Comfortable Contacts: Fanciful Dream or Achievable Reality?
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- Advanced Vision Research
- Alcon
- AlgiPharma
- Allergan
- Contamac USA
- CooperVision
- Essilor
- J&J Vision Care
- Ocular Dynamics
- Oculus
- TearScience

Outline
- Impact of discomfort on CL success
- Relevant material factors
- Relevant solution factors
- Relevant patient factors

Could be much bigger!
- 3.5 billion people worldwide require vision correction
- only 120 million wear contact lenses
  - <5%
  Pathetic!

Who Suggested CL?

Barriers to CL Market Growth?
**Discomfort**

- % of Wearers Dropping out of Lens Wear for a Period of Time
  - Canada: 1993
  - UK: 1999
  - US: 2011

- Weed 1993
- Pritchard 1999
- Dumbleton 2013
- Best 2013
- Richdale 2007
- Nichols 2010
- Rumpakis 2010

**Reasons for Dropout**


**Reasons for Lapsed Wear**


**Financial Impact of Dropout**

- Drop-out rates vary depending upon type of practice, location and products used:
  - 16% (USA) to 30% (Asia)
- Over the life-time of a patient that represents a potential loss of $21,000 per patient!
- Patient retention is crucial to the life of a CL practice

- [Rumpakis: New data on contact lens dropouts: An international perspective. Rev Optom 2010; January](http://example.com)
"Contact Lens Discomfort (CLD) is a condition that is characterized by episodic or persistent adverse ocular sensations related to lens wear either with or without visual disturbance, resulting from reduced compatibility between the contact lens and ocular environment, which can lead to decreased wearing time and discontinuation of contact lens wear."

1. Materials
**Materials & Designs**

359 refs!!!

- Bulk properties
  - water content
  - ionicity
  - Dk and Dk/t
  - modulus
  - dehydration
- Design and fit
  - diameter
  - centration
  - edge alignment/profile
  - toric/Multifocal designs
  - tear exchange
- Surface properties
  - friction/lubricity
  - in vitro wettability
  - ex vivo wettability
  - in vivo wettability
- Deposits
- Wearing modality
  - DW vs EW
  - duration of wear
  - replacement frequency

**Silicone Hydrogel Benefits**

- Hypoxia related complications - problem solved!
  - overnight oedema ~3% 1,2
  - no increase in microcysts 2,3
  - min limbal hyperaemia 2,4
  - min vascularisation 5
  - no myopic creep 6

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**Growth in SiHy Materials**

Morgan et al. CL Spectrum 2016, 31(1) 23,000 contact lens fits across 34 countries

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**Worldwide CL Fits: 2015**

new fits & refits

Morgan et al. CL Spectrum, Jan 2016

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**Worldwide SCL FR: 2015**

new fits & refits

Morgan et al. CL Spectrum, Jan 2016

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**What have SiHy brought us?**
So are SiHy the answer?

Comfort: Hydrogel vs SiHy?

“there is no evidence that for daily wear they have significantly improved comfort compared with the comfort achieved with hydrogel contact lenses”

Friction & Lubricity

- Emerging importance to CL field
  - varied testing protocols
  - unknown which best simulates in-eye performance
- Recent evidence does exist for an association between CL friction and comfort

Infiltrative Keratitis??

Infiltrates?

- Difficult to accurately report incidence rates
  - results depend on:
    • study design
    • criteria used for reporting infiltrates
- Consistently 2X higher rate with reusable SiHy

IK & DD Contacts

“DD lenses were protective relative to reusable lenses”

Chalmers et al., IOVS 2011; 52: 6690-6696

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Adverse Event Rates & DD

<table>
<thead>
<tr>
<th>Material Factors NOT Associated with Comfort</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Higher Dk/t</td>
</tr>
<tr>
<td>• Ionicity/charge</td>
</tr>
<tr>
<td>• Modulus/stiffness</td>
</tr>
<tr>
<td>• Dehydration</td>
</tr>
<tr>
<td>• In vitro wettability</td>
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<td>• Tear exchange</td>
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<td>– denatured lysozyme?</td>
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Chalmers et al., Optom Vis Sci 2013; 90;7: 674-81

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Material Factors PROBABLY Associated with Comfort

• Good fit
  – avoid excessive movement
  – avoid excessive thickness
• Lower water content
• Low friction
• Shorter frequency of replacement
• Shorter periods of wear
  – comfort worse at end of day

Chalmers et al., Optom Vis Sci 2013; 90;7: 674-81

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2. Solutions

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Impact of Solutions on CLD

- There are conflicting studies regarding the impact of solutions on CLD.1,2
- No statistically significant association for solutions in self-reported DE among CL wearers.3


Comfort: Lens & Solution Choice?

- "Ocular comfort and symptoms in symptomatic CL wearers can be perceptibly improved by switching to an alternative CL-LCP combination".
- "This finding provides justification for the efforts of both eye care practitioners and researchers to improve the comfort of CL wearers".

Comfort: Avoiding Solutions...

- "Senofilcon A clinical response is modulated by the lens care products".
- "All lens care products tested reduced subjective responses relative to DD modality..."
- "Senofilcon A performs best when used on a DD basis."

3. Patient Factors

Potential Patient Factors?

- Age
- Environment
- Medication
- Allergies
- Blink rate
- Tear film quality
- Lid disease

Patient Factors Associated with CLD

- Potential factors include:
  - Female sex
  - Younger age
  - Poor TF quality and quantity
  - Seasonal allergies
  - Some systemic medications
    - oral contraceptives
    - isotretinoin
  - Diet, hydration & alcohol
  - Smoking
  - Compliance

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

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**Lid Disease**

**Meibomian Gland Dysfunction**

Bubbles in the tear film

**Digital image analysis**

Upper and lower lids of participant with partial gland drop out

**TearScience LipiView**

Upper and lower lids of participant with no gland drop out
LipiFlow® Device
Dr Donald Korb

LipiFlow® Thermal Pulsation System

- Heat applied to the palpebral surfaces of the upper and lower eyes directly over the meibomian glands
- Crated pulse-like pressure delivered to the outer eyelid

LipiFlow in Action!

Demodex

Essential Fatty Acids & Dry Eye Reviews

Environment

- Keep up water intake
- Avoid salty foods and diuretic beverages
  - coffee; tea; alcohol
- Avoid
  - fans/direct air flow directly on face
  - low humidity
    - air travel
  - smoky environments
  - dusty or polluted environments
  - excessive time on computers

Reviews

2. Rosenberg & Asbell. The Ocular Surface 2010; 8; 1 (18-28).
How Can We Minimise Dropout?

New Findings on Neophyte Patient Retention & Reducing Drop-Out

1st yr retention rate with modern materials in neophyte wearers in UK
- 74%
- most dropouts occurred in first 2 months
- dropout most likely in older individuals
- vision and handling most common issue for dropout
- compared with comfort in established wearers

Problems that need solving

- End of day dryness and discomfort
  - causes ~50% of drop-outs
  - may not be major reason in neophytes
  - probably closer to 20%
- Poor vision
  - major problem in neophytes
  - may cause ~30% of drop-outs in neophytes
  - probably closer to ~15% for established wearers
  - carefully correct astigmats and presbyopes
- Handling
  - major issue for drop-out in neophytes

Summary....

Solving the Comfort Conundrum

- Pay attention to issues relating to:
  - material
  - solution
  - patient
- Continue to keep abreast of developments in all 3 areas
- Comfort issues can be addressed for most patients if a multi-pronged approach is utilised

Thanks for your attention