Analysis of Internal Ocular Aberrations After Implantation of a Toric IOL

Fabrizio I. Camesasca, MD

Paolo Vinciguerra, MD

Massimo Vitali, Orthoptist

I have no financial interests or relationships to disclose

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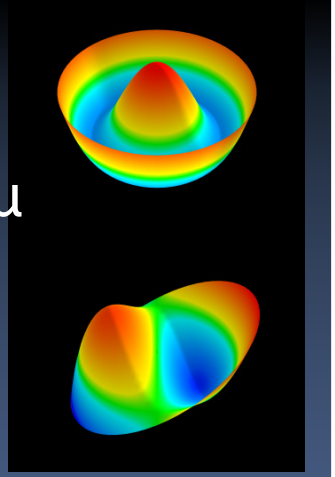
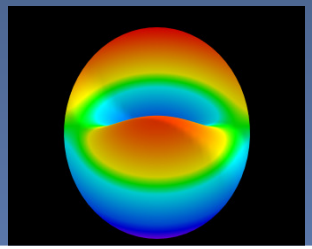
ISTITUTO CLINICO HUMANITAS

CLINICA OCULISTICA
Istituto Clinico Humanitas
Rozzano, Milan, Italy
Chairman: Paolo Vinciguerra, MD

Wavefront Measurement

- Measures the optical performance of the entire eye, its aberrations.
- Built-in human optical high order aberrations
  - Cornea:
  - Spherical aberration (SA), mean +0.27μ
  - Horizontal coma
  - Crystalline lens:
  - SA: mean-0.27μ (young), +0.13μ (60 y.o.)
  - Vertical coma





fabrizio@camesasca.com

Toric IOLs - Rational

- Toric IOLs aim at correcting the corneal astigmatism
- Initially used for high astigmatism (congenital, post-PK)
- Rapidly expanding indications, from 1.00 D cyl up

Purpose of the study

- To prospectively evaluate internal high order ocular aberrations (HOA) at different pupil diameters before and after implantation of an aspheric toric IOL.

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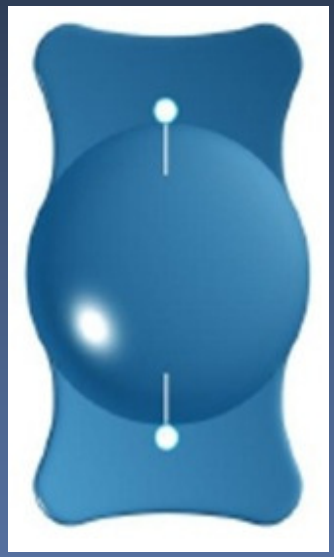
Toric IOL

- Zeiss AT TorBi 709 M toric IOL
  1. Bitoric aspheric (prolate)
  2. Equally convex optic
  3. Hydrophilic acrylic, hydrophobic surface
  1. UV filter
  2. Square edge
  3. 11 mm diameter



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Materials and Methods

1. All eyes underwent HOA evaluation with NIDEK OPD aberrometer preoperatively and 3 weeks after cataract surgery, for a 3, 4, and 5 mm pupil.
2. NIDEK OPD Scan Aberrometer measuring dynamic skyascopy-derived wavefront in a reproducible way

1. Calculates optical pathway difference
2. 1440 data points within 0.4 sec
3. Integrated, registered corneal topographer (0.2 sec)

(Solomon JD, J Refract Surg 2010)

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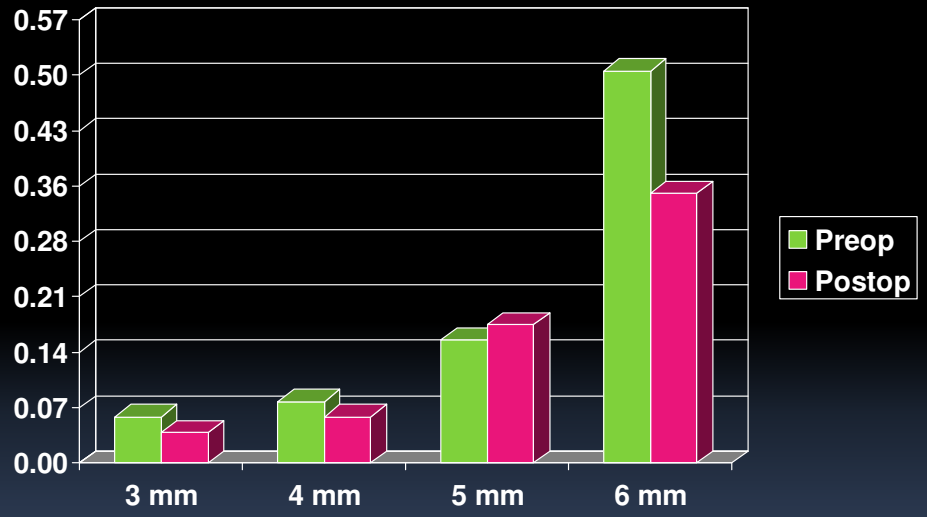
Results

