


Premium IOLs and the Light Adjustable Lens

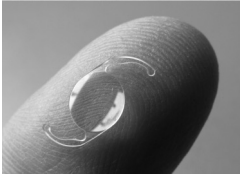
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“Standard” vs. “Premium” IOLs

- All modern IOLs have the same advanced optics
- Monofocal IOLs are covered by insurance
 - Single focal point, distance or near
- “Premium” IOLs add additional features
 - Toric corrects astigmatism
 - Toric is also monofocal
 - Multifocal (MFIOL)
 - Creates multiple focal points
 - Extended depth of focus (EDOF)
 - Extends the focal point continuously



https://en.wikipedia.org/wiki/Intraocular_lens




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Presbyopia

- What is it?
 - Loss of accommodation as the crystalline lens hardens
 - Begins to affect most people after age 40
- In 2015, an estimated 1.8 billion people affected
 - 25% of the world's population¹
- Near vision is *crucial* in modern society

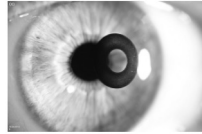
1. "Global Prevalence of Presbyopia and Vision Impairment from Uncorrected Presbyopia: Systematic Review, Meta-analysis, and Modeling", Frickie et al., Ophthalmology 2018.



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Treating Presbyopia

- Spectacles!
 - Reading glasses
 - Bifocals/Trifocals/Progressives
- Monovision
 - One eye for distance, one eye for near
- Corneal Inlays
 - Kamra, Raindrop, etc.



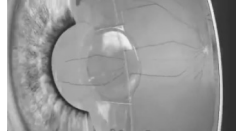
<https://www.hindawi.com/journals/2013/2545093/fig17/>



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Can an IOL accommodate? Maybe!

- Bausch & Lomb Crystalens
 - Ciliary muscle contraction creates increased pressure in vitreous
 - Hinged haptics move optic forward, power is increased
- Issues:
 - Minimal effectiveness at near
 - "Z-syndrome" - rare

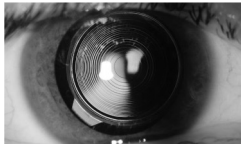


<https://www.youtube.com/watch?v=BD04H1ygggI>



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Multifocal IOLs



- Multiple simultaneous images on the retina
- When focused on distance target, near image is defocused/blurred
- When focused on near target, distance image is defocused/blurred
- Neuroadaptation allows brain to ignore blurred image

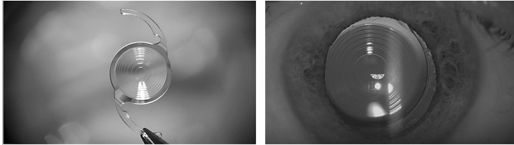
https://journals.lww.com/ophtholpractice/abstract/2013/05000/multifocal_iol_implantation_for_myopia_correction.aspx



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Diffractive Multifocals

- Alcon PanOptix Trifocal
- J&J Tecnis Synergy Trifocal
 - Focal points at distance, intermediate, and near



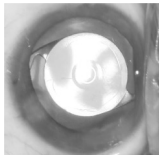
<https://ophthalmologymanagement.com/issues/2022/february/insight-on-new-iol-technologies/>



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Extended Depth of Focus

- EDOF IOLs give distance and intermediate vision
- J&J Tecnis Symfony
 - Diffractive
- Alcon Vivity
 - Waveform shaping



<http://www.alcon.com/usa/products/ophthalmology/extended-depth-of-focus-iol-extended-focus-iol-efi/>



<https://www.jnj.com/tecnis-symfony-extended-depth-of-focus-iol-efi>



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Problem Solved?

TNSTAAFL!

There's no such thing as a free lunch!



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Diffraction Optics

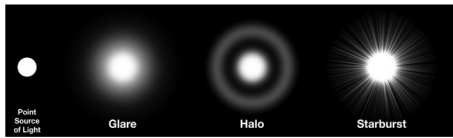
- Diffraction IOLs “lose light” when it is split or extended
- Contrast sensitivity is reduced
 - Lower “quality of vision”
- PanOptix loses 12% of incoming light to diffraction
- Symphony loses 18% of incoming light
- In a perfectly healthy eye, this may be imperceptible



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Dysphotopsias Glare, Halos, Starbursts

➢ The rings have an effect!



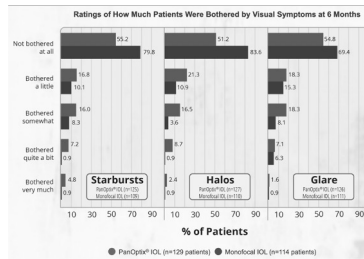
<https://www.reviewofoptometry.com/article/understanding-the-role-of-iol-optics-in-postoperative-vision-complaints>



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This Bothers Many Patients!

➢ PanOptix Initial Study



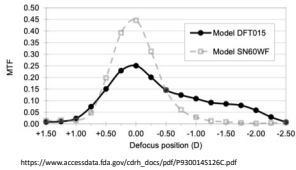
Source: myalcon.com



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What about Vivivity?

