Contact Lens Fitting for Myopia Management

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Overview

- CL fitting and children
- Safety of CL wear w/ children
- OrthoKeratology
- Soft Multifocals
Fitting Kids in Contact Lenses

- ACHIEVE
  - the adolescent and child health initiative to encourage vision empowerment study
  - Contact Lenses significantly improve how children feel about:
    - their physical appearance
    - their ability to play sports
    - their acceptance among friends
Fitting Kids in Contact Lenses

• Studies indicate children as young as 8 are capable CL (soft, GP, and OK)

• CLIP study
  – total chair time only 15 minutes longer
  – 8 to 12 yo vs 13 to 18 yo

• Mature enough to independently care for their lenses
Fitting Kids in Contact Lenses

- Important factors for successful fitting:
  - Interest and Motivation
  - Maturity ability to independently take care of CL
  - Personal hygiene habits
  - Sports
  - Prescription requirements
  - Self-esteem
  - Pre-existing medical conditions
“There is sufficient evidence to suggest that OrthoK is a safe option for myopia correction and retardation. Long-term success of OrthoK treatment requires a combination of proper lens fitting, rigorous compliance to lens care regimen, good adherence to routine follow-ups, and timely treatment of complications.”

Myopia

• When initiate Myopia Management?
  – Risk Factors for myopia development
    • Parental myopia
    • Excessive near work at close distances
    • Reduced time outdoors
    • Ethnicity with East Asian children at greater risk
    • Less than age-expected hyperopia
    • Female gender
Myopia

• When initiate Myopia Management?

  – Initiate treatment when myopia is first diagnosed with cycloplegic spherical equivalent refraction of -0.50D
Myopia

- Collaborative Longitudinal Evaluation of Ethnicity and Refractive effort (CLEERE) study
  - If a child is less hyperopic (cycloplegic) than +0.75D by first grade, the child is at an increased risk to develop myopia.

- 6 yoM OD: +.25 OS +0.50
- 6yoF OD: +0.25 OS pl

Zadnik et al. Prediction of Juvenile-Onset Myopia. JAMA Ophth. 6/2015
Myopia

The best predictor for myopia onset is cycloplegic spherical equivalent refractive error at a given age.

**Low hypermetropic refraction for a given age has greater than an 80% likelihood of myopia onset by age 13.5**
Myopia Control Clinical Protocol

- Age 6-8, refraction more myopic than +0.75D
  - Educate parents about Atropine and Spending Time outdoors; Rx Atropine low dose, if parents are willing
- Age 8-11
  - Monitor for progression (concern with > 0.50D/year)
  - Use calculator for analysis
  - Rx either SMF or Orthokeratology Lenses to slow myopia progression
Myopia Control Clinical Protocol

• Online Progression Calculators
  – Offer reasonable estimates of normal progression without myopia control therapy.
  – The calculated myopia control effect – extrapolates a few years treatment for effect for up to 11 years.
  – Omits that treatment effect decreases over time
  – Misleading with overly optimistic treatment expectations.
Myopia Management Option:

Multifocal soft contact lenses

Percentage reduction in progression of myopia compared to standard correction e.g. single vision spectacles.

49%

If treated with Multifocal soft contact lenses that provides 49% control, then the level of myopia at 17 may be:

-1.92D

If myopia control treatment is not commenced immediately, the final level of your child’s myopia at 17 may be:

-2.80D
Orthokeratology

- Reverse Geometry Gas Permeable Lens
- Flatten central cornea to correct for Myopia
- Mid-peripheral steepening
  - Creates less peripheral defocus versus single plane correction
  - Creates peripheral myopic defocus
Orthokeratology

- Expected to slow myopia progression by 30% to 60%
- Axial Length best measurement
- Newer Designs modifications for myopia management
  - Smaller Optic Zone size
  - HyperDK materials
Orthokeratology

• Using Orthokeratology for Myopia Management is an **OFF-Label** lens application

• Exception:

