

# Subjective and Objective Refraction After Monofocal Toric IOL Implantation And Alignment with an Empirical Method

Fabrizio I. Camesasca, MD

Paolo Vinciguerra, MD

Massimo Vitali, Orthoptist

*I have no financial interests or relationships to disclose*



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



# Why This Paper ?

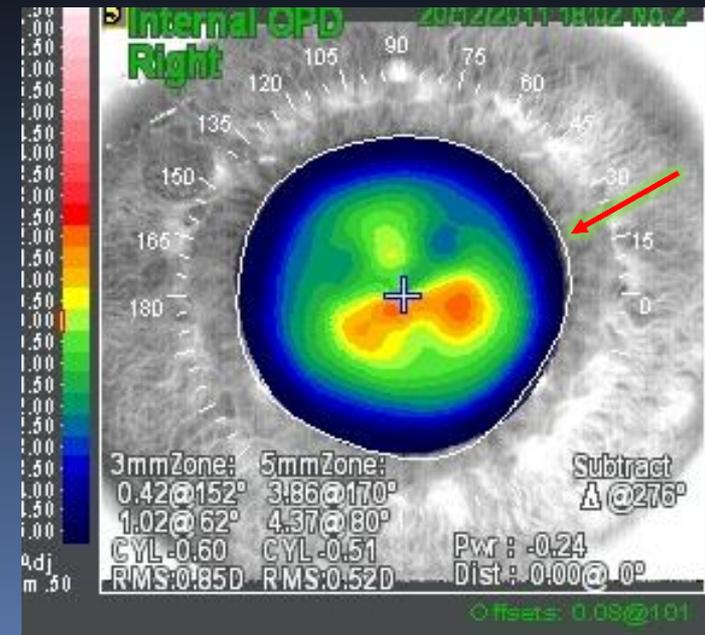
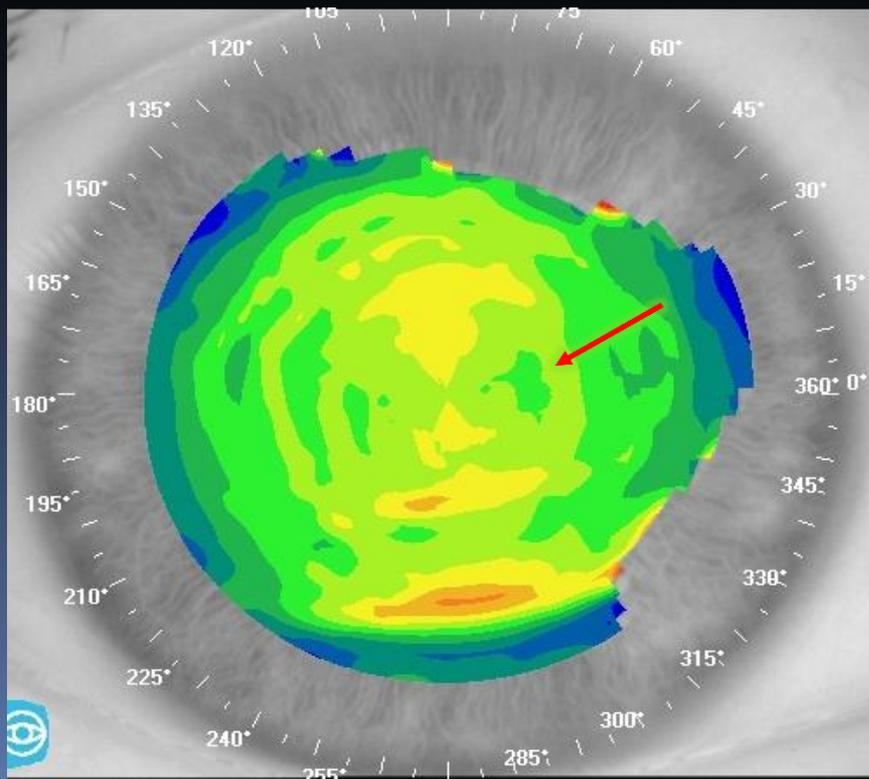
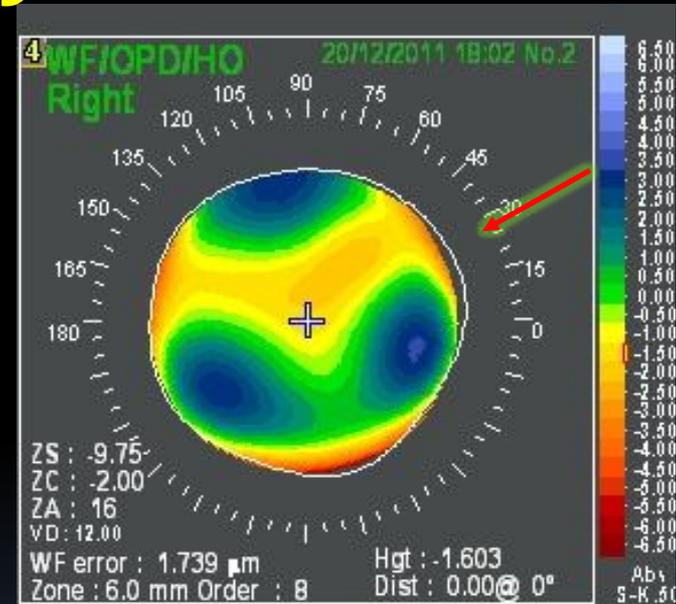
- Precise intraoperative toric IOL axis orientation:
  - May be haphazardous
  - Complicated
  - Time-consuming
  - Every degree of misalignment leads to **residual** astigmatism and sphere
- **Limbal** vessels pattern may be a precise referral structure for proper axis alignment.

