THE DISEASE OF MYOPIA
AND STRATEGIES FOR
MYOPIA CONTROL

MELISSA BARNETT, OD, FAAO, FSLS, FBCLA
Disclosures

- ABB
- Acculens
- Alden Optical
- Alcon
- Allergan
- Anthem, INC
- Bausch + Lomb
- BostonSight
- Bruder
- Contamac
- CooperVision
- EveryDay Contacts
- Gas Permeable Lens Institute (GPLI)

- JJVC Vistakon
- Ocusoft
- Percept
- Raayonnova
- Science Based Health
- Scleral Lens Education Society
- Sjogren’s Syndrome Foundation
- STAPLE program
- SynergEyes
- Tangibie Science
- Visioneering Technologies
• Many thanks to Pat Caroline, COT and Ed Bennett, OD for your contributions to this lecture
WHAT IS MYOPIA?

- NEARSIGHTEDNESS
- MYOPIA PROGRESSES
- MYOPIA CAN CAUSE OCULAR DISEASE
3 TYPES OF MYOPIA

• PATHOLOGIC MYOPIA
  • BEFORE AGE 6
  • CAUSED BY ABNORMAL AND EXTREME ELONGATION OF THE AXIAL LENGTH OF THE EYE THAT DOES NOT CHANGE

• SCHOOL-AGE MYOPIA
  • OCCURS BETWEEN 6-18 YEARS OF AGE
  • STABILIZATION EXPECTED BY LATE TEENS TO EARLY TWENTIES
  • ASSOCIATED WITH HIGHER IQ SCORES
  • MORE TIME SPENT READING
  • LESS EXPOSURE TO SUNLIGHT COMPARED TO NON-MYOPIC PATIENTS
  • MORE COMMON IN URBAN AND INDUSTRIALIZED COUNTRIES
  • IN SINGAPORE, MORE TIME SPENT IN ACADEMIA CORRELATES TO MAGNITUDE OF MYOPIA
3 TYPES OF MYOPIA

• **ADULT ONSET**
  
  • EARLY ADULT IS CONSIDERED 20 TO 40 YEARS OLD; LATE ADULT IS OVER 40 YEARS OLD.
  
  • AFFECTED BY ACCOMMODATIVE ANOMALIES AND NEAR VISION DOMINATED OCCUPATIONS.

• TO CONTROL MYOPIA, THE RATE OF EYE GROWTH MUST BE SLOWED.

• THE AVERAGE AGE FOR THIS IS 16 YEARS.$^2$

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• “THERE IS NO SAFE LEVEL OF MYOPIA” – PAT CAROLINE, KATIE GIFFORD, OD

• “HAVE YOU EVER MET A MYOPIC CHILD THAT DIDN’T GET WORSE?” – EARL SMITH, OD

• “MYOPIA IS A DISEASE PEOPLE!” - CLARKE NEWMAN, OD

• “MYOPIA CONTROL IS THE SAME AS GLAUCOMA AND KERATOCONUS TREATMENT... YOU DON’T START GLAUCOMA TREATMENT WHEN YOU HAVE END STAGE DISEASE AND 90% OF THE NERVE LOST OR HAVE HYDROPS AND ARE READY FOR A CORNEAL TRANSPLANT” – ANDY MORGENSTERN, OD
RISK FACTORS FOR MYOPIA

• Race
• Genetics
• Parents
• Environment
• Time performing near work
• Time spent outdoors

Risk Scale for Myopia and Near Work

Myopia is the result of a complex interaction between all of these...especially genetics and environment!
<table>
<thead>
<tr>
<th><strong>Quantitative definitions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Myopia</strong></td>
</tr>
<tr>
<td>A condition in which the spherical equivalent</td>
</tr>
<tr>
<td>refractive error of an eye is $\leq -0.50$ D</td>
</tr>
<tr>
<td>when ocular accommodation is relaxed.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Low myopia</strong></td>
</tr>
<tr>
<td>A condition in which the spherical equivalent</td>
</tr>
<tr>
<td>refractive error of an eye is $\leq -0.50$ D</td>
</tr>
<tr>
<td>and $&gt; -6.00$ D when ocular accommodation is</td>
</tr>
<tr>
<td>relaxed.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>High myopia</strong></td>
</tr>
<tr>
<td>A condition in which the spherical equivalent</td>
</tr>
<tr>
<td>refractive error of an eye is $\leq -6.00$ D</td>
</tr>
<tr>
<td>when ocular accommodation is relaxed.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Pre-myopia</strong></td>
</tr>
<tr>
<td>A refractive state of an eye of $\leq +0.75$ D and</td>
</tr>
<tr>
<td>$&gt; -0.50$ D in children where a combination of</td>
</tr>
<tr>
<td>baseline refraction, age, and other quantifiable</td>
</tr>
<tr>
<td>risk factors provide a sufficient likelihood of the</td>
</tr>
<tr>
<td>future development of myopia to merit preventative</td>
</tr>
<tr>
<td>interventions.</td>
</tr>
</tbody>
</table>
Incidence of Myopia Worldwide in 2008

Myopia affected 1.6 billion worldwide
GLOBAL PREVALENCE OF MYOPIA AND HIGH MYOPIA AND TEMPORAL TRENDS FROM 2000 THROUGH 2050

BRIEN A. HOLDEN, PHD, DSC, TIMOTHY R. FRICKE, MSC, DAVID A. WILSON, PHD, MONICA JONG, PHD, KOVIN S. NAIDOO, PHD, PADMAJA SANKARIDURG, PHD, TIEN Y. WONG, MD, THOMAS J. NADUVILATH, PHD, SERGE RESNIKOFF, MD

OPHTHALMOLOGY 2016
Distribution of People Estimated to have Myopia 2000 and 2050

Holden et al Ophthalmology 2016
MYOPIA IS A MAJOR PUBLIC HEALTH ISSUE

MYOPIA IS INCREASING

• 40-50% PREVALENCE IN US AND EUROPE\(^1\)
• ALMOST 80% PREVALENCE IN SOME ASIAN COUNTRIES\(^2\)
• 5 BILLION AFFECTED PEOPLE BY 2050\(^3\)
• EARLIER ONSET MEANS HIGHER MYOPIA\(^4\)


Slide courtesy of VTI
Speed of Myopia Progression

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Average Speed (D/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>0.55</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>0.63</td>
</tr>
<tr>
<td>Asian</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Average age 9 years across all ethnicities:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Average Speed (D/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>0.71</td>
</tr>
<tr>
<td>Females</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Prevalence of Myopia East Asia

Greater than 80% in Hong Kong, Taiwan & Singapore

5 to 7% in rural, uneducated groups (Morgan 2006)

5% in grandparents in Hong Kong (Lam 1994)

Suggest environmental factors rather than genetic factors are responsible for influx of myopia.
WHY SUCH A HIGH INCIDENCE IN THE ASIAN CULTURES?

