Adaptive Symptoms to CL Wear

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ADAPTIVE SYSTEMS

- Most obvious in neophyte wearers
- Will occur in drop-outs when refitted
- Can occur in occasional wearers
- Greater with rigid lenses
- Usually only some, not all, reported
- Usually only occur in very early stages of wear
CL Adaptation

- **Definition:**
  - Ocular response to CL’s that occurs during the first few weeks of CL wear
Types of CL Adaptation

- Physiological
- Neurological
CL Adaptation

- **Physiological:**
  - lacrimation contributes to 3% corneal thickening with GP
  - altered tear protein levels, NaCl and K ions affect equilibrium of tear layer (Gildos-Donnan)
  - tear layer becomes diluted of proteins and ions (ie. hypotonic)
CL Adaptation

- Neurological:
  - corneal sensitivity decreases with lens wear
  - as the Dk of the material decreases, the corneal thickness increases and the corneal sensitivity decreases (Millidot)
  - neural adaptation coincides with CL adaptation (Lowther and Hill)
CL Adaptation versus Abnormal Responses

- **Adaptive Symptoms:**
  - expected during the first few weeks
  - diminishes with each day

- **Abnormal Symptoms:**
  - persist beyond the expected period
  - due to an identifiable physical cause
    - lens /solution related
    - procedural errors
    - environment related
Adaptive Symptoms with GP

- tearing - foreign body sensation
- increases blinking
- difficulty looking up and to side
- abnormal head posture
- palpebral aperture narrowing
- itchiness of lids and eyes after removal
- photophobia
Adaptive Symptoms with GP

- mild redness
- fluctuating vision
- flare, reflections, fluttering of light, haze
- lid swelling
- spectacle blur
- mild discomfort or irritation
- lens/eye dry at end of wearing time
Adaptive Symptoms with SCL’s:

- minimal adaptation
- minimal tearing
- fluctuating vision, haze, protein film
- decreased blink frequency
- lens/eye dry at end of wear
- mild redness
- lens stings on insertion
Abnormal Symptoms: Sudden

- sudden pain/burning
- severe persistent halo around lights
- severe redness/irritation
- blur with specs > 1 hr.
- increasing discharge
- lens adhering to eye
Abnormal Symptoms: Persistent

- vision reduction/fluctuation
- discomfort/pain
- dryness
- redness
Causes of Abnormal Symptoms

- Refractive - flexure, optics
- Mechanical - edge, fitting, wettablility
- Toxic/Allergic - solution
- Hypoxic - Dk, overwear
- Inflammatory - deposits
- Infectious - microorganisms
Abnormal Symptoms: Vision

- Immediate
  - constant
  - intermittent/fluctuate

- Delayed
  - becomes worse
  - fluctuate
Abnormal Symptoms: Vision

- Immediate
  - Constant
    - improper refraction
    - significant uncorrected astigmatism
    - poor optics
    - inverted lens
    - lens switched
    - lens surface defects/scratches
Abnormal Symptoms: Vision

- Immediate
  - Intermittent
    - loose fit
    - optic zone not centred
    - optic zone too small/ only in dark
    - dry environment
    - dry eyes
    - improper/incomplete blink
Abnormal Symptoms: Vision

- Delayed
  - Becomes worse
    - flat/steep fit (punctate staining)
    - excessive/minimum lens movement
    - mechanical trauma to cornea
    - poor tear circulation
    - change in lens parameters/warpage
    - deposits
    - discolouration
Abnormal Symptoms: Vision

- **Delayed**
  - Fluctuates
    - excessive secretions
    - incorrect lens bearing
    - secretion with bad lens edge
    - BV anomaly/accommodation
  - Spectacle Blur (GP)
    - <1 hour
    - low DK causing corneal warpage
Abnormal Symptoms: Vision, Tx

- modify lens edge
- modify lens parameters
- change lens power
- change lens design
- give BV training
- clean/polish lens
- go to disposable lens
Abnormal Symptoms: Vision GP

Reduced Vision with GP

- flexure
- warpage
- decentration
- poor surface wettabillity
- power change
Abnormal Symptoms: Vision GP

- Flexure: Causes
  - high astigmatism
  - steep BOZR
  - thin design
  - large BOZD

- Flexure: Diagnosis
  - toricity with over-K
  - spherical on radiuscope
Abnormal Symptoms: Vision GP

- Warpage: Causes
  - digital pressure when cleaning
  - former PMMA wearer
  - improper placement in case

- Warpage: Diagnosis
  - toric values with radiuscope
Abnormal Symptoms: Vision GP

- Decentration: Causes
  - decentered apex
  - unusual corneal topography
  - tight or loose lid tension
  - thick lens design
  - high specific gravity material