• Acuvue Abiliti Overnight Therapeutic Lenses
  – This is the first and only FDA approved orthokeratology (ortho-k) contact lens for the management of myopia.
  – Planned to be available in 2022
  – Menicon Z material
Orthokeratology

• Ideal Candidates:
  – Children with moderate myopia
    • Between -1.25D to ~-4.00D
    – Lower myopia – less mid-peripheral plus induced
    – Higher myopia – harder to achieve targeted prescription
  – Children with large pupils
Patient Selection

- FDA approval for CRT (corneal refractive therapy)
  - Up to -6.00 D of Myopia
  - Up to -1.75 D of astigmatism
  - No age limitations

- FDA approval for VST (vision shaping treatment)
  - -1.00 to -5.00 D of myopia
  - Up to -1.50 D of astigmatism
  - No age limitations

My rules for patient selection:

- More successful:
  Up to -4.00D myopia
  Up to -1.75 WTR astigmatism
  Up to -1.00 ATR astigmatism

- Less successful:
  Up to -6.00D myopia
  Up to -1.75 astigmatism
Orthokeratology

• Technology Needed:
  – A scan
    • Baseline, every 6 months
  – Topographer
    • Baseline, every follow-up appointment
    • Monitors
      » Lens positioning
      » Progression of Treatment
      » Determining the problem solving approach
Patient Selection

• In-office screening:
  – Manifest Refraction
  – Slit-lamp examination
  – Measurement of corneal HVID
  – Pupil size measurement
  – Baseline corneal topography
  – Baseline A scan
  – Discussion of patient motivation and expectations
Fitting Options

• **Diagnostic Set**
  – Lens selection from Flat K(topography) and Refraction
  – More hands-on for doctor; higher start up costs
  – Example: Paragon CRT

• **Topography Designed**
  – HVID, Topography, and Manifest Refraction
  – Examples: BE Retainer, WAVE, Eyespace, Arise

• **Laboratory/Fitting Software Designed**
  – HVID, Topography, and Manifest Refraction
  – Examples: Euclid Emerald, Contex, Moonlens

Image courtesy of paragon vision sciences
Orthokeratology

Myopia Control Design
- Optic Zone Diameter: 5.4mm

Adult Design
- Optic Zone Diameter: 6.8mm

Orthokeratology
Orthokeratology - topography

- Post lens wear; Tangential Map
- Central flattening
  - Treatment zone
- Mid-peripheral steepening
  - Return Zone/Relief Zone
- Peripheral Flattening
  - Alignment Curve
Orthokeratology

- Dispense appointment
- 1 week vs 1 day follow-up appointment
- 2 week follow-up appointment
- 1 month follow-up appointment
- 6 month follow-up appointment
Orthokeratology

• Follow-up procedures:
  – Topography
  – Refraction
  – Corneal Evaluation
    • May observe superficial corneal staining at first few follow-up appointments
  – Lens fit evaluation with over-refraction
  – A scan at 6 months
Orthokeratology - topography

Baseline

Post wear

Subtractive or Difference Map; Tangential Power Map
Orthokeratology - topography

Dioptric scale comparison on subtractive map
OrthoKeratology - Refraction

• Refractive error after lens wear should be close to plano.
  – Scenarios to consider:
    • 8am refraction plano -- wonderful, do nothing
    • Noon refraction -0.25 -- no problem, do nothing
    • 3pm refraction -0.50 -- I don’t think mess with this
    • Noon refraction -1.00 -- modify lens parameters to improve visual outcome; will also need an OR with lens on the eye.
OrthoKeratology – lens evaluation

- “bulls-eye” pattern
- Centration
- Topographical analysis
- Visual Outcome
OrthoKeratology – lens evaluation
OrthoKeratology – lens evaluation
OrthoKeratology

• Lens over-refraction
  – The OR should be LOW, most likely +0.50

• A scan (if available)
  – Baseline and every 6 months
OrthoKeratology – clinical protocol