ASIAN SOCIETIES FAMILY AND PEER PRESSURES:

• SUSTAINED NEAR TASKS FROM AN EARLY AGE
• LONG SCHOOL HOURS AND HOMEWORK
• LEARNING TO WRITE CHINESE OR JAPANESE
2010
nearly 28% affected
by Myopia

2050
nearly 50% affected
by Myopia
## MYOPIA RISK (KATE GIFFORD, GSLS January 2017)

<table>
<thead>
<tr>
<th>Risk of myopia</th>
<th>Cataract (PSCC)</th>
<th>Retinal detachment</th>
<th>Myopic Maculopathy</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.00 to -3.00</td>
<td>2.1</td>
<td>3.1</td>
<td>2.2</td>
</tr>
<tr>
<td>-3.00 to -6.00</td>
<td>3.1</td>
<td>9.0</td>
<td>9.7</td>
</tr>
<tr>
<td>-6.00 to -8.00</td>
<td>5.5</td>
<td>21.5</td>
<td>40.6</td>
</tr>
</tbody>
</table>

WHY IS MYOPIA CONTROL IMPORTANT?  
(JONG, GSLS JANUARY, 2015)

• IN NORTH AMERICA 1/3 OF INDIVIDUALS WERE MYOPIC IN 2000; 50% IN 2030; 60% IN 2050

• FROM 1972 – 2002, MYOPIA INCREASED FROM 25 – 46% IN US; 8X INCREASE IN ≥8D MYOPIA, 3X GREATER RISK OF GLAUCOMA & 10X GREATER RISK OF RETINAL PATHOLOGY

• MYOPIC MACULAR DEGENERATION IS A LEADING CAUSE OF BLINDNESS WORLDWIDE

• ALMOST EVERY HIGH MYOPE ≥ 60 YRS OF AGE HAS OCULAR PATHOLOGY

• PART OF THE PROBLEM, LOWER OUTDOOR ACTIVITY WITH INCREASED NEAR WORK  
(SYDNEY MYOPIA STUDY, 2008)
Myopia Control
Why Each Diopter Matters

Bullimore, Mark A. MCOptom, PhD, FAAO1; Brennan, Noel A. MScOptom, PhD, FAAO2

Optometry and Vision Science: June 2019 - Volume 96 - Issue 6 - p 463–465
doi: 10.1097/OPX.0000000000001367

PERSPECTIVES

• Study that evaluated data from five large population-based studies of the prevalence of myopic maculopathy on 21,000 patients

• A 1-diopter increase in myopia associated with a 67% increase in the prevalence of myopic maculopathy

• Restated, slowing myopia by 1 diopter should reduce the likelihood of a patient developing myopic maculopathy by 40%

• This treatment is beneficial regardless of the level of myopia
WHAT MIGHT CONTRIBUTE TO MYOPIA?

**Genetics:**
- Myopic parents

**Environment:**
- Sunlight, vitamin D, dopamine levels, time spent outdoors

**Peripheral Hyperopia:**
- Routine correction constantly moves images behind the retina which may continually signal the eye to grow

**Near work:**
- Extended reading, use of electronic devices

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2. Peripheral Hyperopia explanation summarized from:

Slide courtesy of VTI
Minus lenses correct at the center of the retina for clear vision...

However, peripheral light rays at the edge of the eye are now moved behind the retina.

This may re-establish a growth signal and lead to the lengthening of the eye.

1 Peripheral Hyperopia explanation summarized from:

Onset of Myopia

- Decreased hyperopia (0.75D to 1.00D) occurs up to two years before myopia onset (Xiang et al, 2012)
- Decreased hyperopia is one of the strongest predictors of myopia (Zadnik et al, 2015)
- Occurs between 6 – 12 years of age (Zadnik et al, 2015)

<table>
<thead>
<tr>
<th>Age</th>
<th>Level of Hyperopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 6</td>
<td>Less than +0.75</td>
</tr>
<tr>
<td>Age 7 &amp; 8</td>
<td>Less than +0.50</td>
</tr>
<tr>
<td>Age 9 &amp; 10</td>
<td>Less than +0.25</td>
</tr>
</tbody>
</table>

Age 6
Ideal +1.00 D
If less than +1.00 D, high risk for myopia
Onset of Myopia

- After myopia is present, rate of refractive change is reduced (−0.50D to −0.75D per year)
- Myopia continues to slow over time (−0.25D to −0.50D per year)
- Axial length (AL) elongation accelerates in the year before myopia onset
- AL/corneal radius ratio is normally > 3mm at that time
MYOPIA PROGRESSION

• Myopia progression is not linear
• Periods of rapid progression
• Periods of apparent stabilization
• Maintain a long-term perspective
• Instead of managing patients on a narrow timeline
OUTDOOR TIME

- Increased outdoor time was associated with less myopia

- Many classrooms are removing walls and ceilings and replacing with glass and bright lights

Guangdong Province, China
TIME OUTDOORS AT SPECIFIC AGES DURING EARLY CHILDHOOD

• AVON LONGITUDINAL STUDY OF PARENTS AND CHILDREN (ALSPAC)

• AGE 2 TO 15 YEARS

• 2833 PARTICIPANTS

• FROM 3 YEARS OF AGE ONWARD, GREATER TIME OUTDOORS ASSOCIATED WITH A REDUCED RISK OF INCIDENT MYOPIA.