- Decentration: Diagnosis
  - biomicroscopic evaluation during & after the blink
Abnormal Symptoms: Vision GP

- Poor Surface Wettabiliy: Causes
  - Initial
    - too much heat during manufacturing
    - poor polishing techniques
    - improper diamond
    - residual pitch
Abnormal Symptoms: Vision GP

- Poor Surface Wettability: Causes
  - Acquired
    - poor tear quality
    - improper blinking
    - poor compliance
    - improper solution
    - hand creams, cosmetics
    - scratches
Abnormal Symptoms: Vision GP

- Poor Surface Wettability: Diagnosis
  - poor surface wettability;
    - break-up of tears
    - presence of hazy or mucoprotein deposits
Abnormal Symptoms: Vision GP

- **Power Change: Causes**
  - aggressive digital cleaning
  - use of an abrasive cleaner

- **Power Change: Diagnosis**
  - increase in minus power &/or
  - decrease in centre thickness during progress visit
Abnormal Symptoms: Vision SCL

- lens deposits
- inverted lens
- abrasion
- incorrect Rx: uncorrected astigmatism, toric lens rotation, myopic creep
- defective lens
- edema
- pathology
Abnormal Symptoms: Vision SCL

- **Lens deposits**
  - replace lens
  - educate
  - planned replacement
  - change care system
  - refit into GP

- **Corneal edema**
  - reduce WT
  - decrease CT
  - increase water content
  - refit into GP
Abnormal Symptoms: Discomfort

- Immediate
  - becomes worse
  - subsides

- Delayed
  - becomes worse
Abnormal Symptoms: Discomfort

- Immediate
  - Becomes worse
    - loose lens
    - excessive movement
    - tear, bad edge
    - trapped foreign body
    - hypersensitive/psychological
Abnormal Symptoms: Discomfort

- Immediate
  - Subsides
    - environmental
    - smoking
    - low humidity
    - dirty environment
Abnormal Symptoms: Discomfort

- Delayed
  - Becomes worse
    - asthenopia
    - residual astigmatism
    - accommodation
    - BV anomaly
Abnormal Symptoms: Discomfort

- upon insertion
- after removal
- constant
- immediate (after a period of wear)
Abnormal Symptoms: Discomfort

- Upon insertion
  - torn lens
  - solution sensitivity
  - prism ballast

- After Removal
  - abrasion
  - infection
  - ulcer
Abnormal Symptoms: Discomfort

- **Constant**
  - tight lens
  - edema
  - lens deposits

- **Immediate**
  - trapped FB
  - torn lens
  - lens deposits
Abnormal Symptoms: Pain

- **Immediate**
  - becomes worse
  - related to photophobia, blepharospasm and lacrimation

- **Delayed**
  - becomes worse
  - related to burning/dryness
Abnormal Symptoms: Pain

- Immediate
  - becomes worse
    - insertion abrasion
  - associated with photophobia, blepharospasm and lacrimation
    - infection
Abnormal Symptoms: Pain

- Delayed
  - becomes worse
    - foreign body abrasion
    - central abrasion from a flat fit/excessive mov’t
  - related to burning /dryness
    - steep fit/minimum mov’t
Abnormal Symptoms: Burning

- Solution sensitivity
  - preservative sensitivity
  - non-buffered solution

- Inappropriate care regimen
  - residual cleaner on lens
  - incomplete neutralisation of Hydrogen peroxide
  - improper solution use
Abnormal Symptoms: Dryness

- poor tear quality
- pregnancy
- incomplete blink
- medications
- environment
- computer use
Abnormal Symptoms: Redness

- mechanical
- toxic/allergic
- hypoxic
- inflammatory
- infectious
- associated with dry eye
Abnormal Symptoms: Redness

- conjunctival
  - infectious
  - inflammatory
  - toxic/allergic
  - dry eye

- limbal
  - Hypoxic

- palpebral
  - toxic/allergic
  - inflammatory
Abnormal Symptoms: Redness

- **CL induced**
  - damaged lens
  - edema
  - soln sensitivity
  - tight lens
  - deposits
  - contaminated
  - trapped fb
  - poor fit
  - improper soln use

- **Non CL induced**
  - fb
  - conjunctivitis
  - ocular pathology
  - trauma
  - cigarette smoke
  - swimming in pool
  - lack of sleep
  - excess alcohol
  - allergy, dryness
Abnormal Symptoms: Signs

- Refractive
  - poor optics
  - power change
  - uncorrected astigmatism
  - toric lens rotation
  - flexure
  - corneal warpage
  - surface wettability/deposits
Abnormal Symptoms: Signs

