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*

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The Trifocal Design

1st Bifocal Design:
Distance & Near

2nd Bifocal Design:
Distance & Intermediate

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Overview

Light Distribution

- 35% near
- 20% intermediate
- 45% distance

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).

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
Normal

EDOF

Volumetric PSF

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, 4.5 mm apertures:
- Trifocal IOLs is claimed to correct corneal positive spherical aberrations partly leaving some positive aberrations that contribute to providing depth of focus.


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

- The tested IOLs were:
  - TECNIS ZMBoo (bifocal; Abbott Medical Optics, Abbott Park, IL),
  - TECNIS Symfony ZXROO (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.

**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.**
• **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


Quoted from RR Fekry MD
MTF curves

At 2 mm aperture


MTF curves

At 3 mm aperture

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] El-Massry
Intermediate VA

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

Near VA

- Trifocal IOL was superior to EDOF IOL with VA of $0.96$ in comparison to $0.63$
Defocus curve

Open Journal of Ophthalmology, 6, 176-183

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.

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

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

*El-Massry*
First Trifocal in Egypt on 22nd February 2017

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
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.
THANK YOU