Evolution of Multifocal IOLs

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Multifocal IOLs have evolved tremendously.

Earlier models had significant side effects and did not meet patient’s visual needs.

Patient dissatisfaction resulted in increased amount of chair time, causing some of you to have a negative outlook on multifocal lenses.

Evolution of Multifocal Lenses

• Zonal Refractive
• Diffractive
• Depth of Focus
• Trifocal / Quadrifocal

Array / Rezoom

• Alternating zones of refractive power (near and distance)
• Each zone acts primarily as an independent annular refractive lens
• Centration and axial alignment are important
• Pupil size dependent

Theoretical Energy Balance

FROM ARRAY TO REZOOM
ZONE SIZE CHANGES

<table>
<thead>
<tr>
<th>Zone</th>
<th>Array (Distance)</th>
<th>ReZoom (Distance)</th>
<th>Change (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>0.1 - 2.1 mm</td>
<td>0.1 - 2.1 mm</td>
<td>~0.1</td>
</tr>
<tr>
<td>Zone 2</td>
<td>2.1 - 3.4</td>
<td>2.1 - 3.45</td>
<td>~0.05</td>
</tr>
<tr>
<td>Zone 3</td>
<td>3.4 - 3.9</td>
<td>3.45 - 4.3</td>
<td>~0.35</td>
</tr>
<tr>
<td>Zone 4</td>
<td>3.9 - 4.43</td>
<td>4.3 - 4.6</td>
<td>~0.23</td>
</tr>
<tr>
<td>Zone 5</td>
<td>4.43 - 6.0</td>
<td>4.6 - 6.0</td>
<td>~0.17</td>
</tr>
</tbody>
</table>
ZONAL REFRACTIVE LENSES

These zonal refractive platform lenses provide:
• Limited spectacle freedom
• 41% Array / ReZoom
• Visual disturbances
• Pupil dependency
• Inferior material platform (silicone)

RINGS AROUND LIGHTS AT NIGHT WITH ZONAL LENS

DIFFRACTIVE IOLS

• ReSTOR 4.0
• ReSTOR 3.0
• Tecnis Multifocals

ACRYSO® IQ RESTOR® IOL

SN6AD3
Add Power: +4.0 D
Spectacle Plane: +2.2 D
Range: +10.0 D to +34.0 D
A-Constant: 118.9

SN6AD1
Add Power: +3.0 D
Spectacle Plane: +2.5 D
Range: +10.0 D to +34.0 D
A-Constant: 118.9
BINOCULAR DEFOCUS CURVE

Source: AcrySof® IQ ReSTOR® IOL Package Insert

TECNIS MULTIFOCAL IOL

DISTRIBUTION OF LIGHT ENERGY USING ANALOGY OF M&M CANDIES

DIFRACTIVE IOLS

REFRACTIVE MF AND DIFRACTIVE IOLS

RESTOR AND ZONAL REFRACTIVE - 5MM PUPIL
### Spectacle Freedom

#### Overall Vision

<table>
<thead>
<tr>
<th>Intraocular Lenses</th>
<th>Global Spectacle Wear</th>
<th>Satisfactory</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>43</td>
<td>8</td>
<td>27</td>
</tr>
<tr>
<td>0.5</td>
<td>38</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>0.6</td>
<td>55</td>
<td>9</td>
<td>25</td>
</tr>
</tbody>
</table>

### Depth of Focus Lenses

- ReSTOR 2.5
- Symfony

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### RESTOR 2.5 Lens

- A 0.9 mm refractive monofocal central zone
- 7 diffractive rings

### Optic Design Differences:

**RESTOR +2.5 D vs. +3.0 D**

- AcrySof® IQ ReSTOR® +2.5 D IOL
- AcrySof® IQ ReSTOR® +3.0 D IOL

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### RESTOR 2.5

#### AcrySof® IQ ReSTOR® +2.5 D IOL

Combined Mean Best-Corrected Distance Curve

### Symfony

#### AcrySof® IQ Monofocal IOL
Current Intraocular Lenses

Depth-of-Focus Lenses – ReSTOR 2.5* & Symfony *

*These lenses give visual quality of a 45-50 year old patient will still need reading glasses.

