



Alexandria

Introduction

- **Trifocal : FineVision (PhysIOL, Liège, Belgium)**
 - Fully diffractive IOL
 - Two bifocal diffractive patterns (far/near and far/intermediate vision)
 - Continuous decrease of the diffractive steps height from optical center to the periphery
 - More far vision dominant at larger pupils for diminution of photic phenomena under dim conditions

Design

Trifocality of PhysIOL FINEvision

- Fully diffractive apodized trifocal optic
100% of the optic surface is trifocal.
- The patient benefits from trifocality in all dim conditions.
- Thanks to the **apodization** & **convolution**, the patients have less complaints of halos & glare and they experience less photopic phenomena



Quoted from R R Fekry MD

The Trifocal Design

1st Bifocal Design:
Distance & Near



2nd Bifocal Design:
Distance & Intermediate

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Overview

Light Distribution



The trifocal IOL distributes **45% of incoming light to distance, 20% to intermediate, and 35% to near** (versus 59% to distance and 25.5% to near with the bifocal MFIOL).

Quoted from R R Fekry MD

Introduction

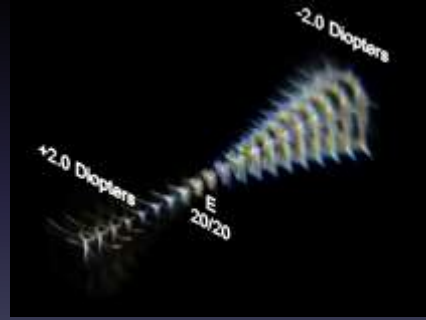
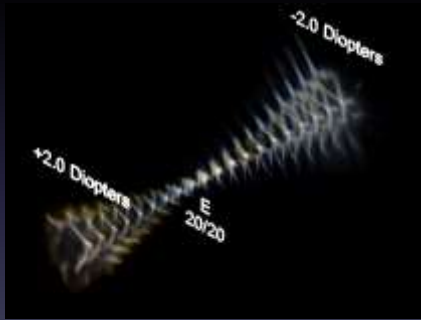
- EDOF : Symphony (Abott)
 - Diffractive step like pattern
 - *Aims at an elongated focal area rather than various focal points*
 - Correction of chromatic aberrations for better contrast sensitivity

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Normal

EDOF

Volumetric PSF



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*Stanly Bridge at night,
Alexandria ,Egypt.*

Spherical Aberrations

- Trifocal IOLs showed **less negative spherical aberrations** than EDOF IOLS at 2.0, 3.0, 3.75, 4.5mm apertures :
- Trifocal IOLs is claimed to correct corneal positive spherical aberrations **partly** leaving some positive aberrations that contribute to providing depth of focus

[J Refract Surg. 2016;32(4):273-280.]

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Clinically Relevant Optical Properties of Bifocal, Trifocal, and Extended Depth of Focus Intraocular Lenses.

J Refract Surg. 2016 Apr 1;32(4):273-80. doi: 10.3928/1081597X-20160121-07.

Gatinel D, Loicq J.

- The tested IOLs were:
 - **TECNIS ZMB00** (bifocal; Abbott Medical Optics, Abbott Park, IL),
 - **TECNIS Symphony ZXR00** (extended depth of focus; Abbott Medical Optics),
 - and **FineVision GFree** hydrophobic (trifocal; PhysIOL, Liège, Belgium).

Their surface topography was analyzed by optical microscopy.

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- **Modulation transfer function (MTF) and spherical aberrations** were determined on optical bench for variable pupil apertures and with two cornea models (0 μm and +0.28 μm).
- **United States Air Force target imaging** was analyzed for different focal points (near, intermediate, and far).
- **Point spread function (PSF)** and halos were quantified & compared.