• ADDITIONAL TIME OUTDOORS 3 - 9 YEARS OF AGE ASSOCIATED WITH A REDUCED INCIDENCE OF MYOPIA BETWEEN AGES 10 -15 YEARS.
POSSIBLE MECHANISMS

1. LESS ACCOMMODATIVE DEMANDS IN OUTDOOR ENVIRONMENTS.

2. PUPIL CONSTRICTION IN BRIGHTER LIGHT RESULTING IN GREATER DEPTH OF FOCUS.

3. DIRECT LIGHT EXPOSURE MAY RELEASE RETINAL TRANSMITTERS WHICH MAY INHIBIT EYE GROWTH.
   
   DOPAMINE

   VITAMIN D
• WHY YOUR KIDS MIGHT BE ABLE TO SEE BETTER IF THEY PLAY OUTDOORS MORE OFTEN

• SEPTEMBER 26, 2017 1.17AM BST

• HTTPS://THECONVERSATION.COM/WHY-YOUR-KIDS-MIGHT-BE-ABLE-TO-SEE-BETTER IF-THEY-PLAY-OUTDOORS-MORE-OFTEN-83693
COMMON LIGHTBULBS MAY PROMOTE NEARSIGHTEDNESS

• COMMERICALLY AVAILABLE LED LIGHT BULBS MAY CONTRIBUTE TO NEARSIGHTEDNESS

• A NEW SOURCE OF LIGHT MAY PROTECT AGAINST THE DEVELOPMENT OF MYOPIA

• STUDY ON CHICKS OVER 3 DAYS

• LED LIGHT BULBS ENCOURAGED EYE GROWTH

• RESEARCHER-DESIGNED LIGHT SOURCE REDUCED EYE GROWTH AND CAUSED LESS NEARSIGHTEDNESS

• “THESE FINDINGS HAVE SIGNIFICANT CLINICAL IMPLICATIONS, AS THE LIGHTING WE CREATED COULD POTENTIALLY BE USED IN INDOOR ENVIRONMENTS, LIKE SCHOOL CLASSROOMS, FOR THE PREVENTION OF MYOPIA,” HANNAH YOON
TIME OF THE DAY INFLUENCES THE RESPONSE TO OPTICAL DEFOCUS IN HUMAN EYES

• READING IN THE MORNING MAY PROMOTE THE DEVELOPMENT OF NEARSIGHTEDNESS FASTER THAN READING IN THE EVENING

• 12 YOUNG ADULTS

• STUDY DETERMINED WHETHER READING-LIKE CONDITIONS IMPACTED THE EYE DIFFERENTLY DEPENDING ON THE TIME OF DAY.

• “OUR RESULTS SHOW THAT CHANGES IN THE LENGTH OF THE EYE IN RESPONSE TO VISUAL BLUR, WHICH CAUSES MYOPIA, ARE DEPENDENT ON THE TIME OF THE DAY. AS A RESULT, SCHEDULING INTENSIVE READING ACTIVITIES IN THE EVENING, ALONG WITH FREQUENT BREAKS FOR DISTANCE VIEWING MAY PREVENT THE DEVELOPMENT OF MYOPIA IN SCHOOL CHILDREN, PARTICULARLY THE ONES THAT ARE AT RISK OF DEVELOPING MYOPIA DUE TO EXCESSIVE NEAR WORK,” RANJAY CHAKRABORTY, PHD

Chakraborty, R. Time of the day influences the response to optical defocus in human eyes. ARVO 2018 Flinders University. Adelaide, Australia
RESOURCES FOR PRACTITIONERS

- WWW.MYOPIAPROFILE.COM
- WWW.MYOPIAINSTITUTE.COM
- WWW.BRIENDOENVISION.ORG
- WWW.MYOPIAPREVENTION.ORG
- WWW.MYOPIACARE.COM
- WWW.MANAGEMENTYOPIA.ORG

Review of Myopia Management
RESOURCES FOR PARENTS

- WWW.MYKIDSVISION.ORG/SURVEY
- WWW.MYKIDSVISION.ORG
- WWW.ALLABOUTVISION.COM/PARENTS
- WWW.MYOPIACARE.ORG
- https://MANAGEMYOPIA.org
BRIEN HOLDEN VISION INSTITUTE MYOPIA CALCULATOR

• AVAILABLE IN ENGLISH, MANDARIN, SPANISH

• USES
  • AGE
  • REFRACTIVE ERROR AT PRESENTATION
  • ETHNICITY (ASIAN OR CAUCASIAN)

• 95% CONFIDENCE INTERVAL MEANS THAT AN ESTIMATED OBSERVATION USING THE DATA SETS IS LIKELY TO FALL WITHIN THAT BAND

• “ESTIMATED ANNUAL PROGRESSION WITHOUT MANAGEMENT” USED AS A COMPARISON
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:

-3.69D

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

-6.76D

References Multifocal soft contact lenses
We Know the Problem...So How Do We Fix It?

• Atropine Eye Drops
• Overnight Custom RGP’s for Myopia Control (OCRMC)
• Custom Distance Center Soft Multi-Focal Contact Lenses
Guess what does not work?????

- Spectacles
- Myopic Undercorrection
- CRT!!!
Here is what DOES NOT work....
Undercorrection for Myopia Control

The undercorrected groups showed **INCREASED** myopia and axial length

<table>
<thead>
<tr>
<th></th>
<th>Under Correction</th>
<th>Full Correction</th>
<th>% Change Annual RE Progression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chung</td>
<td>0.50</td>
<td>0.39</td>
<td>-16%</td>
</tr>
<tr>
<td>Adler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millodot</td>
<td>0.50</td>
<td>0.42</td>
<td>-24%</td>
</tr>
</tbody>
</table>
PHARMACEUTICAL INTERVENTIONS

• PHARMACEUTICAL INTERVENTIONS SHOW GREATER EFFICACY THAN ORTHOKERATOLOGY OR MULTIFOCAL AND PERIPHERAL DEFOCUS-BASED OPTICAL INTERVENTIONS IN SLOWING PROGRESSION OF MYOPIA.¹

ATROPINE

- NON-SELECTIVE ANTIMUSCARINIC RECEPTOR AGENT
- AFFINITY FOR ALL 5 SUBTYPES OF MUSCARINIC ACETYLCHOLINE M1 TO M5 RECEPTORS
- ATROPINE SULFATE – SULFATE SALT OF ATROPINE
- DERIVED FROM
  - THE LEAVES OF ATROPA BELLADONNA
  - PLANTS IN THE SOLANACEAE FAMILY SUCH AS DATURA STRAMONIUM, A. BELLADONNA, HYOSCYAMUS NIGER, AND MANDRAGORA OFFICINARUM
- ATROPINE CONSISTS OF AN ORGANIC BASE (TROPINE) AND AN AROMATIC (TROPIC) ACID TO COMPLETE THE STRUCTURE OF AN ORGANIC ESTER.
ATROPINE

• NON-SELECTIVE ANTIMUSCARINIC AGENT

• INITIALLY HIGHER CONCENTRATIONS OF ATROPINE (COMMONLY 1%) FOUND TO BE EFFECTIVE IN SLOWING AXIAL ELONGATION BETWEEN 70% AND UP TO 94% IN WELL-CONDUCTED TRIALS. 1-3, 4-6

