Lid margin wellness: Are we being proactive contact lens fitters?

CL-06

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CL Market overview: Summary every January

- $7.4B world market ($2.7B in the US)
- In the US
  - 40.9 M wearers, >18 yrs
  - 16.7% of the adult population
- Females (66%) > Males (34%)
- Largest age group: 18-34 (48%)

Source: CL Spectrum Jan 2015, Jan 2016, Jan 2017
SiHY dominating the market

Source: CL Spectrum Jan 2017

Modality

Weekly/2 Week 24%
Frequent replacement: 68%
1 Month 44%

DD: steady growth in the past 7 yrs

Source: CL Spectrum, January 2017
#1 Concern in CL Wear: CL Dropouts

- 40.9 M CL wearers in the US
- #1 issue for CL discontinuation is discomfort/DE

Prevalence of CL discomfort

Table 1. Prevalence of CLD From Population-Based Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Location</th>
<th>Number of Wearing</th>
<th>Age</th>
<th>Sex</th>
<th>Number of CLD Experiencing</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANDEES study</td>
<td>Canada</td>
<td>5.285</td>
<td>10–80 y</td>
<td></td>
<td>Male 77%, female 25%</td>
<td></td>
</tr>
<tr>
<td>Kommi study</td>
<td>Japan</td>
<td>105</td>
<td></td>
<td></td>
<td>Male 50%, female 50%</td>
<td>Uchino et al., 2011</td>
</tr>
<tr>
<td>Japanese VDT users study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Male 60%, female 40%</td>
<td>Uchino et al., 2008</td>
</tr>
<tr>
<td>Japanese high school study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Male 50%, female 50%</td>
<td>Uchino et al., 2008</td>
</tr>
<tr>
<td>Chinese senior high school students study</td>
<td></td>
<td>22</td>
<td>Not mentioned</td>
<td>Not mentioned</td>
<td>Male 70%, female 30%</td>
<td>Zhang et al., 2012</td>
</tr>
</tbody>
</table>

SCL wearers experienced symptoms significantly more frequently than non-wearers.

On average, 50% of CL wearers experience CLD or dryness at least occasionally.

Reasons for discontinuing

Dumbleton et al. ECL 2013
Reasons for discontinuing: New wearers

Sulley et al. Retention rates in new contact lens wearers ECL 2017

- Poor vision affecting retention rates!
- New CL designs need to be suggested

FIG. 9. Reasons for discontinuation at 12 months.

Contact Lens Discomfort

Environment

Material e.g. Lubricity Water Content
Design e.g. Edge Base Curve
Fit & Wear e.g. Lens Interaction Modality
Lens Care e.g. Solution Chemistry Care Regimen
Inherent Patient Factors e.g. Age/Gender Ocular/Systemic Disease
Modifiable Patient Factors e.g. Medication Compliance
Ocular Environment e.g. Lipid/Tear Stability Blink
External Environment e.g. Humidity Air Quality

“Strugglers” Physical Awareness Visual Disturbance
Reduced Comfortable Wearing Time
Reduced Total Wearing Time
Temporary Discontinuation of Lens Wear
Permanent Discontinuation of Lens Wear (Drop Out)
Lid margin disease

Anterior Blepharitis

Main causes of blepharitis;
• Bacterial (Staphlococcal)
• Fungal (Seborrheic)
• Viral (herpes simplex, zoster)
• Parasitic (Demodex)
Posterior blepharitis / MGD

Mixed Blepharitis
Blepharitis

**Symptoms**

- Inflamed lid margins
- Dry eye
- Discomfort/ sore / pain
- Itchiness (lid margin)
- Sticky lids (morning)
- Grittiness/Foreign body sensation
- Teary eye
- « Eyes look red/tired »

**Signs**

- Hyperemia
- Debris (lashes /tear film)
- Secretions
- Epiphora
- Madarosis
- Telangiectasia
- Trichiasis
- Tylosis
- Gland dropout
- Notches along lid margin

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**Effect of cosmetics on the ocular surface**

- Cosmetics products migrate into the tear film (Ng et al ECL 2015)
- Certain eyeliners can affect the composition (viscosity) of lipids on the ocular surface (Hunter et al. Ophthalmic Res 2015)
- Impact of cosmetics on the eye (Ng et al ECL 2016)
  - Increased risk of infection
  - Risk of mechanical trauma (mascara)
  - Toxicity
  - Allergy (eyelash extension glue)
  - Changes in conjunctiva and periocular pigmentation (mascara, Latisse)
  - Changes to the tear film lipid layer and stability
  - Changes to the MG (Isotretinoin—Accutane)
Other causes of lid margin problems

How digital device usage is affecting youth

Schacter, S. Optometry Times Feb 2017

THE DELETERIOUS EFFECTS OF DIGITAL EYE STRAIN

As dependence on digital devices grows, every patient needs to be told about taking screen breaks.