• Monitoring for Success
  – If at 6 month follow-up or 1 year follow-up
    • Refraction change >0.50D OR
    • axial length elongation >0.2
    • Patient myopia has likely progressed.
    • Change lens parameters to improve vision
OrthoKeratology – clinical protocol

• Monitoring for Success
  – If at 2 year follow-up
    • Refraction change >0.50D  OR
    • axial length elongation >0.2
    • Patient myopia has likely progressed.
    • Need to consider additional methods of myopia management or combination therapy with
      – Atropine
      – SMF
Soft Bifocal Contact Lenses

- Multifocal soft contact lenses are expected to slow myopia progress by about 30% to 50%

   - This modality may be less effective due to “part-time” wear compared to Orthokeratology and Pharmacological Interventions
Soft Bifocal Contact Lenses

- **Soft Multifocal lens are an OFF-Label application for slowing the progression of myopia, except.....**

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**FDA NEWS RELEASE**

**FDA approves first contact lens indicated to slow the progression of nearsightedness in children**

November 15, 2019

Soft Bifocal Contact Lenses

- Lens Design
  - Multifocal lens that is a Center Distance Design

- Refraction
- Keratometry
- Biomicroscopy
- Baseline A scan
- Pupil Size evaluation
Soft Bifocal Contact Lenses

• Clinical Fitting Protocol
  – Initial lens selection based on cycloplegic spherical equivalent refractive error

  – Highest Add power acceptable to the child without compromising distance vision
Soft Bifocal Contact Lenses

• BLINK randomized clinical trial
  – Does a high add power SMF (+2.50D) slow myopia progression more than medium (+1.50D) add power lenses
  – 292 participants; mean age 10.3 years
  – 3 year myopic progression:
    • +2.50D add    -0.60D  0.42mm
    • +1.50D add    -0.89D  0.58mm
    • Single Vision  -1.05D  0.66mm
  – Treatment with high add power MF significantly reduced the rate of myopia progression over 3 years over medium add power and single vision.

## Soft Multifocal Contact Lenses

<table>
<thead>
<tr>
<th>Company</th>
<th>Brand</th>
<th>Distance Powers</th>
<th>Adds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coopervision</td>
<td>Biofinity Multifocal “D”</td>
<td>+6.00 to -8.00 (0.50 step above -6)</td>
<td>+1.00, +1.50, +2.00, +2.50</td>
</tr>
<tr>
<td>Coopervision</td>
<td>Proclear Multifocal “D”</td>
<td>+6.00 to -8.00 (0.50 step above -6)</td>
<td>+1.00, +1.50, +2.00, +2.50</td>
</tr>
<tr>
<td><strong>also available in MF toric design</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnson and Johnson</td>
<td>Acuvue Oasys for Presbyopia</td>
<td>+6.00 to -9.00</td>
<td>Low (+0.75 to +1.25) Med(+1.50 to +1.75) High(+2.00 to +2.50)</td>
</tr>
<tr>
<td>Visioneering Technologies, Inc</td>
<td>NaturalVue (daily disposable)</td>
<td>-0.25 to -12.25D in 0.25D steps</td>
<td>1 Universal ADD power, effective up to +3.00D</td>
</tr>
<tr>
<td>CooperVision</td>
<td>MiSight</td>
<td>-0.50D to -6.00D 0.25D steps</td>
<td>1 ADD power (+2.00D)</td>
</tr>
</tbody>
</table>

*The above designs are center Distance soft bifocal contact lenses with moderate to high add powers, commercially available in the US.*
Soft Multifocal CL

• What if child can not see well with +2.50 add?
  – Initiate a build-up period
    • Begin with +1.50 or +2.00 add
      – Wear for 1 month
    • Change to next step up
      – Wear for 1 month
  – Incorporate distance over-refraction
Soft Multifocal CL

• Schulle KL, et al
  – BLINK study group
  – *To determine the spherical over-refraction necessary to obtain BCVA when fitting myopic children with center distance MFCL.*
  – Children typically require -0.50D to -0.75D SOR to achieve BCVA
    • With +2.50 add in MFCL