References, see notes.
ATROPINE SIDE EFFECTS

• NO SERIOUS ADVERSE EVENTS
• PHOTOPHOBIA
• DIFFICULTY WITH NEAR WORK
• BOTH PRESENT IN 38% TO 100% OF PARTICIPANTS.\textsuperscript{1,2}

ATROPINE SIDE EFFECTS

• NO RETINAL DAMAGE
  • ELECTRORETINOGRAMS OF EYES TREATED WITH DAILY ATROPINE¹,²

• NO DIFFERENCE IN INTRAOCULAR PRESSURE WITH ATROPINE VS. PLACEBO³

• ATROPINE HAS A DOSE-DEPENDENT EFFICACY

• SIDE EFFECTS ALSO APPEAR TO SHARE DOSE-DEPENDENCY⁴⁻⁶

ATROPINE SIDE EFFECTS

• LOW COMPLIANCE OF ATROPINE IN THE UNITED STATES AND EUROPEAN COUNTRIES.¹

• REBOUND MYOPIA WITH ATROPINE CESSATION, ESPECIALLY HIGHER DOSES²,³

LOWER CONCENTRATIONS INTRODUCED

- LOWER CONCENTRATIONS OF ATROPINE
- FEWER SIDE EFFECTS
- LESS REBOUND OF MYOPIA

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FIG. 1. Comparison of effectiveness between different interventions for myopia control treatment. There are different interventions contributing to the myopia control treatment; the figure above summarizes the effectiveness of each individual treatment strategy in slowing myopia progression. The vertical axis, the y-axis, represents the effectiveness that relates to the difference between the mean annual spherical equivalent of the treatment and the control group except for Ortho-K where it represents the change in axial length. The horizontal axis, the x-axis, represents different interventions for myopia control as follows: (1) Undercorrection (Adler et al. 2006); (2) Multifocal spectacles (Sankaridurg et al.); (3) Bifocal spectacles (Cheng et al. 2014); (4) PDM CLs: peripheral defocus-modifying contact lenses (Sankaridurg et al.); (5) Ortho-K: orthokeratology (Cho et al.); (6) Pirenzepine: selective muscarinic receptor antagonists (Tan et al.); (7) 7 methylxanthine: adenosine receptor antagonists (Trier et al. 2008); (8) Low-dose atropine: 0.01% atropine, nonselective muscarinic receptor antagonist (Chia et al.); (9) Moderate-dose atropine: 0.1% atropine (Chia et al.); and (10) High-dose atropine: 0.5% atropine (Chia et al.).
Five-Year Clinical Trial on Atropine for the Treatment of Myopia 2

Myopia Control with Atropine 0.01% Eyedrops

Audrey Chia, FRANZCO, PhD,1,2 Qing-Shu Lu, PhD,3,4 Donald Tan, FRCS, FRCOphth1,2,4,5

Purpose: To compare the safety and efficacy of different concentrations of atropine eyedrops in controlling myopia progression over 5 years.

Design: Randomized, double-masked clinical trial.

Participants: A total of 400 children originally randomized to receive atropine 0.5%, 0.1%, or 0.01% once daily in both eyes in a 2:2:1 ratio.

Methods: Children received atropine for 24 months (phase 1), after which medication was stopped for 12 months (phase 2). Children who had myopia progression (≥−0.50 diopters [D] in at least 1 eye) during phase 2 were restarted on atropine 0.01% for a further 24 months (phase 3).

Main Outcome Measures: Change in spherical equivalent and axial length over 5 years.

Results: There was a dose-related response in phase 1 with a greater effect in higher doses, but an inverse dose-related increase in myopia during phase 2 (washout), resulting in atropine 0.01% being most effective in reducing myopia progression at 3 years. Some 24%, 59%, and 68% of children originally in the atropine 0.01%, 0.1%, and 0.5% groups, respectively, who progressed in phase 2 were restarted on atropine 0.01%. Younger children and those with greater myopic progression in year 1 were more likely to require re-treatment. The lower myopia progression in the 0.01% group persisted during phase 3, with overall myopia progression and change in axial elongation at the end of 5 years being lowest in this group (−1.38±0.98 D; 0.75±0.48 mm) compared with the 0.1% (−1.83±1.16 D, P = 0.003; 0.85±0.53 mm, P = 0.144) and 0.5% (−1.98±1.10 D, P < 0.001; 0.87±0.49 mm, P = 0.075) groups. Atropine 0.01% also caused minimal pupil dilation (0.8 mm), minimal loss of accommodation (2–3 D), and no near visual loss compared with higher doses.

Conclusions: Over 5 years, atropine 0.01% eyedrops were more effective in slowing myopia progression with less visual side effects compared with higher doses of atropine. Ophthalmology 2016;123:391-399 © 2016 by the American Academy of Ophthalmology.
A dose as low as 0.01% was shown to slow myopia at a rate similar to that of 1% with “negligible” effect on accommodation and pupil size.

No reports of allergic conjunctivitis or dermatitis.

Needs to be formulated, expensive, no preservatives, Shelf life 90 days.
Efficacy Comparison of 16 Interventions for Myopia Control in Children

A Network Meta-analysis

Jinhai Huang, MD,1,2, Daizong Wen, MD,1,3, Qinmei Wang, MD,1,2, Colm McAlinden, MB BCH, PhD,1,4,5, Ian Flitcroft, FRCOphth, DPhil,6,8 Haiyi Chen, MD,1,2, Seang Mei Siew, PhD,7, Hao Chen, MD,7, Fangjun Bao, MD,1,2 Yume Zhao, MD,1,2 Liang Hu, MD,1,2 Xueyi Li, MD,1,2 Rongrong Guo, MD,1,2 Weichong Lu, MD,1,2 Xiaoqiang Du, MD,1,2 Zhengxuan Jing, PhD,9 Ayong Yu, PhD,1,2 Hengli Lian, MS,9 Qiruo Jiang, MD,1,2 Ye Yu, MD,1,2 Jia Qu, MD, PhD12

Table 2. Treatment Effect Relative to Single Vision Spectacle Lenses/Placebo Based on the Network Meta-analysis

