RayOne Trifocal: Visual outcomes and IOL stability – long term follow-up

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All authors have no financial interests
PURPOSE

- To report long term visual outcomes of RayOne® Trifocal IOL (Rayner)

- To compare visual outcomes and patient satisfaction of RayOne® Trifocal IOL with another trifocal IOL (Acrysof IQ PanOptix® - Alcon) and monofocal IOL (AcrySof® IQ Monofocal – Alcon)

- To evaluate post-operative aberrations, IOL stability and PCO in the three different groups
3 groups of 12 eyes (6 patients) were evaluated in San Marino Hospital after implantation of RayOne Trifocal (Group 1), PanOptix (Group 2) and Acrysof IQ Monofocal (Group 3)

Data evaluated:
- Distance Uncorrected (UCVA) and Distance Best Corrected Visual Acuity (BCVA) (LogMAR)
- Near (UNVA) and Intermediate Visual Acuity (UIVA) (LogMAR) with MNread charts
- Contrast sensitivity with MOS 22 (Dueffe Tecnovision)
- Defocus curve from -4.00 D to +4.00 D
- Aberrometry (OSIRIS – CSO)
- Patient satisfaction with a self-administered questionnaire (NEI-RQL-42™)
- PCO incidence and IOL stability with digital photos of anterior segment

- Minimum follow-up: 10 months
- Average age: 65.4 ± 8.8 (range 48-72)
- Mean pupillar diameter: 3.82 mm (range 5.40-2.32 mm)

EXCLUSION CRITERIA:
- Previous ocular surgery
- Regular corneal astigmatism greater than 0.75 D
- Irregular astigmatism and corneal opacities
- Glaucoma with impairment of GCL and RNFL
- Macular diseases
MATERIALS AND METHODS

PRE-OPERATIVE EXAMINATION
- Corneal tomography (Sirius – CSO)
- Pupillometry (photopic, mesopic and scotopic) (Sirius – CSO)
- Macular OCT (Spectralis – Heidelberg Engineering Inc.)
- Optical Biometry (IOL Master 700 – Zeiss)
- SRK-T formula with target of emmetropia (A-cost 118.6)

SURGICAL TECHNIQUE
- All operations were performed by the same surgeon (A. M.)
- 2.4 mm clear corneal incision in temporal side
- Continuous curvilinear capsulorhexis with a 5.5 mm diameter
- Phacoemulsification with Chop Technique
- Follow-up: 7 days, 1 month, 3 months, 6 months, 10 months post-operatively
- No intra and post-operative complications
All patients in Group 1 (RayOne Trifocal) and Group 2 (PanOptix) achieved monocular UCVA of 0.1 LogMAR or better.

8 patients (66%) in Group 3 (AcrySof Monofocal) achieved monocular UCVA of 0.1 LogMAR or better.
RESULTS – UNVA AND UIVA

- 8 patients (66%) in Group 1 (RayOne Trifocal) and 6 patients (50%) in Group 2 (PanOptix) achieved monocular UNVA of 0.1 LogMAR or better (Mnread charts)
- 11 patients (91%) in Group 1 (RayOne Trifocal) and 10 patients (83%) in Group 2 (PanOptix) achieved monocular UIVA of 0.2 LogMAR or better
- No statistical differences were noted between 2 groups

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<th>Uncorrected Near Visual Acuity (LogMAR) – 10 months follow-up</th>
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At 10 months post-operatively, RayOne and PanOptix groups showed a smooth transition phase between the far and the near focus, resulting better than the AcrySof group.

From +1.00 D to -2.00 D, visual acuity was >0.10 LogMAR in all patients, demonstrating good intermediate vision.

At -2.50 D, corresponding to near vision at 40 cm, visual acuity was 0.12 LogMAR or better.

At -3.00 D (near vision at 33 cm) and -4.00 D (near vision at 25 cm) visual acuity was respectively 0.21 and 0.42 LogMAR for RayOne group, and 0.14 and 0.3 LogMAR for PanOptix group.

Defocus curves are not fully representative of reading visual acuity as the effects of convergence and pupillary constriction are not taken in consideration.
Contrast sensitivity levels of the all groups were within normal limits under both photopic (85 cd/m\(^2\)) and mesopic (3 cd/m\(^2\)) conditions throughout follow-up.

At higher spatial frequency (> 6 cycle/degree) PanOptix group showed lower contrast sensitivity than the other groups under photopic and mesopic conditions.
RMS values (μm) were better in AcrySof IQ Monofocal group regarding ocular and internal aberrations.

RayOne group showed lower LOA and HOA internal aberrations than PanOptix group (not statistically significant).

Internal aberrations are directly related to the IOL: low values of RSM indicate a minimum dispersion of the light inside the eye.
High patient satisfaction was found for both the RayOne Trifocal and PanOptix group.

Increased patient satisfaction for glare and symptoms category was found greater in RayOne group than the PanOptix group (not statistically significant).
We evaluated IOL stability and Posterior Capsular Opacification (PCO) incidence with digital photo of anterior segment during the follow-up.

- No PCO was reported in any patients.
- IOL stability and centration was excellent during the follow-up: no tilting or decentration was reported in any case.

RESULTS – PCO AND IOL STABILITY

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CONCLUSIONS

- RayOne Trifocal IOL showed excellent results regarding distance, intermediate and near uncorrected visual acuity
- All the examined patients showed a very high level of spectacle independence, with a high post-operative satisfaction
- RayOne Trifocal IOL demonstrated long term stability, good centration and no PCO
- RayOne Trifocal IOL and PanOptix IOL showed similar results regarding visual outcomes, defocus curve, contrast sensitivity, aberrations and patient satisfaction