Refractive changes and wavefront aberrations of polyfocal intraocular lens during focusing on far and near target measured by iTrace Visual Function Analyzer.

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**Methodology**

**Instrument - iTrace**
- Innovative technology providing information concerning corneal and lenticular optical aberrometry.
- iTrace includes: Auto-Refractometer, Aberrometer, Corneal Topographer, Pupillometer, Keratometer.
- iTrace can measure actual optical power of 256 points in the optical system of the eye, and it can distinguish corneal and lenticular components.

**Clinical Study**
- 36 patients (49 eyes);
- mean age: 64.5 years, (47 to 80 years);
- on average 5.6 years after IOL implantation
- 22 males, 14 females
- All patients underwent routine cataract surgery and WIOL-CF bioanalogic IOL implantation at 3 centers in Czech Republic

**Data Acquisition**
The patients were asked to focus on two different distances - far target (6 m minimally) and near optotype (30 cm) - and at the same time wavefront measurements and corneal topography were performed. iTrace software enables comparison between two exams – far and near focus - of same eye.
Pattern of WIOL-CF Accommodation using iTrace

WIOL-CF accommodation and near focus shift refraction to more myopia (myopic shift)

Polyfocality

Accommodation Volume (4.42 D)

Mean Accommodation (Sp.Eq. 0.82D)

Peak Accommodation (3.09 D)

Parameter (N = 36) | Value (Accomodating Eyes)
---|---
Average Peak Accommodation (D) | 3.09 D ± 1.03 D
Average Accommodation Volume (D) | 4.42 D ± 1.70
Average Mean Accommodation (D) | 0.82 D ± 0.56
• 73% of the eyes achieve significant, objectively measured accommodation.

• 27% of the eyes see at all distances as the accommodating group without using fully the WIOL-CF accommodative potential. The wide depth of focus provided by the negative spherical aberration of the WIOL-CF (polyfocality) is sufficient to achieve good VA.

• The iTrace observations support clinical accommodation range of more than 2 D.
Components of WIOL-CF Accommodation

- Changes of high order aberrations correspond to the changes of polyfocality.
- Data of individual patients show that changes of refraction due to the accommodation are driven predominantly by low order aberrations.

* The RMS (Root Mean Square) is a parameter given by iTrace. It is the amount that the measured wavefront differs from the ideal wavefront. The higher the RMS value, the more aberrated the eye.
Conclusions

- All WIOL-CF patients (2-9 years post-op.) have good VA at all distances.
- The majority of patients use the benefits of accommodation:
  - similarly to NCL, WIOL-CF exhibits myopic shift when focusing at near target,
  - similarly to NCL, the changes in refraction are driven mainly by LO aberrations,
  - the accommodation range observed by iTrace is consistent with previously measured clinical defocus curves showing accommodative range of above 2 D,
  - accommodation volume and changes of HO aberrations can be attributed to the polyfocality (wide depth of focus due to the negative spherical aberration of WIOL-CF),
  - changes of refraction observed by iTrace are driven by shape changes that induce also polyfocality changes.
- 27% of long-term users do not need to accommodate, they use wide depth of focus of WIOL-CF and they can see at all distances without true accommodation.
- This study confirms previous results obtained by iTrace*.

* Pallikaris I. et al: Evaluation of changes in accommodation and wavefront aberrations by means of the i-Trace wavefront aberrometer, after WIOL –CF accommodative IOL implantation; ESCR Congress 2013