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RESULTS

- The three lenses **presented step-like optic topography** for a pupil size of **3 mm or greater**, clearly distinctive MTF peaks were observed for all lenses:
- **Two peaks for the extended depth of focus and bifocal lenses with +1.75 and +4.00 diopters (D) addition, respectively,**
- **Three peaks for the Trifocal lens with +1.75 and +3.50 addition for intermediate and near vision, respectively.**

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- **The extended depth of focus and bifocal lens had slightly higher MTF at best focus with the +0.28 μm cornea model than with the 0 μm model,**
(That's why in DLS some prefer to put it)
- whereas the **Trifocal lens was likely to be more independent of the corneal spherical aberrations.**
(That's why some prefer it for cataractous patients)

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Optical Performance

Spherical aberrations

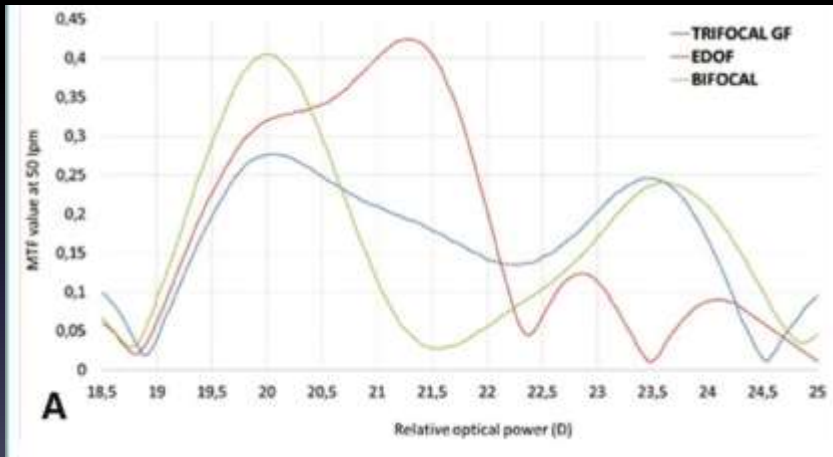
Spherical aberrations (μm) at 2.00, 3.00, 3.75 and 4.50 mm apertures for the EDOF, bifocal and trifocal intraocular lenses



Gatinel, D., & Loicq, J. (2016). Clinically relevant optical properties of bifocal, trifocal, and extended depth of focus intraocular lenses. *Journal of Refractive Surgery*, 32(4), 273-280.

Quoted from RR Fekry MD

MTF curves

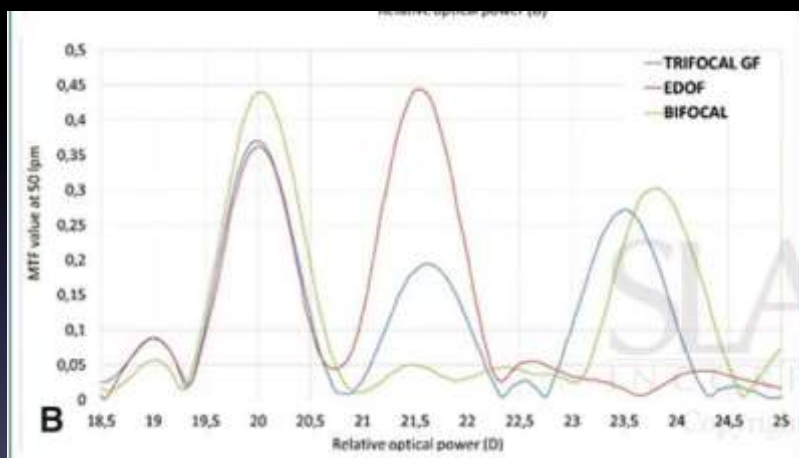


At 2 mm aperture

[J Refract Surg. 2016;32(4):273-280.]

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MTF curves



At 3 mm aperture

[J Refract Surg. 2016;32(4):273-280.]

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Image Resolution



[J Refract Surg. 2016;32(4):273-280.]