- Not diffractive, so no additional glare, halos, or starburts
- Similar or worse loss of contrast sensitivity to diffractive IOLs



https://www.accessdata.fda.gov/cdrh_docs/pdf/P9300145126C.pdf



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Contraindications to MF/EDOF IOLS

- Cornea
 - Dry Eye / Blepharitis
 - High astigmatism
 - Higher order aberrations
 - Post-refractive (RK, LASIK, PRK)
- Retina
 - ARMD - absolute contraindication
 - ERM/Pucker
 - Macular edema (DM, RVO, MacTel, etc)
- Others
 - Uveitis
 - Moderate or severe glaucoma
 - ?



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MFIOLs Can Be Great

- Many patients hate glasses
- Most dysphotopsias are well-tolerated
- Patients who do well LOVE these lenses

- But... a small percentage do poorly



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What if we just had to get it close?



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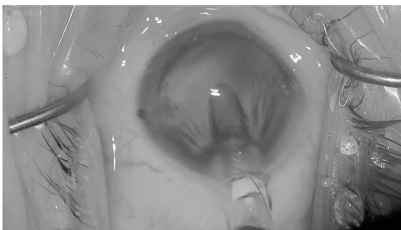
RxSight Light Adjustable Lens

- > 3-piece silicone IOL
- > "Macromers"
 - Mobile photosensitive subunits
- > UV light interacts with macromers causing the IOL to change shape

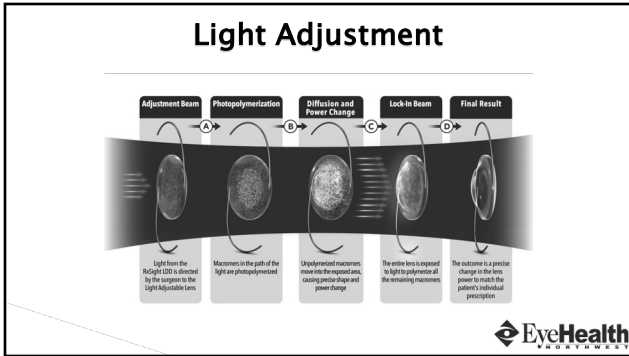


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LAL Insertion



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LAL has EDOF

- Targeting -0.5 D Sphere or more minus on the first treatment induces EDOF effect
 - Non-dominant eye
- This adds about double the near vision as the MRx suggests
 - E.g. MRx of -0.75 D would have equivalent near vision as typical -1.50 D
- The Light Delivery Device (LDD) adds negative spherical aberration to the center of the lens
 - No rings, so no additional glare or halos
 - Minimal reduction in contrast sensitivity
 - Patients who are not diffractive MF candidates can be LAL candidates

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Light Adjustment Process

- Patient must wear UV-protecting glasses
- First adjustment at least 21 days after surgery
- Can adjust 3D of combination sphere and cylinder
- Up to 3 adjustments per lens
- At least 72 hours between adjustments
- 2 final "lock-ins"

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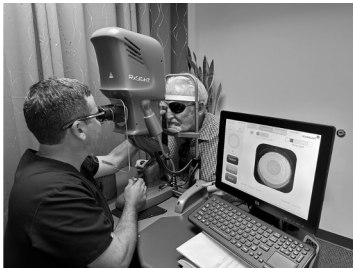
The Importance of Refraction

- The LDD will do what you tell it to do
- If the refraction is incorrect, results will be incorrect
- MUST be confident in the refraction before light treatment



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Light Adjustment



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Great LAL Candidates

- Post-refractive surgery: LASIK, PRK, and even some RK
- Highly demanding
- Pathology that contraindicates diffractive EDOF or MF IOLs
 - Dry Eye, AMD, POAG, etc.
- Glare/Halo/Dysphotopsia concerns



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Not LAL Candidates

- Poor dilation
 - Dilation needs to be at least 5.5mm, ideally >6mm
- Astigmatism > 3D
 - Ideally < 2D
- Highly aberrant corneas (e.g. keratoconus, some RK, scars, etc.)



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LAL Considerations

- Very Expensive
- Many post-op appointments (generally 4 to 6)
- Wearing UV glasses until lock-ins are complete
- No instant gratification
 - Vision doesn't "come in" until first adjustment



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LAL and Near Vision

- With both eyes, ~90% of LAL patients are 20/20 and J2¹
- Need to tolerate some monovision to get near
 - About 80% of LAL patients choose "blended" vision
- May still need some reading glasses for small print
 - Those who want full range of vision with both eyes may do better with MFIOL

1. ReSight Combined PMCS-001 & PMCS-002 Clinical Outcomes of Patients Bilaterally Implanted with LAL



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Summary

- We don't have an accommodating IOL... yet
- There are some great options for treating presbyopia
- Diffractive multifocal IOLs can provide a full range vision
 - But many are not candidates
 - Need to be able to deal with glare and halos
 - Need to nail the refractive outcome
- The LAL is the most accurate IOL
 - Best glasses-free outcomes for distance
 - No glare or halos
 - Need to tolerate some blended vision for near, may still need readers rarely



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Thank You!

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