# Patient Evaluation

- Diagnostic exams:  
hunting for the axis
  - Subjective refraction
  - Corneal topography
  - Aberrometry
  - Scheimpflug tomography
  - Accurate IOL calculation

# Corneal Topography + Aberrometry

- Subjective astigmatism:
  - Corneal astigmatism (A/P)
  - Lens astigmatism
- VOD 0.65 -5.00 -1.50 (175)



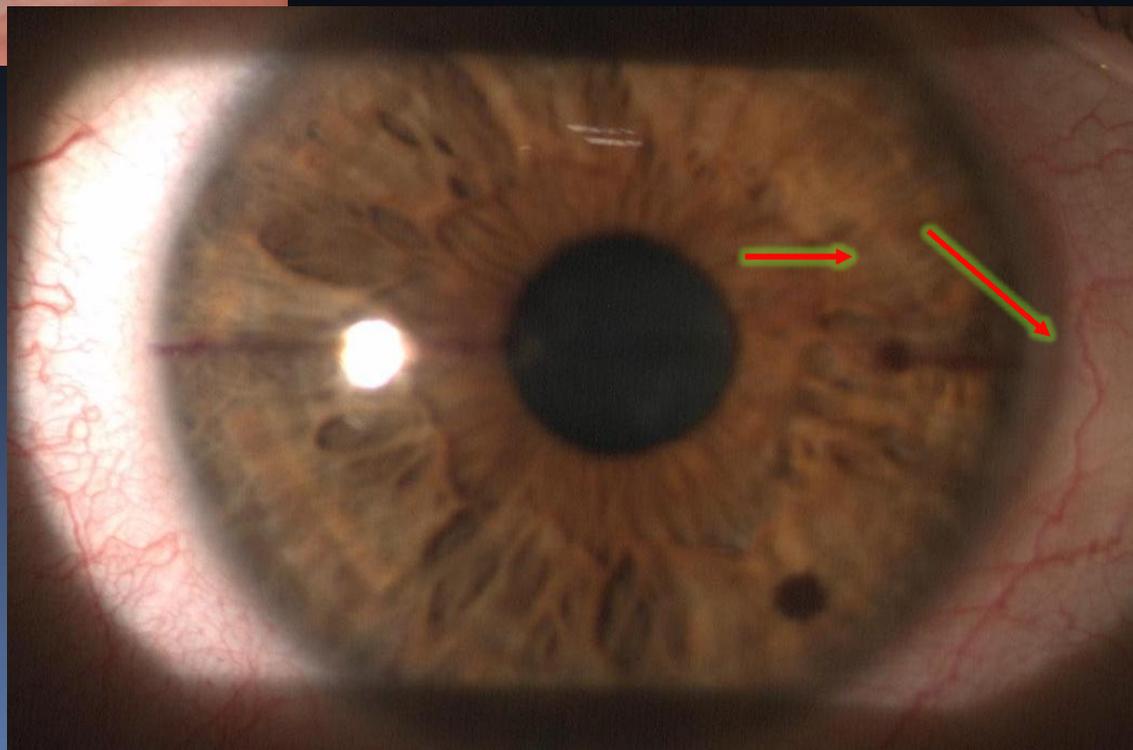
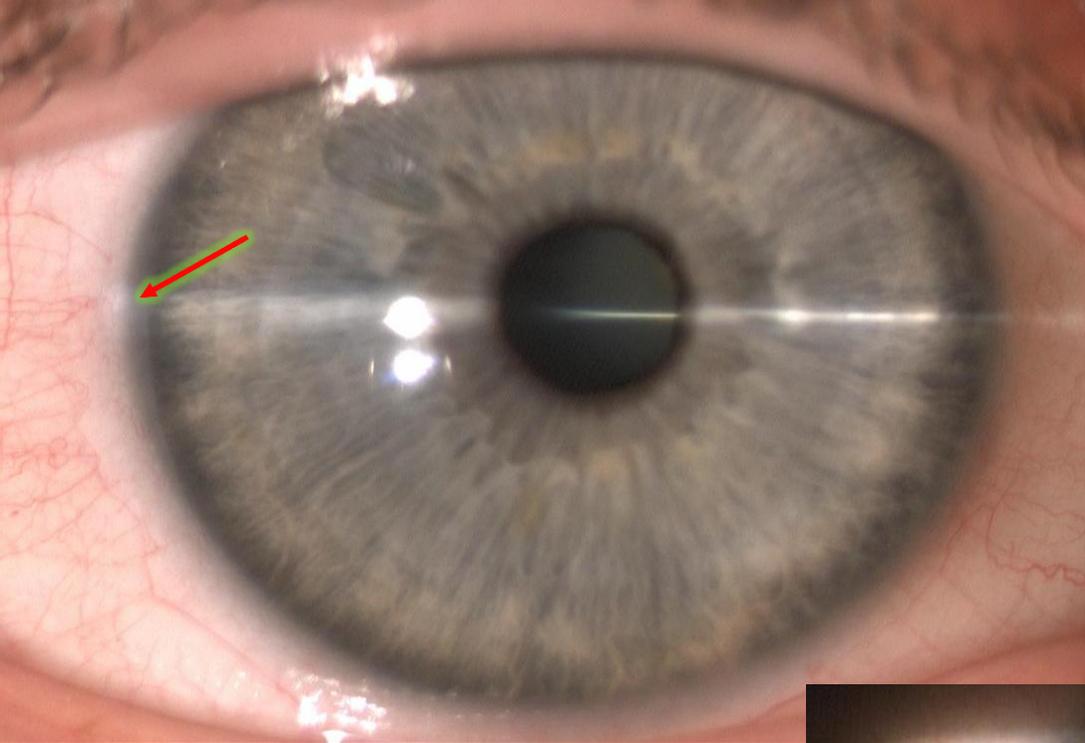
# Purpose of the study

