https://www.thevisioncouncil.org/content/digital-eye-strain

Treatment Considerations

• Digital-Specific Recommendations
  • Keep hand held devices at a safe distance and below eye level
  • Most children hold devices at 5 to 6 inches from face. Increase distance.
Conclusion