BY ROCHELLE NATALONI, CONTRIBUTING EDITOR

From first thing in the morning until the last thing at night, people are tethered to their smartphones. Screen time is ubiquitous throughout the day, whether at work or play. Computer vision syndrome (CVS) is as pervasive as the devices for which it is named, having been described as

Prolonged exposure to digital devices and video screens contributes to OSD, particularly meibomian gland dysfunction (MGD), according to Dr. Yee, formerly a clinical professor of ophthalmology at the University of Texas and now in private practice. Dr. Yee and colleagues performed a study examining the relationship between frequency of screen use and ocular surface health. They found that individuals who had exposure to device screens for 3 or more hours daily were more likely to have OSD symptoms and complaints.
Diagnostic tests: MG expression

Mastrota Paddle
Meibomian Gland Evaluator (MGE) TearScience

ExpressorPro Mibo Medical
Expressor Forceps Optimed

Impact of CL on Ocular Parameters
Overview of the Tear Film

Normal tear volume: 7 ± 2 µl

distributed in the fornices, upper & lower tear menisci and pre-ocular tear film

Average central tear thickness: 3-5 µm

Consider the relative thickness of the tear film and the CL it supports.


Image courtesy of Jay Wang
AAO 2017 Lid Wellness: Are we being proactive CL fitters?
E Bitton, S Srinivasan October 2017

TEAR FILM CHANGES THE LENS: DEPOSITION

LENSES CHANGES THE TEAR FILM: COMPROMISED TEAR FILM FUNCTIONS

INFLAMMATION, IRRITATION, INFECTION, DISCOMFORT

- Property loss: Denatured proteins, Oxidized lipids, Collapsed mucins
- Tear film thinning /evaporation
- Decreased lipid
- Collapsed mucins

- Property loss: Proteins, lipids and mucins (quantity & quality)
- Lens is a barrier to nutrient transfer to the cornea
- Lens is a barrier to oxygen transfer to the cornea
- Firmly adhered deposition on lens alters natural cleaning

- Slit lamp deposits
- Vision
- Lubrication
- Hydration
- Moisture
- Nutrition
- Oxygenation
- Cleaning
- Protection
- Vision

Functional loss:
- Denatured proteins
- Oxidized lipids
- Collapsed mucins
CL wear and Tear Film

- CLs split tear film into:
  - Pre-and post-lens components
  - Pre-lens much less stable
- Reduced lipid layer
  - Increased evaporation rate
  - Lower volume
- Best assessed by evaluating tear film for
  - Debris
  - Volume and possibly evaporation over the CL

Tear film and Ocular Surface Society
Contact Lens Discomfort Workshop Report

- Factors impacting CLD
- 9 subcommittees
- >70 members
- Academic and industry representatives
- Oct 2013: publication in IOVS
- 10 reports
What factors influence comfort in CL wearers?

Patient factors:
- Demographics
- Age
- Gender
- Environment
- Humidity
- Temperature
- General Health
- Allergies
- Diet
- Medications
- Systemic conditions
- Ocular Physiology
- Lid margin disease
- Ocular surface
- Tear film

Lens factors:
- Design and fit
- Deposition
- Material
- Dk/t
- Lubricity
- Hydration
- Modulus
- Wettability
- Surface properties
- Modification
- Wetting agents
- Wearing schedule
- Modality
- Replacement frequency
- Wearing time

Care regimen factors:
- Disinfecting solutions
- Rewetting drops

MGD & CL Discomfort

- Noted since the early 1980’s\(^1,2\)
- Described by Korb & Henriquez
- “a syndrome characterised by deficient or inadequate meibomian gland secretions, minimal or transient symptoms suggestive of ocular dryness, and contact lens intolerance is described”.
- “…studies indicate that the syndrome is due to obstruction of the Meibomian gland orifices by desquamated epithelial cells.”
Association of MGD with CL Wear?