- Evaluate:
  - subjective and objective refraction
  - topographic astigmatism (TA)
  - before and after implantation of toric aspheric monofocal IOL
  - aligned with an empirical method based on the limbal vessels pattern.

# Materials and Methods

## 1. IOL Alignment

1. Preoperative identification of topographic axis of astigmatism
2. Slit-lamp identification and photograph of limbal vessels in correspondence of the most curve axis of astigmatism
3. Preoperative mark of  $0^{\circ}$  -  $180^{\circ}$  axis
4. Intraoperative detection of involved limbal vessel and IOL alignment



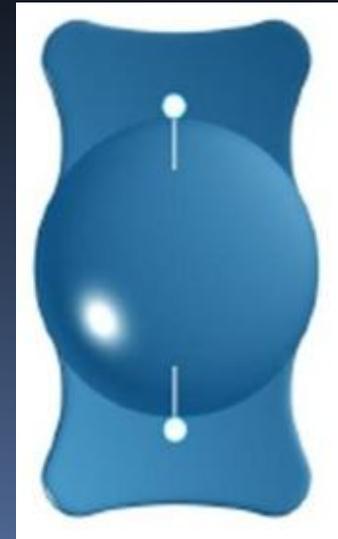
# Materials and Methods

1. Thirty-six eyes (20 patients, mean age  $64.35 \pm 16.59$ )
2. 2.2 mm incision surgery
3. Toric aspheric monofocal IOL (Zeiss AT Torbi 409 MP)
4. Mean power:  $+16.33 \text{ D} \pm 7.57 \text{ D}$ ,  $-2.75 \text{ D} \pm 0.27 \text{ D cyl}$ .
5. Preoperatively:
  1. Reference limbal vessels positioned in correspondance of the alignment axis recommended by the specific website software (Zeiss Z Calc) were photographed.
6. IOL axis orientation:
  1. Aligning the axis with reference limbal vessels
  2. Checking preoperative corneal topography astigmatism
7. Subjective refraction and TA were measured before and nine months after surgery.