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weak: R0 to 0.25 D/yr</th>
<th>Moderate: R0.25 to 0.50 D/yr</th>
<th>Strong: R0.50 to 1.00 D/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attr H</td>
<td>R0.09 (-0.12 to -0.05)</td>
<td>R0.34 (-0.08 to 0.52)</td>
<td>R0.37 (-0.12 to 0.12)</td>
</tr>
<tr>
<td>Attr M</td>
<td>R0.21 (-0.07 to 0.48)</td>
<td>R0.11 (-0.20 to 0.28)</td>
<td>R0.11 (-0.20 to 0.28)</td>
</tr>
<tr>
<td>Attr L</td>
<td>AL0.08 (-0.16 to 0.00)</td>
<td>AL0.14 (-0.20 to 0.01)</td>
<td>AL0.14 (-0.20 to 0.01)</td>
</tr>
<tr>
<td>PI-ECMls</td>
<td>AL0.09 (-0.07 to 0.34)</td>
<td>AL0.14 (-0.20 to 0.28)</td>
<td>AL0.14 (-0.20 to 0.28)</td>
</tr>
<tr>
<td>CYP</td>
<td>AL0.14 (-0.02 to 0.36)</td>
<td>AL0.14 (-0.20 to 0.01)</td>
<td>AL0.14 (-0.20 to 0.01)</td>
</tr>
<tr>
<td>BSLa</td>
<td>R0.02 (-0.02 to 0.02)</td>
<td>AL0.05 (-0.13 to 0.05)</td>
<td>AL0.05 (-0.13 to 0.05)</td>
</tr>
<tr>
<td>RXOSLs</td>
<td>R0.12 (-0.06 to 0.20)</td>
<td>R0.12 (-0.04 to 0.31)</td>
<td>R0.12 (-0.04 to 0.31)</td>
</tr>
<tr>
<td>MOA</td>
<td>R0.02 (-0.31 to 0.27)</td>
<td>R0.02 (-0.02 to 0.02)</td>
<td>R0.02 (-0.02 to 0.02)</td>
</tr>
<tr>
<td>RGCsLs</td>
<td>AL0.03 (-0.09 to 0.13)</td>
<td>AL0.03 (-0.09 to 0.13)</td>
<td>AL0.03 (-0.09 to 0.13)</td>
</tr>
<tr>
<td>TMS</td>
<td>R0.02 (-0.02 to 0.02)</td>
<td>R0.02 (-0.02 to 0.02)</td>
<td>R0.02 (-0.02 to 0.02)</td>
</tr>
<tr>
<td>SCLa</td>
<td>AL0.03 (-0.09 to 0.13)</td>
<td>AL0.03 (-0.09 to 0.13)</td>
<td>AL0.03 (-0.09 to 0.13)</td>
</tr>
<tr>
<td>USVLs</td>
<td>AL0.03 (-0.09 to 0.13)</td>
<td>AL0.03 (-0.09 to 0.13)</td>
<td>AL0.03 (-0.09 to 0.13)</td>
</tr>
</tbody>
</table>

AL = axial length change; Attr = atropine; Attr H = high-dose atropine (1% or 0.5%); Attr L = low-dose atropine (0.01%); Attr M = moderate-dose atropine (0.1%); BSL = bifocal spectacle lenses; CYP = cyclopentolate; D = diopeter; MOA = more outdoor activities (14–18 h/week); OK = orthokeratology; PASLs = progressive addition spectacle lenses; PBO = placebo; PIRCLs = prismatic bifocal spectacle lenses; PIRCLs = peripheral refractive contact lenses; PIRCLs = peripheral refractive modifying contact lenses; PIRCLs = peripheral refractive contact lenses; RGCCLs = rigid gas-permeable contact lenses; SCLs = soft contact lenses; USVLs = single vision spectacle lenses; Tim = timolol; USVLs = undercorrected single vision spectacle lenses.

The underlined data indicate that these are statistically significant effects (P < 0.05). A 0.18-mm axial length change is estimated to produce a 0.50 D change in refraction.
CONTROLLING ONSET AND PROGRESSION OF MYOPIA AT A YOUNG AGE CAN REDUCE THE RISK OF MORBIDITY ASSOCIATED WITH HIGH MYOPIA.

MYOPIA IS A LEADING CAUSE OF UNCORRECTED REFRACTIVE ERROR

ANNUAL GLOBAL COST RELATING TO THE DECREASE OF PRODUCTIVITY ASSOCIATED WITH UNTREATED REFRACTIVE ERROR WAS MORE THAN US $200 BILLION OVER 5 YEARS.\textsuperscript{1,2}


Low-Concentration Atropine Eye Drops for Myopia Progression

Fen Fen Li, MD and Jason C. Yam, FCOpthHK, FRCSEd

- Review article
- Included LAMP study
- Low-concentration Atropine for Myopia Progression (LAMP) study
- Evaluated 0.05%, 0.025%, 0.01% atropine eye drops and placebo group
- 438 myopic children

- Provided placebo-compared evidence of low-concentration atropine eye drops in myopia control
- Both efficacy and side effects followed a concentration-dependent response within 0.01% to 0.05% atropine
- 0.05% atropine was the optimal concentration to achieve best efficacy and safety profile

**Clinical Tests**

All visits
- Appropriate history taking relative to treatment
- Distance and near VA
- Subjective and/or objective refraction
- Accommodative and binocular vision assessment
- Ocular health examination

Annually (or on indication)
- Cycloplegic refraction
- Dilated fundus examination

**If Available**
- Axial length measurement (every 6 months)

**Treatment Specific**

- **Atropine**
  - Pupil size and function
  - IOP

- **Orthokeratology**
  - Corneal topography

*Figure 2. Clinical tests for myopia management.*
The following figures are from *IMI – Clinical Management Guidelines Report*

https://iovs.arvojournals.org/article.aspx?articleid=2727318

**Figure 1.** Review schedule for myopia management based on treatment type.
Visual Environment Advice

1. At least 60 mins a day outdoors, be sun smart, and active 60 mins a day.

2. Watch, 10 mins near work, 20/20 rule, every 20 mins take a break for 20 secs.

3. Less than 2 hrs screen time after school and don't sit for too long.

Less than 2 yrs primary school.

4. Wear protective glasses or contacts.

Kids Can Wear Contacts

Wearing contact lenses improves children's self-confidence in school, and sports and satisfaction with their vision.

Children aged 8-12 appear to be safer contact lens wearers than teens and adults, with a lower risk of infection.

Children only take 15 minutes more to learn how to handle contact lenses than teens.