1. Twelve cataract eyes, 7 patients
2. 2.2 mm incision surgery
3. Zeiss AT TORBI 709 M toric IOL
    - Mean power: +16.33 D ± 7.57 D, -2.75 D ± 0.27 D cyl.
4. Preoperative BSCVA 0.52 ± 0.65 LogMar
    - with -3.25 ± 3.01 sph and -2.50 ± 0.51 cyl
5. Follow-up: 47.00 ± 14.21 days.
6. Postoperative:
    1. UCVA 0.01 ± 0.43 LogMar
    2. BSCVA 0.05 ± 0.51 LogMar
        - with -0.79 ± 1.04 D sph and -0.17 ± 0.26 cyl

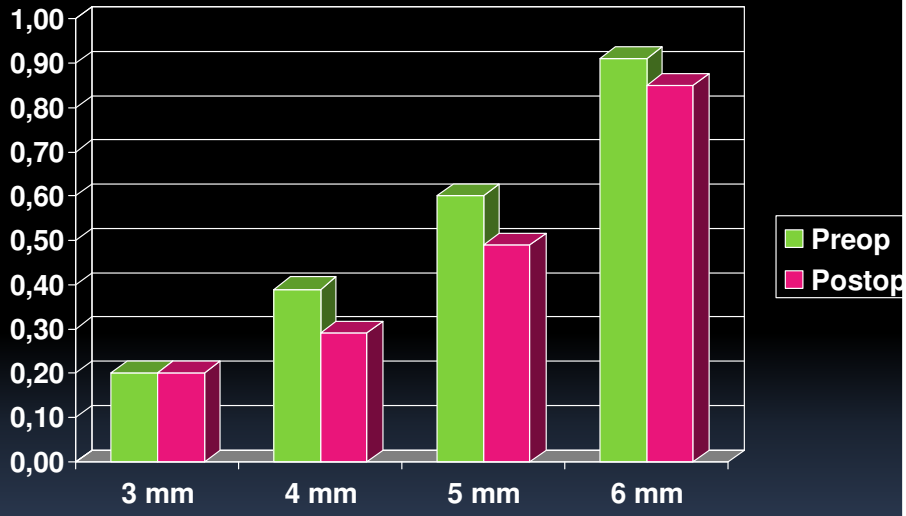
fabrizio@camesasca.com

Total HOA

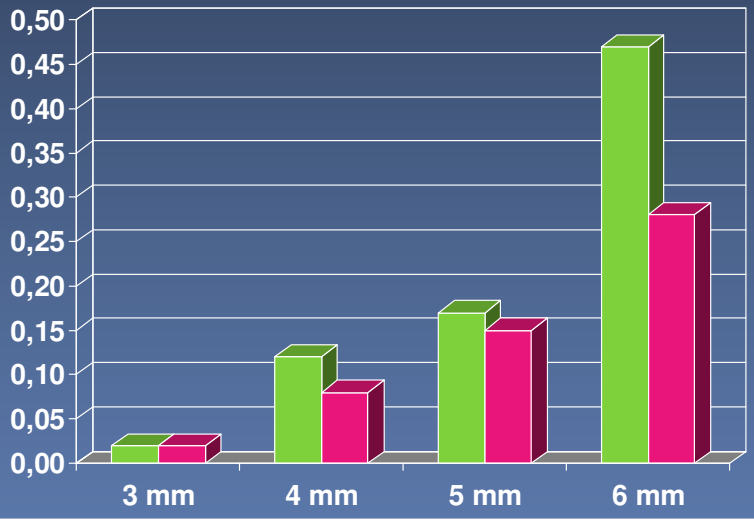
Coma



Trefoil

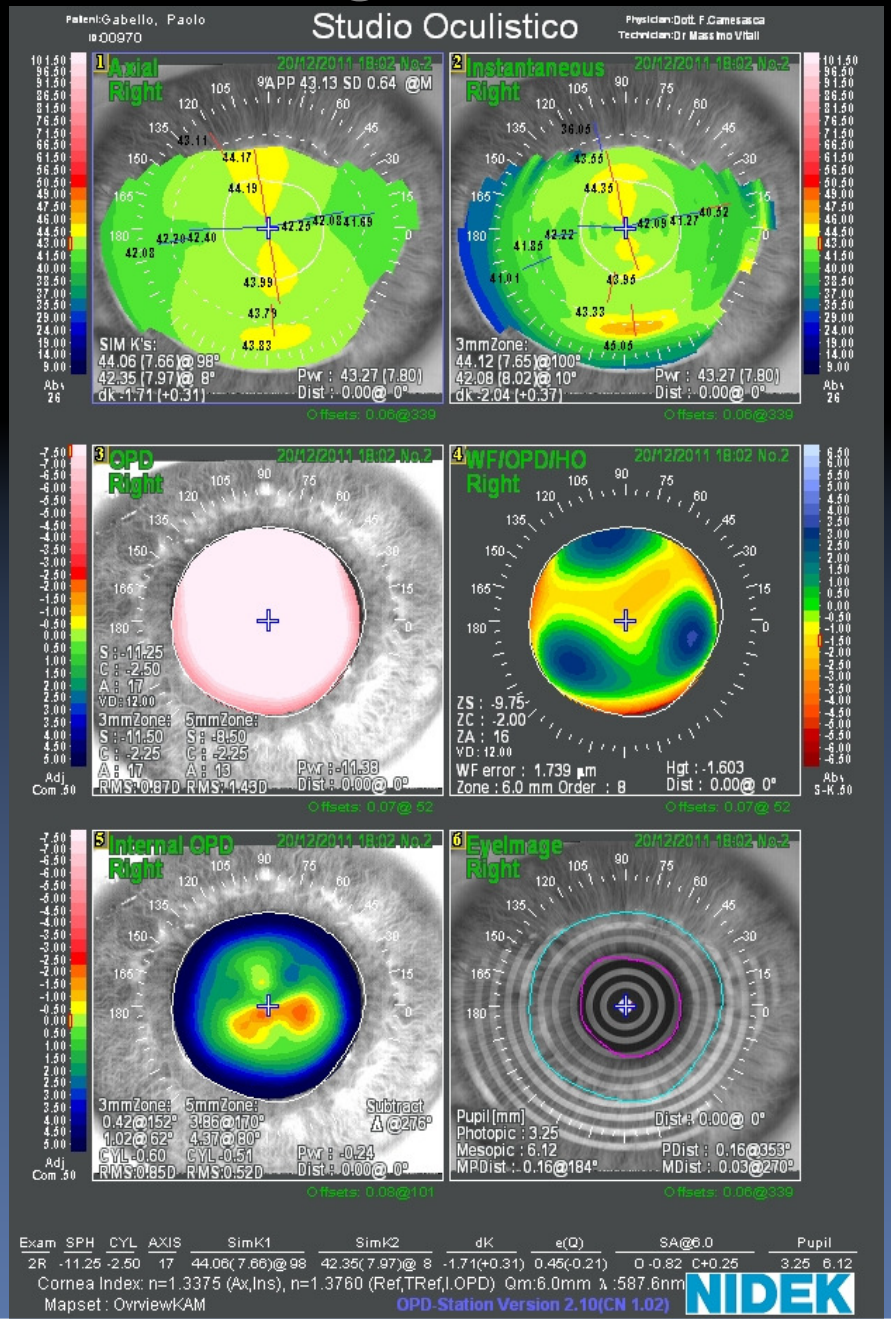


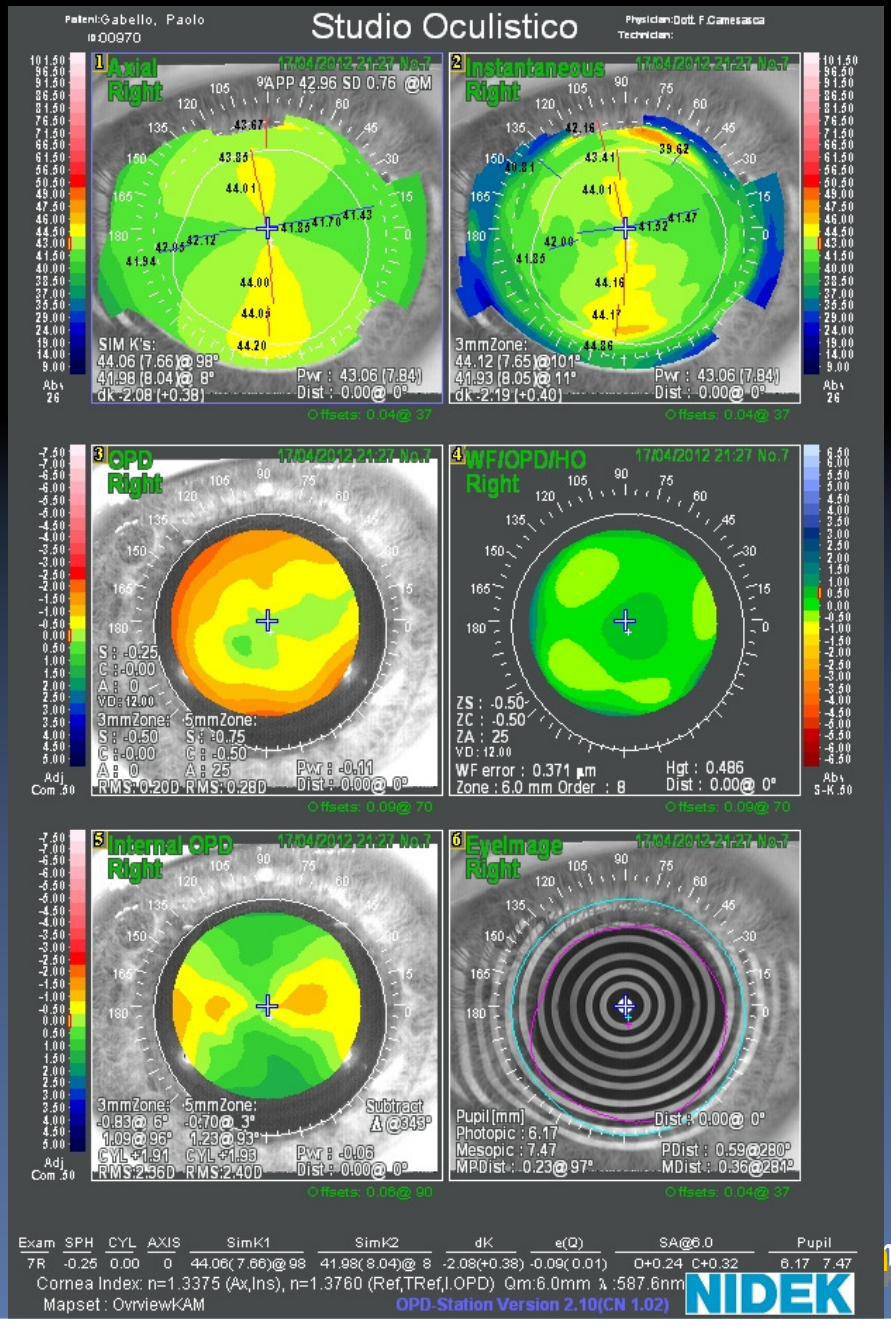