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Distance VA

- Both EDOF and Trifocal IOLs gave **good and predictable distance VA**.
- Trifocal IOLs gave slightly lower distance VA (**0.95** decimal scale) compared to EDOF (**1.01**)

Open Journal of Ophthalmology, 6, 176-183

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Intermediate VA

- Both IOLs gave **excellent intermediate VA**
- EDOF IOLs gave better intermediate VA (**0.95**) compared to Trifocals (**0.85**)

Open Journal of Ophthalmology, 6, 176-183

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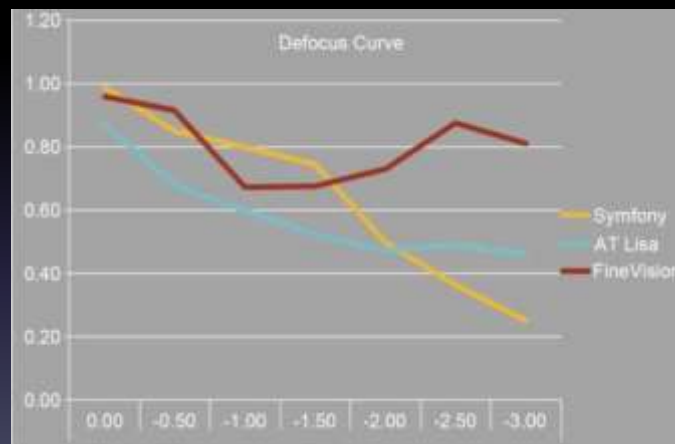
Near VA

- Trifocal IOL was **superior to EDOF IOL with VA of 0.96** in comparison to **0.63**

Open Journal of Ophthalmology, 6, 176-183

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Defocus curve



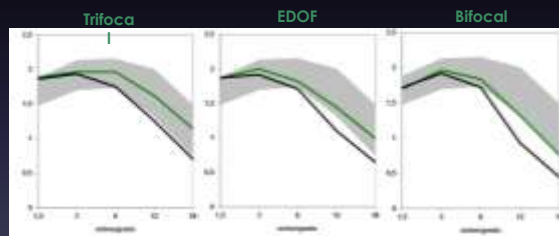
Open Journal of Ophthalmology, 6, 176-183

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Optical Performance

Contrast Sensitivity

Spherical aberrations (μm) at 2.00, 3.00, 3.75 and 4.50 mm apertures for the EDOF, bifocal and trifocal intraocular lenses.



Cochener B, Vryghem J, Rozot P, Lesieur G, Heireman S, Blancaert JA, Van Acker E, Ghekiere S. *Visual and refractive outcomes after implantation of a fully diffractive trifocal lens.* Clin Ophthalmol. 2012; 6:1421-1427

Spectacle independence

- 5 % of patients implanted with EDOF IOL required reading glasses while all patients with Fine vision were glasses independent

Open Journal of Ophthalmology, 6, 176-183

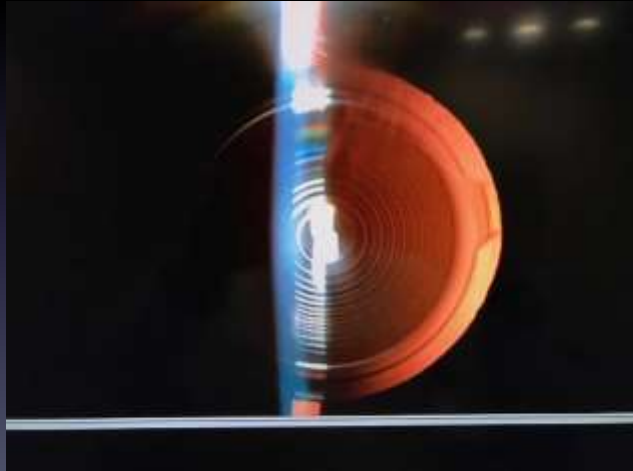
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Our Prospective comparative Interventional Study Fine-vision(Trifocal) IOLs

- 67 eyes of 33 patients ; all are spectacle independent for 12 months now (Short Period)
- Excellent near, intermediate and far VA
- No complaints of halos nor glare
- None of them complained of difficulty during night driving, reading or Intermediate tasks

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First Trifocal in Egypt on 22nd February 2017



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Cont,..

- One **Toric Trifocal**. (Physician)
- Some patients had **postoperative astigmatism of up to (0.75 D)** and still were happy.
- **Two Surgeons, One Dentist** and didn't complaint of any degradation of their quality of vision

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Conclusion

- Both IOLs gave excellent far and intermediate VA but again **Fine-vision was superior** in the near VA offering potentially higher spectacle independence rates.

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THANK YOU