Protecting Children from Myopia

Myopia Profile | CORE | Canadian Society of Optometry

For further reading on this infographic and references, see www.myopiaprofile.com/protecting-children-from-myopia
Soft Multifocal
The Future of Myopia Control Contact Lenses

- 2016 Gifford P, Gifford KL
- Standard soft and rigid CLs - minimal or no effect for myopia control
- OrthoK and soft multifocal CLs
  - Most consistent
  - Least side effects
- Acceptance of both CLs influenced by
  - Data limitations
  - Required off-label usage
  - Lack of clear understanding of their mechanisms for myopia control
Multifocal Contact Lenses for Myopia Control

- 2013
- Walline J, Greiner K, McVey, ME, Jones-Jordan LA
- Soft multifocal CL wear
- +2.00 add D
- 2 year treatment
- 50% reduction in myopia progression
- 29% reduction in axial myopia
Soft Multifocal Contact Lenses
Soft Multifocal Contact Lenses for Myopia Control

• Good for lower myopes
• Center distance multifocal lenses
• Commercially available lenses (mostly off-label)
• Most commercially available designs center-near
Soft Multifocal Contact Lenses for Myopia Control

- Which add to select?
- +2.00D center-distance lens does not always generate sufficient peripheral defocus
- +2.50D and above **does** generate sufficient peripheral defocus
  (Berntsen and Kramer, 2013)
Soft Multifocal Contact Lenses for Myopia Control

• Lower add values do not change peripheral defocus
• Cannot be considered as part of an MCS
  • (Lopes-Ferreira et al, 2011)
• Higher add distance-center CLs can impact distance vision, especially under reduced lighting and contrast
  • (Sanders et al, 2008)
• Do not want to over-minus, can induce myopia progression
• Equivalent to under-correcting myopia, which can lead to myopia progression
  • (Smith and Walline, 2015)
A. CHANGING SPHERICAL RX

• ARE YOU DOING ANYTHING DIFFERENT?
B. SWITCHING DESIGNS

• WHAT ARE OUR OPTIONS?

• CooperVision
  • Now in the US!

• Visioneering Technologies
# MISIGHT LENS – COOPERVISION

<table>
<thead>
<tr>
<th>Material</th>
<th>Omafilcon A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water content</td>
<td>60%</td>
</tr>
<tr>
<td>Base curve (mm)</td>
<td>8.7</td>
</tr>
<tr>
<td>Diameter (mm)</td>
<td>14.2</td>
</tr>
<tr>
<td>Sphere power</td>
<td>-0.25 to -6.00 (0.25 steps)</td>
</tr>
<tr>
<td>Optical design</td>
<td>ActivControl® Technology</td>
</tr>
<tr>
<td>Dk/t (at -3.00D)</td>
<td>28</td>
</tr>
<tr>
<td>Pack Size</td>
<td>30</td>
</tr>
<tr>
<td>Replacement schedule</td>
<td>Daily disposable</td>
</tr>
<tr>
<td>Pricing</td>
<td>Small premium to a sphere lens to ensure accessibility for all</td>
</tr>
</tbody>
</table>
MISIGHT LENS – COOPERVISION

- Optical zone with ActivControl® technology
- Four optical zones
  - Two correction zones (refractive correction)
  - Two treatment zones (2.00D myopic defocus)
HOW IT WORKS

• Myopic Defocus Controls Axial Elongation

• Correction Zone – provides distance vision in all gazes

• Treatment Zone – provides consistent myopic defocus in all gazes
A 3-year Randomized Clinical Trial of MiSight Lenses for Myopia Control

Paul Chamberlain, BSc (Hons), 1* Sofia C. Peixoto-de-Matos, MSc, 2 Nicola S. Logan, PhD, 3 Cheryl Ngo, MBBS, MMed, 4 Deborah Jones, BSc, FAAO, 5 and Graeme Young, PhD, FAAO 6

- Myopic children age 8 to 12 years
- No prior CL wear
- Spherical equivalent refraction, -0.75 to -4.00 D; astigmatism, <1.00 D
- 3-year, double-masked, randomized clinical trial

- Four investigational sites in four countries
- Subjects in each group matched for age, sex, and ethnicity
- Randomized to either a MiSight 1-day contact lens (test) or Proclear 1-day (control; omafilcon A)
- Worn on a daily disposable basis
- Primary outcome measures
  - Change in cycloplegic spherical equivalent refraction
  - Axial length

A 3-year Randomized Clinical Trial of MiSight Lenses for Myopia Control

Paul Chamberlain, BSc (Hons),1* Sofia C. Peixoto-de-Matos, MSc,2 Nicola S. Logan, PhD,3 Cheryl Ngo, MBBS, MMed,4 Deborah Jones, BSc, FAAO,5 and Graeme Young, PhD, FAAO6

- 75.5% (109/144) completed the clinical trial
  - (53 test, 56 control)

- Change in spherical equivalent refraction
  - -0.73 D (59%) less in test group than control group

- Mean change in axial length was 0.32 mm (52%) less in test group than in control group

- Changes in spherical equivalent refraction and axial length were highly correlated (r = -0.90, P < .001).

FIGURE 3. Frequency distribution of change in refractive error from baseline to 36 months. The filled and open bars represent the MiSight and control groups, respectively.
NaturalVue® Multifocal designed for clear vision at near, intermediate and distance

A “virtual aperture” is created by the interaction between the retina and visual cortex ignores the peripheral relative plus power from the smooth, continuous power curve of the multifocal contact lens design, creating an extended depth of focus where far, intermediate, and near vision are all in focus at once.
Virtual Aperture Zone----Clear Vision
How The Design Works for Myopia Management

Extended depth of focus optics utilize a large amount of plus power in the periphery to create a ‘virtual aperture’ for clear vision.

High amount of relative plus power in the periphery places the image shell in front of the retina to reduce peripheral hyperopia.\textsuperscript{1,2}


Case Series Analysis: NaturalVue Multifocal and Myopia (N=32)

- 10 Practices using NaturalVue Multifocal in myopic children
- Control: Each child served as his/her own historical control
  - Age, Spectacle refraction at time of last exam and date of last exam
  - Type of correction used
  - Calculated Diopters progression per month since last exam, then annualized
- Use of NaturalVue Multifocal
  - Age
  - Spectacle Refraction at initial visit
  - Spectacle refraction at follow up visit – Minimum 6 months
  - Calculated D progression per month since last exam, then annualized
- DEMOGRAPHICS
  - 36% Male; 64% Female
  - Age at fitting with NaturalVue Multifocal: 10.98 + 2.95 years (range 6 to 19)
  - Length of wearing NaturalVue Multifocal: 10.94 + 4.76 months (range 6-25)
NaturalVue® Multifocal – Refractive error change vs. prior correction

In children who have worn NaturalVue Multifocal for 6-25 months:

**Annualized Refractive Error Change** (D)

The decrease in the annualized refractive error change was 95.4% OD and 96.25% OS (96% for both eyes combined) with the most frequently observed decrease in refractive error change (mode) of 100% in each eye.