Spherical Aberration



1. Internal spherical aberration decreased or remained unchanged for all pupil diameters.
2. Internal trefoil decreased for all pupil diameters.
3. Internal coma decreased for 3 and 4 mm pupil, and increased for 5 mm pupil. P was < .05.

VOD 0.1 LogMar





Conclusions

- Cataract-induced increase in internal trefoil is eliminated
- Given that corneal SA remains stable, toric aspheric IOL lowers age-related increase in SA
- Internal coma decrease: IOL properly centered, and stable: no tilt
- IOL safe and reliable, easy to rotate in both direction for proper centering
- Aspheric toric IOL improved substantially visual acuity

(van Gaalen KW, J Cataract Refract Surg 2010)

fabrizio@camesasca.com

But… is it all so easy ?

- Wrong belief no. 1: corneal astigmatism is stable throughout life
  - Corneal astigmatism in healthy subjects slowly changes from with-the-rule (WR) to against-the-rule (AR) with time.
  - -0.30 D in 10 years

(Hayashi K, Am J Ophthalmol 2011)

- Wrong belief no. 2: power of posterior corneal surface is not important
  - 0.50 D AR in with-the-rule corneas (WR)
  - 0.30 D AR in against-the-rule corneas (AR)

(Koch D, ASCRS pc)

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Thank you for your attention !