# Toric IOL

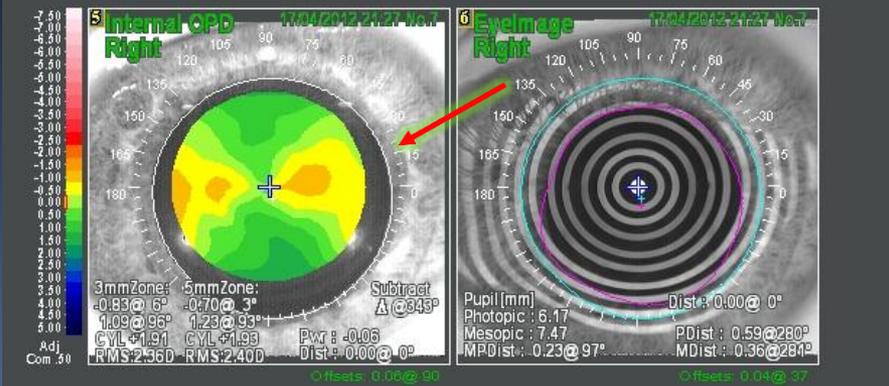
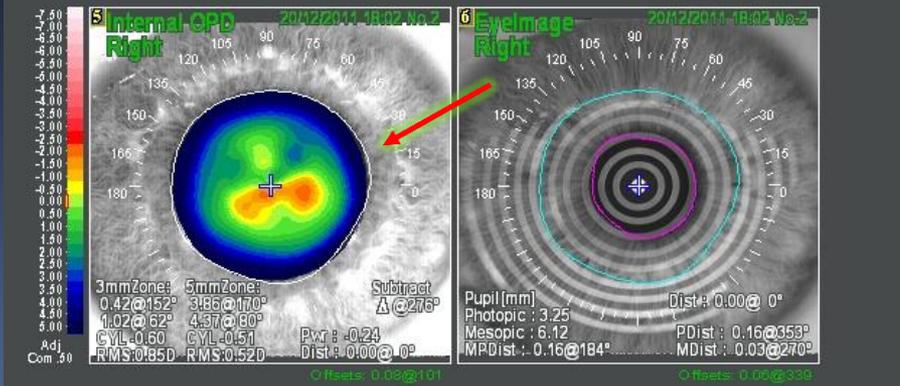
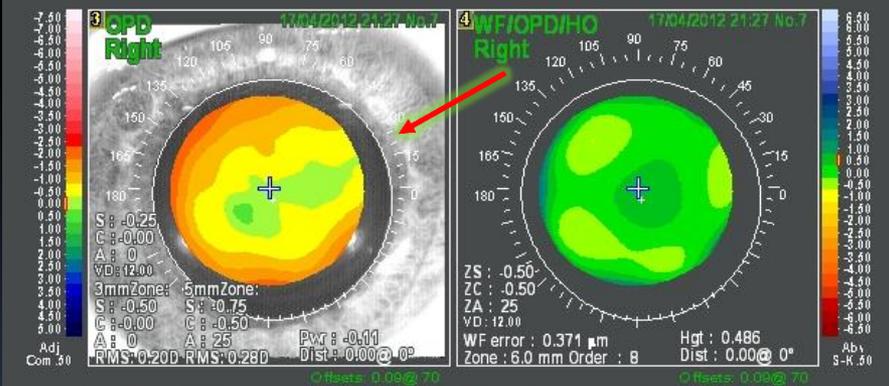
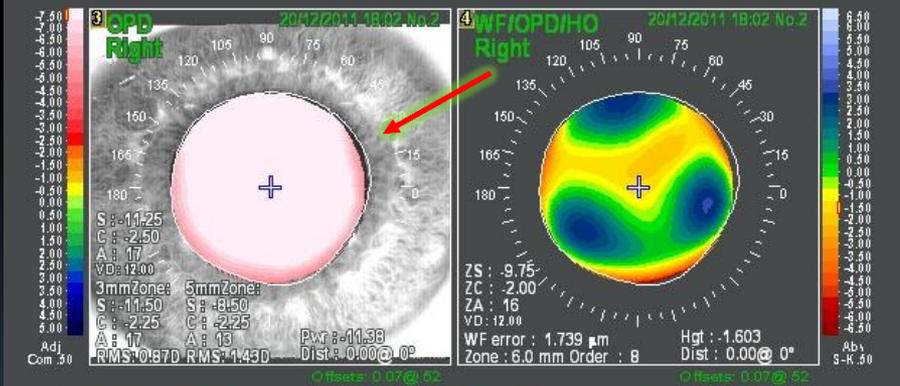
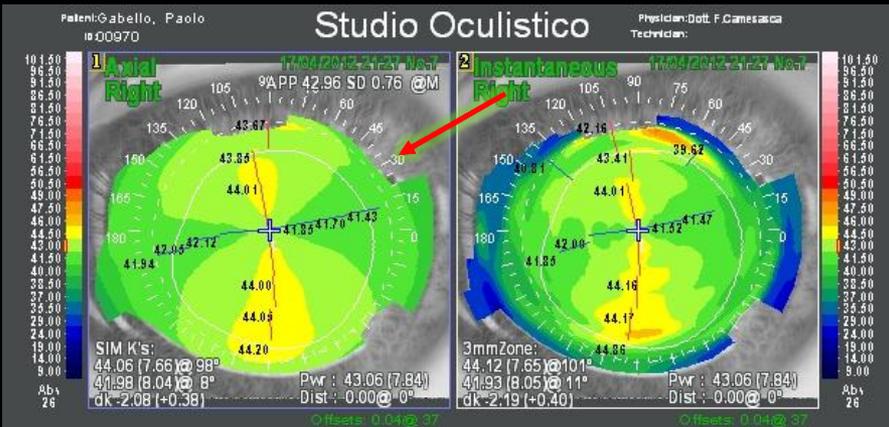
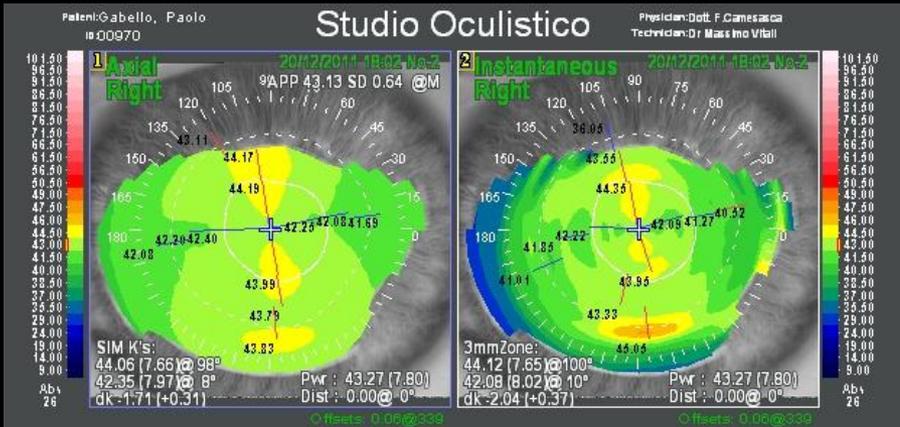