**Percentage decrease with NaturalVue Multifocal = 96%** (both eyes combined)

In children who have worn NaturalVue® Multifocal for 6-25 months:

- 98% showed decrease in refractive error change.
- 91% showed a decrease of 70% or greater.

81% showed no refractive error change or showed a decrease in refractive error.

Contact Lens Methods for Clinical Myopia Control

- Turnbull PR, Munro OJ, Phillips JR
- Optom Vis Sci. 2016 Sep;93(9):1120-6
- Comparative case series of 110 patients
  - (4 – 33 years old, 62% female) for 4 years
  - Ortho K – 56
  - Dual focus soft contact lens – 3
  - Advice – 22
Contact Lens Methods for Clinical Myopia Control

- ★ Both orthokeratology and dual focus soft contact lenses are effective strategies for targeting myopia progression
- ★ No significant difference between the two
- Very few barriers for any CL practitioner to be actively promoting myopia control treatment to at-risk patients.
• Am I placing a child at risk of contact lens-related infection?

   **Lifetime risk of Microbial Keratitis:**
   Daily wear (DD) 1 in 75

• Am I placing a child at risk of myopia-associated pathology if I do nothing different?

   **Lifetime risk of retinal detachment (>-5.00D):** Retinal detachment 1 in 20
When to implement MCS?

- “A MCS should be offered to, and implemented for, every patient who is at significant risk of developing progressive myopia and/or in those who present a faster progression rate than expected.”

* Defining a Strategy for Myopia Control. Langis Michaud, OD, MSC, FAAO (Dipl), FSL, FBCLA; Patrick Simard, OD, MBA, MSC, FAAO; & Rémy Marcotte-Collard, OD. Contact Lens Spectrum. March 1, 2016
CYPRESS (Control of Myopia Using Peripheral Diffusion Lenses: Efficacy and Safety Study)

- SightGlass Vision
- Three-year trial
- Prospective, multi-center, subject- and observer-masked, randomized, controlled clinical study
- 256 children 6-10 years old
- 14 trial sites - United States and Canada
- After 1 year, reduction in myopia progression of 59% and 74%

- Participants wore 1 of 3 types of lenses
- Control lenses or one of two test lens designs
- Followed for myopia progression over 36 months
CONTACT LENSES 2019
A mostly quiet year of steady growth ended with an FDA decision that could prove to be the tipping point in how practitioners manage young progressive myopes.

By JASON J. NICHOLS, OD, MPH, PHD, & LISA STARCHER  January 1, 2020

![Diagram showing contact lens fits & refits by lens designs for 2018 and 2019.](image)

Figure 3. 2018 to 2019 contact lens fits & refits by lens designs.
WHY CORNEAL RESHAPING/ORTHOKERATOLOGY IS CURRENTLY INCREASING

- CORNEAL TOPOGRAPHY APPLICATIONS
- REVERSE GEOMETRY LENSES
- FOUR ZONE DESIGNS
- OVERNIGHT ORTHOKERATOLOGY
- CONSUMER INTEREST IN MYOPIA REDUCTION
- MYOPIA MANAGEMENT!
PATIENT SELECTION

- GOOD CANDIDATES INCLUDE:
  - HIGH MOTIVATION
  - AVAILABILITY
  - CAN AFFORD COSTS
  - LOW MYOPIA: < -4.5D SPH; <1.75D CYL
  - SMALL-TO-MEDIUM PUPIL SIZE
  - OCCUPATIONAL CONSIDERATIONS
Fitting Kids in Contact Lenses

- Studies indicate children as young as 8 are capable CL (soft, GP, and OK)
- CLIP study (Walline)
  - total chair time only 15 minutes longer
  - 8 to 12 years old vs 13 to 18 years old
- Mature enough to independently care for their lenses
- Motivated (i.e., active and a spectacle wearer)
POOR CANDIDATES

- > -4.50D MYOPIA; ≥ 2D CYLINDER; ATR CYLINDER; LIMBUS-TO-LIMBUS CYLINDER
- LARGE PUPIL SIZE (>5MM ROOM ILLUM)
- DEEP-SET EYES WITH LOOSE LIDS
- UNREALISTIC EXPECTATIONS
- COST/VISIT SCHEDULE ARE PROBLEMS

Image credit University of Iowa
Stabilizing Myopia by Accelerating Reshaping Technique (SMART)-Study Three Year Outcomes and Overview

Abstract

Objectives: The SMART study is a three-year, longitudinal, multicenter evaluation comparing corneal reshaping contact lenses (CRCL) influence on the progression of myopia in children (age 8 to 14 at enrollment) to the wearing of soft silicone hydrogel contact lenses (SCL) worn on a daily wear basis with monthly replacement. This study represents one of the largest patient enrollment with ten investigators and adds to the literature by verifying the outcomes of smaller enrolled investigations strengthen the outcomes of corneal reshaping techniques.

Methods: At enrollment 172 subjects were fit with corneal reshaping contact lenses worn overnight on a nightly basis (Emerald design by Euclid Systems) and 110 subjects were fit with silicone hydrogel contact lenses on a daily wear monthly-replacement basis (Pure Vision by Bausch & Lomb). Visits were conducted at 24 hours, one week, one month, three months, and every six months thereafter for three years. A regression protocol was conducted for the CRCL subjects at each yearly visit for three years by discontinuing lens wear and monitoring for stability of refraction and topography for consecutive visits until baseline was reached.

Results: The outcome of the three-year investigation indicated that myopia progressed at a statistically significantly higher degree in the SCL group as compared to the CRCL group. Mean spherical equivalent change in myopia for the SCL group was -1.03 ± 0.58 diopters, vs. CRCL group -0.13 ± 0.62 diopters (p < 0.0001). There were no cases of reduced best corrected visual acuity for three years for either group. There were no significant adverse events in either group from baseline to the three-years. 80% of eyes were successfully fit with CRCL with the first lens fit empirically and 95% of eyes were fit successfully with only one lens change. There was no significant difference between dropout rates during the three year study between the two groups.

Conclusion: The three year longitudinal study found that myopia progressed at a significantly higher degree in the SCL vs. CRCL subjects. Efficacy, safety, and dropout rate of corneal reshaping in our sample population appears to be comparable to wearing SCL.

