CUSTOMIZE YOUR FIT TO "UNFIT" MYOPIA

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Disclosure

- Developer of Double Reservoir Lenses (DRL) for Ortho-k
- Financial interest on Paunevision company.
- Consultant for Precilens contact lens manufacturer.
- Patents holder for two ortho-k lenses, one myopia control and keratoconus.

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Myopes show peripheral refractive hyperopic defocus

OK and Relative Peripheral refraction


May we have a better correction system?

“Increasing effective curvature of field should be possible to correct central errors while induce a myopic blur” - E. Smith (2005)
Ortho-k Optics related to myopia control
What we know so far?
Younger progress faster

OD annual progression related to age (n= 136)

\[ y = -0.008x^2 + 0.2684x - 2.7091 \]

\[ R^2 = 0.1948 \]
Progression with OK is related to baseline Rx increase

Axial length grow with Ok related initial Rx increase (n=50)

\[ y = -0.2566x - 0.0276 \]

\[ R^2 = 0.192 \]
Annual AL vs. Refraction increase

0.09 mm/year for no refractive change

\[ y = 0.1452x^2 - 0.2762x + 0.0844 \]

\[ R^2 = 0.9653 \]

Amiopik Longitudinal Study
COMET Gwiazda (2003)
CLEERE Mutti (2007)
MCOS Santodomingo (2012)
Si Yuan Li (2015)
May we increase ortho-k effectivity?
Manipulation of orthokeratology lens parameters doesn’t change RPR?

Kang, P. Can manipulation of orthokeratology lens parameters modify peripheral refraction? Optometry and Vision Science, Vol. 90, No. 11, November 2013
RRP related to BOZD changes

Significative only at 20º N (P<0.001)

Perez, J. Analysis of the changes on peripheral refraction on low myopes related to the diameter of optic zone in orthokeratology. Master thesis. Polytechnic University of Catalonia. 2014
Treatment Optic Zone Diameter is related to apical tear layer thickness

TLT changes = -18 µ
High Tear layer thickness on apical zone induces multifocal OZ Treatment
Chow 5 Year OK Axial Length Study

• Traditional 5 Curve OK Lens Design N = 165
• Aspheric 6 Curve OK Lens Design N = 129
• Historical Control CLEERE Study 2007
Five Year Axial Length Change From Baseline (mm)

Baseline Spherical Equivalent (D Rounded)

Lens Design and Myopia Control
Were we measure power change

<table>
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<th>K</th>
<th>Eccentricity</th>
<th>Pachimetry</th>
<th>ACD</th>
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<table>
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<th>Dist apex</th>
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Relative Refractive Power

Relative Corneal Power

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<tr>
<th>Cornea</th>
<th>RRP</th>
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<tr>
<td>-12</td>
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<tr>
<td>-10</td>
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Topography

Cornea
-12 -8
-10 -6
-8 -5
-6 -4
-4 -2
-2 -1
0 0
What is the exact amount of relative peripheral myopia that will stop myopic progression?
How much add we need?

**Rx vs RPR (Sph) n=100**

\[ y = -0.0992x + 1.0109 \]
\[ R^2 = 0.0185 \]

\[ y = -0.1892x + 0.7588 \]
\[ R^2 = 0.1179 \]
Oblique Astigmatism Modification
Optimization of peripheral refraction

Oblique Retinoscopy on temporal retina

Central Rx - Peripheral Rx = RRP

Ad = RRP + Lag Accomodation
Axial length

Refraction

• Perform Over-Refraction at delivery (Cyclopegic)
• Take a topography or keratometry of the anterior Base Curve

• Repeat at follow-up

• Change in myopia =
  Rx Baseline − Rx at control − Base curve power change
If we know the critical spot & how much myopic defocus to create…

“We can then create individualized optics in corneal reshaping designs (or soft lenses and possibly spectacles) for each patient to create the precise peripheral myopic defocus at the ideal position on the retina.”

Michael J. Lipson, 2015
Are you ready?