- Equivocal results....
- **No association** between CL wear and MG atrophy
- CL wear reduces # of functional MG
  - decrease is proportional to duration of CL wear
- CL wear results in MG changes
  - onset during first 2 yrs of wear
  - 6 months cessation of wear no impact on recovery
- **Impact of age??**


Tear Cytokine levels after CL wear – short term

- N=26 (SiHy); n= 27 (non –CL controls)
- Baseline, 4-6 hrs and 1 night of SiHy wear
- Tears collected at each visit for cytokine analysis
- A short period of daily and overnight silicone hydrogel lens wear does not significantly alter the inflammatory status in adapted soft contact lens wearers

CL Wear and Demodex

- N=40 young Asian females
  - 20 wearers; 20 non-wearers
  - Mean age 27 (±9)
- Demodex observed in 90% of lens wearers and in 65% of non-wearers (p = 0.06)
- The # of Demodex was higher in lens wearers than in non-wearers (7.6 vs. 5.0; p = 0.02).
- The # of Demodex tended to increase with age


CL Wear and Demodex

- N=62
  - 28 ex-CL wearers; ceased wear due to discomfort
  - 34 asymptomatic CL wearers
  - Mean age 29
- Significant difference in % exhibiting demodex infestation

Ocular Surface Factors Associated with CLD

• Potential factors include:
  – Staining
    • bulbar conjunctival staining
    • corneal staining
  – Lid abnormalities
    • meibomian gland disease
    • lid wiper epitheliopathy
  – Tear film abnormalities
    • reduced tear film stability
    • increased tear film evaporation
    • tear film biochemical changes
      – mainly to lipids


Current lid margin therapies
E Bitton, S Srinivasan

Eyelid cleansers

Eyelid cleansers with TTO

In-office use
Eyelid cleansers with hypochlorous acid

0.01 % spray

0.2 % spray/gel

Warm compresses

1. Eyemasks
   – Reusable (microwave) or self-heating

MGDRx EyeBag

TheraPearl (B+L)

Eye Hydrating Compress (Bruder)

EyeGiene (Lactician)
Warm compresses

2. Thermal technologies
   – Goggles (Blephasteam)
   – Electric eyepad (Digital heat Inc)
   – Translid (Mibo Thermoflo)
   – Direct (Lipiflow)
Warm compresses

3. Intense Pulse Light (IPL)

Debridement of lid margin

- Golf spud along the line of Marx
  - (Korb, Blackie, Cornea 2013)
- Microblepharoexfoliation (MBE)
  - BlephEx
  - Lid Pro (Mibo Technologies)
AAO 2017 Lid Wellness: Are we being proactive CL fitters?
E Bitton, S Srinivasan October 2017

Pharmaceuticals

- Antimicrobials
- Anti-inflammatories
- Nutraceuticals

Capsule, Liquid and Vegan formulations

Promoting lid margin health in CL wear in clinical practice
• How many of you brush and floss every night?
• How many of you have seen a dentist in the last 6 months?
  – why do you go?
  – do you go because you have pain/problems?
• How many of you have a routine physical every year?
• How many of you have an eye exam every year?
• How many of you do warm compresses or lid scrubs every night?

• Is it because
  – my eyes don’t bleed like gums bleed?
  – my eyes don’t smell bad!!?
  – my eyes don’t get cavities like my teeth?
  – my eyes don’t have to go through whitening treatment?
  – of insurance coverage issues?
• Should optometry learn from dentistry?
• Preventative measures
  – preventive gum care and preventive eye care/lid care?
• Brushing and flossing = warm compresses and lid hygiene
• More relevant in CL wearers

Ocular surface wellness – novel concept
We SHOULD do routine evaluation

- Blink rate assessment
  - Lid closure
  - Partial vs full blink
- Interferometry/lipid layer assessment
- Meibography
- Osmolarity
- Lid debridement
- MG gland diagnostic expression
- In office lid hygiene and warm compress
- Demodex evaluation

Should ECPs conduct screening procedures on everyone - especially CL wearers? With and without symptoms? Why should we wait until...
eye makeup tips
for people who wear soft contact lenses

Makeup belongs on your face, not your contact lenses.

Keep your contact lenses clean and free of makeup residue to maintain eye comfort and vision.

No matter why you wear contact lenses... play it safe!