- Mechanical
  - foreign body
  - edge effects
  - 3 & 9 staining
  - CLAPC (contact lens associated papillary conjunctivitis)
  - poor lens surface wettability
“3&9” Staining

Prevalence:
- **50-80%** of daily wear RGP lens wearers *(Lowther, 1982; Barr, 1985)*
- **10%** clinically significant *(Ghormley et al, 1990)*
Abnormal Symptoms: Signs

- Toxic/Allergic
  - Signs
    - chemosis, hyperemia, infiltrates, limbal follicles, mucus discharge, punctate staining
  - Symptoms
    - stinging, burning, dryness, redness, reduced wearing time
Abnormal Symptoms: Signs

- Toxic
  - rapid onset
  - due to preservatives that destabilise the tear film &/or are toxic to conjunctival and corneal epithelium

- Allergy
  - based on immunologic hypersensitivity
  - delayed after min. 36hrs.
  - diagnosed by skin patching, scrapings etc
## DDx of Solution-Related Toxic/Allergic Ocular Response

<table>
<thead>
<tr>
<th>CC</th>
<th>Toxic</th>
<th>Allergic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edema</td>
<td>burning</td>
<td>itching</td>
</tr>
<tr>
<td>Infiltrates</td>
<td>diffuse, epi none</td>
<td>diffuse, stromal present</td>
</tr>
<tr>
<td>Bulbar Inj.</td>
<td>bright red</td>
<td>pale red</td>
</tr>
<tr>
<td>Staining</td>
<td>diffuse punct.</td>
<td>little diffuse</td>
</tr>
<tr>
<td>Time Course</td>
<td>hrs. to days</td>
<td>wks. to mons.</td>
</tr>
</tbody>
</table>
Solution Hypersensitivity/Toxicity

- **Prevalence**
  - 5-10% of hydrogel lens wearers

- **Etiology**
  - exposure to elements within a care system
    - peroxide “burns”
    - thiomerosal / chlorhexidine
    - benzalkonium chloride
    - polyhexanide / polyquad
Tx Toxic/Allergic Reactions

- purge lenses/throw out if disposable
- try different preservative
- use non-preserved systems
  - Ultracare
  - Clear Care (Peroxide)
  - Insta-Care
- use non-preserved saline to rinse lenses i.e. aerosol or unit-dose
Abnormal Symptoms: Signs

- Hypoxia
  - neovascularisation
  - microcysts
  - polymegathism
  - limbal hyperemia
  - central corneal clouding (CCC)
  - microcystic edema
Abnormal Symptoms: Signs

- Inflammatory
  - CL-SLK (CL induced superior limbic keratitis)
  - CLARE (CL associated red eye)
  - SEI (sub-epithelial infiltrates)
  - CLPU (CL induced peripheral ulcer)
**Abnormal Symptoms: Signs**

- **Infectious**
  - bacterial (pseudomonas)
  - fungal
  - protozoan (acanthameoba)
  - viral (adenovirus)
  - all cause MK (microbial keratitis)
Abnormal Symptoms: Signs

- Relationship among:
  - CLARE
  - SEI or IK
  - CLPU
  - MK
Abnormal Symptoms: Signs

**CLARE**
- Contact Lens
- Deposits
- Protein/Lens Interaction
- Adherence of Bacteria
- Growth/Overnight
- Toxin Release
- Host Defense/Inflammatory Response
- SEI or IK
Abnormal Symptoms: Signs

- **CLPU**
  - inflammation
  - necrosis
  - hypoxic stress
  - loss of epithelium
  - Bowman’s intact
  - banking of PMN’s
  - no microorganisms

- **MK**
  - microorganism adherence
  - infected
  - stromal involvement
  - excavation through Bowman’s
  - loss of epithelium
  - *OUCH!*
Abnormal Symptoms: Signs

- Associated with Dry Eye
  - Smile staining
  - Conjunctival redness
  - Conjunctival staining
  - Inflammation
  - Can be associated with MGD
SMILE STAINING

○ Prevalence
  ● up to 25% of SCL wearing subjects have inferior corneal staining (Guillon et al, 1990)
  ● majority of severe staining is inferiorly positioned (Schwallie et al, 1997)

○ Etiology
  ● initial lens dehydration
  ● depletion of the postlens tear film
  ● subsequent staining through epithelial desiccation
  ● greatest with
    - high water content lenses
    - thinner lenses
    - low humidity environments
    - incomplete blinking
SMILE STAINING

- **Symptoms**
  - dryness
  - reduced wearing time

- **Signs**
  - coarse inferior punctate staining in an arcuate fashion
  - extends from 4 to 8 o'clock in the lower 1/3 of the cornea
  - typically 4-5 mm in from the limbus