Volume 2 Issue 3 - 2015

Robert L Davis*, S Barry Eiden, Edward S Bennett, Bruce Koffler, Lisa Wohl, and Michael Lipson

*Corresponding author: Robert L Davis, Davis Eye Care Associates, 4663 West 95th Street, Oak Lawn, Illinois 60453, USA, Tel: 708-636-0600, Fax: 708-636-0606, Email: eyemanage@aol.com

Received: March 12, 2015 | Published: April 21, 2015
MK IN OK:
THE WORLDWIDE EXPERIENCE (WATT & SWARBRICK, 2010)

• POOR COMPLIANCE IMPLICATED
  • USE OF TAP WATER RINSE
  • INAPPROPRIATE USE OF SOLUTIONS, STORAGE IN SALINE
  • LENS CASE CONTAMINATION
  • PERSISTING IN LENS WEAR DESPITE DISCOMFORT

• MANY CASE REPORTS PROVIDED LITTLE DETAIL ON PATIENTS, LENSES, COMPLIANCE
• BULLIMORE ET AL (OVS 9/2013) FOUND THE RISK OF MK WITH OOK SIMILAR TO OTHER OVERNIGHT LENSES
• Overall estimated incidence of MK is 7.7 per 10,000 years of wear
• For children, the estimated incidence of MK is 13.9 per 10,000 patient-years
• For adults, the estimated incidence of MK is 0 per 10,000 patient-years
MYOPIA CONTROL: ORTHOKERATOLOGY

% reduction in axial growth

0 10 20 30 40 50 60 70 80

Gwiazda et al 2003*
Cho et al 2005
Walline et al 2009
Santodomingo et al 2011
Kakita et al 2011
Hiraoka et al 2012
Cho et al ROMIO 2012*
Charm and Cho 2013*
Cho et al TO-SEE 2013
Chua et al ATOM2 2012*
FROM SANKARIDURG (REV OF CORNEA & CLS, JAN-FEB, 2017)
Corneal Reshaping Tools and Resources

Webinars:

- Getting Started with Orthokeratology in Your Practice
  Presented in December 2017 by Dr. Melanie Frogozo.

- Myopia Control Update
  Presented in October 2017 by Dr. Jeff Walline.

- Corneal Reshaping: What the Latest Research Means for Your Patients and YOU
  Presented in June 2016 by Dr. Michael Lipson. CE credit available.

- Specialty GP Applications: 1) Fine-Tuning Scleral Lens Fits and 2) Building Your Cornea-Reshaping Lens Practice
  Presented in November 2015 by Dr. Jason Jedlicka. CE credit available.

- Myopia Control 2015
  Presented in October 2015 by Dr. Jeffrey J. Walline. CE credit available.

- 1-2-3 GP: GP Lenses for Corneal Reshaping, Scleral Lenses and Multifocals: How to Incorporate GPs to Build Your Practice
  Presented in May 2015 by Dr. Michael Lipson.

- Corneal Reshaping Update
  Presented in November 2013 by Craig Norman, FCLSA.

- Talking to Patients (and Parents) About Orthokeratology
  Presented in June 2013 by Dr. Michael Lipson.

- Problem Solving in Overnight Corneal Reshaping
  Presented in June 2012 by Dr. Michael Lipson.

Tune in to Our Live Webinars
Each month, contact lens fitters can communicate with industry experts about GP lenses. CE credit is available, too. Check the 2017 Webinar Schedule for the next online event.

Coding and Billing Resources
Get valuable information from coding and billing expert Dr. Clarke Newman. Access resources here.

Join Our Locator Listing
Every day patients visit ContactLenses.org to find a qualified GP lens expert. Add your practice to our list now!

Building Your Practice with GP Multifocals
Fitting & marketing multifocal contact lenses is easier with these free videos and patient materials. Access here.
See With Your Contacts...

Even When You’re Not Wearing Them

✓ No Daytime Contacts
✓ No Surgery
✓ No Glasses

Corneal Reshaping (CR)

Is Corneal Reshaping (CR) for children?
Yes! CR is safe and effective for people of all ages. Recent studies have shown the use of CR lenses may slow and possibly stop the progression of nearsightedness (myopia) in children.

When your child is wearing glasses or daytime contacts, are you:

✓ Concerned about the risk involved?
✓ Uncomfortable with the appearance of glasses?
✓ Tired of losing your child’s glasses?

I am 11 years old, a black belt in Tae-Kwon-Do, an excellent skier and mountain bike racer. Corneal Reshaping lenses made all of this possible!

I have been using your Corneal Reshaping lenses since the third grade. I have been very pleased with the results! I know some people think kids aren’t responsible enough to wear glasses. Corneal Reshaping lenses make wearing lenses a breeze!
OCRMC VS. CRT
Delivering Myopia Control Optics

OCRMC

Multifocal SCL’s
Rule #1
In OCRMC
The distant optical zone is only 1 to 2 mm in diameter

Rule #2
The amount of plus power in the periphery equals the amount of minus power corrected.

+4.00 D.
-4.25 D.
Post -4.75 LASIK
5.0 mm Pupil

-4.75 D
Post OCRMC -5.00 D.
5.0 mm Pupil

-5.00 D
LASIK
5.0 mm Pupil
-4.75 D.

OCRMC
5.0 mm Pupil
-5.00 D.
DISPELLING THE CONCERNS

• Much faster adaptation than other GP lenses (often within a few nights)
• Certification is online; thousands of ECPs have been certified
• Per studies, the majority of kids can successfully adapt and handle lenses
• The great majority of reports of microbial keratitis are from Southeast Asia (China)
• Empirical fitting works well with first fit success
• Newer designs should enter the market soon that will allow easier access and few restrictions to ECPS
BOTTOM LINE

- Corneal reshaping allows long-term effective myopia control
- Confirmed by a large number of clinical studies
- FDA is gathering evidence on CR as a modality for myopia control
- The quality of unaided vision rivals that of aided visual acuity of daily wear soft lenses and is not compromised via having a multifocal correction in front of the eye
- Also represents a viable option for most astigmatic patients
- Visual freedom resulting from not needing to wear correction during the day makes it a very good modality for active individuals - including young people – involved in sports
Dr. Brien Holden

- Customary spectacles and CLS can encourage myopia development.

- “A 1D myopic seven-year-old child will be approximately 6D myopic at age 16. With a 50% myopia control lens the refractive error will only be approximately 3D at age 16.”

- “From an ocular health standpoint that difference is highly significant.”

- “We should fit every myopic child, young adult, and university student with peripheral plus power lenses.”
Thank you for your time and attention!