Contact lenses can change your appearance, add style to your looks, and enhance your self-esteem. However, did you know that contact lenses are also a source of potential health hazards?

- Keep contact lenses clean and free of any makeup residue to maintain eye comfort and vision.

meibomian glands

Your meibomian glands play an important role in keeping your eye surface healthy. These glands produce tears, which help wash away dirt and bacteria from your eyes.

Talk to your eye care professional about your options.

unexpected all-nighter?

Don't be casual with your contact lenses

Can children wear contact lenses?

Research has shown that children as young as eight can successfully handle, care for, and wear contact lenses. Is your child ready to try them? Consider the following factors before making your decision.

- Vision correction for children
- Amblyopia (lazy eye)
- Refractive error (myopia, hyperopia, astigmatism)

Cleaning Instructions
for contact lens wearers

Follow these guidelines to keep your contact lenses comfortable and to avoid eye infections.

- Clean lenses with a solution
- Keep lenses moist with a saline solution
- Use lens case with caution
- Store lenses in a case

For more information, visit contactlensinfo.com
Educational resources for patients and practitioners

- http://www.aocle.org/healthyHabits.html
- https://www.cdc.gov/features/healthy-contact-lens/index.html
- https://www.optimed.co.uk/captiv8/
- http://www.contactlensupdate.com/compendium/
- http://contactlensupdate.com/

Educate ECPs

- Educate practitioners of novel testing options and devices:
  - Blephex
  - Lid Debridement-Scaling
  - IR meibography
  - Meibomian gland evaluators
ECPs should educate CL patients

- Emphasize the need for routine eye care and daily lid care
- Healthy Ocular surface = Comfortable CL wear

CL that support the ocular surface
CL material Factors NOT Associated with comfort

- Higher Dk/t
- Ionicity/charge
- Modulus/stiffness
- Dehydration
- Deposits
- In vitro wettability
- Tear exchange

CL material Factors PROBABLY Associated with comfort

- Good fit
  – avoid excessive movement
  – avoid excessive thickness
- Low water content
- Low friction
- High in-eye wettability
- Shorter frequency of replacement
- Shorter periods of wear
  – comfort worse at end of day
What Material Concepts Can Help Minimise CLD and promote CL wear?

### 1. Wetting Agents in Blister Pack Solution

- Mainly relevant for DD materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Surface Tension (dynes/cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water/Saline</td>
<td>72</td>
</tr>
<tr>
<td>1 Day AV Moist</td>
<td>40</td>
</tr>
<tr>
<td>Dailies AquaComfort +</td>
<td>21</td>
</tr>
<tr>
<td>1 Day AV TruEye</td>
<td>45</td>
</tr>
<tr>
<td>Proclear</td>
<td>60</td>
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<tr>
<td>AV OASYS</td>
<td>59</td>
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<tr>
<td>Biofinity</td>
<td>58</td>
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<tr>
<td>PureVision</td>
<td>65</td>
</tr>
<tr>
<td>Air Optix Aqua</td>
<td>64</td>
</tr>
<tr>
<td>AO Aqua N&amp;D</td>
<td>57</td>
</tr>
</tbody>
</table>

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2. Low Dehydration Materials

- HEMA + Phosphorylcholine (PC)

- HEMA + Glycerol methacrylate (GMA)

3. Elution of Polymers

- High molecular weight PVA released into the tears over the course of the day
  - nelfilcon A (polyvinyl alcohol)
4. Addition of Internal Wetting Agents

- High molecular weight polymers added to aid surface wetting
  - PVP (polyvinylpyrrolidone)
    - reusable & DD
      - hydrogel
      - SiHy
  - HA (hyaluronic acid)

5. Proprietary Wetting Technologies

- Unique technologies to aid surface wetting
  - Aquaform®
  - Menisilk™ & Nanogloss™
  - MoistureSeal™
  - SmartShield™
  - WetLoc™
6. Hydrogel Interface Over SiHy

- Ocular surface and lids “see” a hydrogel interface
  - aiming for
    - enhanced wettability
    - low friction
- Water gradient technology
  - “ultra-soft” surface gel
- Low friction surface

Summary – how to be proactive?

- Lid margin and dry eye testing should be part of every CL candidate exam
- Be aware of the novel testing options and devices
- Multiple techniques for diagnosis and management of ocular surface wellness to enhance CL success
- Implement educational tools to inform staff and patients on the importance of lid margin wellness