Matching Technology with Lifestyle

• Example:
  • Patient very active in distance and middle buckets
  • Active outdoors on weekends and summers (golf, boating, hunting)
  • Busy on a computer and desk work during weekdays
• Recommended Technology:
  • Dominant eye - ReSTOR 2.5 Lens
  • Non-dominant eye – Symfony Lens
  • “Mix and Match” > happiest group of patients for that time period
  • Patient still needed reading glasses (+1.25 D > +1.5 D)

Trifocal / Quadrifocal

• PanOptix
  • Made in the USA
  • Available worldwide about 5 years
  • Approximately 1 million implanted worldwide
  • Number 1 lens in Europe, Canada and Asia
  • Available for US Surgeons September 2019

Trifocal Lenses – PanOptix

• Simulates the vision of a 35 year old
• Only lens on the market that give patients total independence from glasses with rare exception
**PanOptix vs. Symfony**

![PanOptix vs. Symfony](image)

**PanOptix Defocus Curves**

![PanOptix Defocus Curves](image)

**Reimagine Multifocal Performance**

![Reimagine Multifocal Performance](image)

**PanOptix**

![PanOptix](image)

**Dysphotopsias**

![Dysphotopsias](image)
Steps to the successful use of the PanOptix Lens

**Patient Selection**
1. Severe dry eyes
2. Emotionally unstable?
3. Unrealistic Patient Expectation?

**Wound Construction**
1. Square post-limbal wound
2. Less surgically induced astigmatism
3. No change in axis of pre-existing astigmatism
4. Complete sealing wound 4-7 days

**Astigmatism Control**
1. Goal 0.0 > 0.5 D refractive astigmatism
2. Use of Toric version or femtosecond laser
3. Prepared to fix post astigmatism if >0.50 D (no glasses)

**Reduction of HOA**
1. Pre-op evaluation of corneal coma
2. Femtosecond laser gives symmetrical overlap of anterior capsule on lens optic to decrease micro tilt and internal coma

**Manual Capsulorrhexis**
Internal Coma — Outliers
FEMTOSECOND CAPSULORRHEXIS
INTERNAL COMA

0.023 microns of internal coma

STUDY FINDINGS
PATIENT SATISFACTION SURVEY SCORES

Patients were asked 30 questions from 10 categories with responses ranging from 0-3

<table>
<thead>
<tr>
<th>Categories Include</th>
<th>0 - Not a problem</th>
<th>1 - Mild</th>
<th>2 - Moderate</th>
<th>3 - Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glare</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Starburst</td>
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<tr>
<td>Hazy Vision</td>
<td></td>
<td></td>
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<tr>
<td>Blurred Vision</td>
<td></td>
<td></td>
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<tr>
<td>Distortion</td>
<td></td>
<td></td>
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<tr>
<td>Multiple Images</td>
<td></td>
<td></td>
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<tr>
<td>Fluctuation in vision</td>
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<td></td>
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<tr>
<td>Focusing difficulties</td>
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<td></td>
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<td></td>
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<tr>
<td>Depth perception</td>
<td></td>
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</tbody>
</table>

Comparing satisfaction scores and internal coma less than 0.20 microns

<table>
<thead>
<tr>
<th>Satisfaction Score</th>
<th>% of People with internal coma of 0.20 µ or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 (n=15)</td>
<td>100%</td>
</tr>
<tr>
<td>11-20 (n=29)</td>
<td>93.1%</td>
</tr>
<tr>
<td>21-30 (n=30)</td>
<td>60%</td>
</tr>
<tr>
<td>&gt;30 (n=15)</td>
<td>46.7%</td>
</tr>
</tbody>
</table>

(p<0.001)

TARGETED REFRACTIVE ERROR

1. As of March 2020 I have performed cataract surgery using more than 200 PanOptix lenses
2. Dominant eye – target plano to +0.25 D
3. Non-Dominant eye – target plano to -0.50 D
4. If patient has myopia ≥ 3.0 D – target -0.50 D to -0.75 D for non-dominant eye
5. I always ask each patient prior to 2nd eye surgery how they are doing with their 1st eye and adjust 2nd eye accordingly

STEPS TO THE SUCCESSFUL USE OF THE PANOPTIX LENS

TARGETED REFRACTIVE ERROR

1. Reduction of Refractive Error
2. Astigmatism Control
3. Wound Construction
4. Patient Selection

SPECTACLE INDEPENDENCE

1. Targeted Refractive Error
2. Astigmatism Control
3. Wound Construction
4. Patient Selection
RESULTS OF CLINICAL STUDY

• 14 random patients selected with bilateral PanOptix / PanOptix Toric
• Surgery performed December 2019 (P.H.E)
• Evaluation done February 17, 2020 with Dr. Patil
• All 14 patients 20/20 uncorrected at 16 inches
• 13 of 14 patients 20/20 at 24 inches, 1 patient 20/25
• 10 of 14 patients 20/20 at distance, 4 patients 20/25
• All patients were spectacle independent and thrilled with their visual results

WHAT’S COMING

• Synergy J&J’s version of PanOptix
• Symfony Plus increases the near add from 1.75 -> 2.25

FUTURE IOL

• FluidVision
  • True accommodative implant giving 3-4 diopters of accommodation
  • Single piece design where the haptics and the central optic are filled with a liquid.
  • Upon accommodation fluid in the haptics is pushed into the central optic zone, changing the radius of curvature of the optic giving true accommodation.
SUMMARY

• Today's multifocal IOLs give more spectacle independence with less dysphotopsias
• Many patients are demanding this type of technology

QUESTIONS?