- Zeiss AT TorBi 709 M toric IOL
  1. Bitoric aspheric (prolate)
  2. Equally convex optic
  3. Hydrophilic acrylic, hydrophobic surface
    1. UV filter
    2. Square edge
    3. 11 mm diameter



# Results

1. Mean preoperative subjective refraction:  $-2.29 \text{ D} \pm 3.63 \text{ D sph}$  with  $-2.19 \text{ D} \pm 0.55 \text{ D cyl}$  at  $64.44^\circ \pm 72.73^\circ$
2. Mean TA:  $-1.79 \pm 0.39$  at  $118.88^\circ \pm 73.82^\circ$  . Mean SIA was  $-0.20 \text{ D}$
3. Postoperatively ( $9 \pm 4$  months), mean subjective refraction was  $-0.41 \text{ D} \pm 0.79 \text{ D sph}$  with  $-0.25 \text{ D} \pm 0.44 \text{ D cyl}$  at  $93.33^\circ \pm 45.09^\circ$  .
4. Mean BSCVA and UCVA were  $-0.06 \text{ LogMar}$  and  $-0.02 \text{ LogMar}$ , respectively.
5. Mean TA was  $-1.87 \text{ D} \pm 0.40 \text{ D}$  at  $134.25^\circ \pm 63.90^\circ$  .
6. Mean IOL axial orientation was at  $90.83^\circ \pm 38.40^\circ$  .



**0.6 -11.25 -2.50 (17)**

**1.0 plano**

Exam SPH CYL AXIS Srv  
7R -0.25 0.00 0 44.06(7  
Cornea Index: n=1.3375 (A)  
Mapset: nviewKAM

SA@6.0 Pupil  
1.24 C+0.32 6.17 7.47  
nm  
**NIDEK**

# Conclusions

1. Patients receiving monofocal toric IOLs aligned through an empirical method reached optimal visual acuity.
2. Mean TA was not influenced by SIA
3. Final refraction showed highly satisfactory correction of spherical and astigmatic defect.

# 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)*

Thank you for your attention !