Soft Multifocal CL

• Clinical Fitting Protocol
  – Cycloplegic spherical equivalent refractive error
  – Highest Add power acceptable to the child without compromising distance vision
  – Adjust distance power with over-refraction for improved distance visual acuity.
  – Wear time for adequate myopia management is eight or more hours each day
Soft Multifocal CL

- Clinical Fitting Protocol
  - Considering that MiSight is a +2.00 add and has evidence of myopia control
  - BLINK study determined that +2.50 add is best, compared to lower add powers

- Practitioners should feel comfortable with a child wearing either a +2.00 or higher add for myopia control, but not a lower add power.
Soft Multifocal CL

- 11 year old female
- OD: -1.00    OS: -0.75
  - Fit into Biofinity MF “D” lenses
  - OD: -1.00/+2.00D  20/25-    OS: -0.75/+2.00D  20/25-
  - OR: -0.25 OD, OS

- -1.25 / +2.00D    -1.00/+2.00D  x 1 month
- -1.25 / +2.50D    -1.00 / +2.50D  Finalized
Soft Multifocal CL

• 1 year Follow-up
• 12 year old female
• OD: -1.00  OS: -0.75 -0.50 x 175

  – Biofinity MF Center D – continue with same:
• -1.25 / +2.50D  -1.00 / +2.50D Finalized
Myopia Control Clinical Protocol

• If wearing soft multifocal and have progression <0.50D/year
  • Monitor with 6 month refraction checks/axial length measurements

• If wearing soft multifocal and have progression > 0.50D/year
  • Consider adding low dose Atropine
Combination Therapy

• Atropine 0.01% + Orthokeratology
  – 8 to 12 yo; -1.00D to -6.00D – wearing Ortho-K for 3 months
  – 41 participants randomized into OK only or combination with Atropine 0.01%
  – increase in axial length over 1 year
    • $0.09 \pm 0.12$ mm in the combination group
    • $0.19 \pm 0.15$ mm in the monotherapy group
  – Combination therapy more effective

Myopia Control

• 39% of CL Spectrum readers respondents, actively practice myopia control

[Graph showing distribution of myopia control methods:]
- 49% Contact Lens (Multifocal or Orthokeratology)
- 44% Combination (Contact Lens + Atropine)
- 8% Atropine

in terms of atropine concentration (2019)
- 72% Rx 0.01%
- 19% Rx 0.1%
- 8% Rx 0.5%

CL Spectrum 1/21; CL 2020: Figure 6. 2020
Myopia Management

• Scenarios just for fun (these are my actual patients!):
  – 7 year old Female: OD -4.00; OS -4.50
    • Begin myopia management immediately, combination treatment with atropine if parent willing
  – 10 year Male: OD: pl  OS: pl-0.25 x 086
    • Monitor, discuss outdoor play, low does atropine?
  – 15 year old Female:  OD -8.75  OS -8.00
    • Likely too late for any significant myopia control
Myopia Management

- Hey Doc – when I can take my kiddo out of this special lens???
  - 16??
  - 18??
  - Never??
Myopia Management

• Hey Doc – when I can take my kiddo out of this special lens???
  – Does myopia stabilize around 14-16 years of age?
  – Some individuals progress into 20’s
    • Age is a poor indicator of when to cease treatment

  – *If child sees well and enjoys myopia management lens modality, no reason to discontinue treatment, even if there is no continued evidence of myopic progression*
Myopia Management

• Hey Doc – when I can take my kiddo out of this special lens???
  – If child wants to pursue a different non-myopia control lens design and
  – There is evidence through regular monitoring that myopia has ceased to progress, they can discontinue myopia control.
  – Practitioners can continue to monitor for progression at regular appointments.
Myopia Management

- Orthokeratology 30% to 60%
- SMF 30% to 50%
- Atropine (various concentrations) 30% to 80%

- Easy to educate parents
- Easy to incorporate into clinical practice
- Practice Builder

- Questions?