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Electrically variable intra ocular lens for distance accommodation

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Multiple passive solutions (such as lens deformation or lens distance change) have been proposed to address the presbyopia problem. However, those solutions are not considered as reliable in long term since the force of the ciliary muscle may decrease with time. We have developed an alternative “active accommodation” approach by using an electrically variable liquid crystal lens. Among the large variety of geometries, allowing the fabrication of liquid crystal lenses, we have chosen a new gradient index lens approach that has several key advantages. The first one is the absence of micro structuration in the clear aperture of the lens in contrast to Fresnel type liquid crystal lenses. This eliminates the night vision halo that is present in multi focal or other micro structured intra ocular lenses. Another advantage of our approach is the extremely low power consumption of the lens that can be well below 10 microwatts. Optical aberrations of our lens are also very low (figure 1) and they can be remotely adjusted with aging (post-surgery) by re-setting the default control parameters of the lens. The high volume manufacturability of the lens has been successfully demonstrated also.

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Mild Keratoconus: The intrastromal corneal ring as a good choice

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Background: The implant of intrastromal corneal rings in mild Keratoconus patients is controversial.

Purpose: To evaluate in a homogeneous group of mild Keratoconus patients if the intrastromal corneal ring is a good therapeutic choice.

Methods: A group of 65 patients with mild Keratoconus were submitted to an implant of Ferrara ring in a single eye. We measured 6 months after the surgery the visual function using clinical dice, and aberrometry. The aberrations especially coma were described independently.

Results: There was improvement in UCVA, BCVA and refractometry index in all cases ($p < 0.001$). It was observed that the mean UCVA ranged from 1.09 ± 0.40 to 0.67 ± 0.39 LogMAR, the BCVA ranged from 0.45 ± 0.22 to 0.23 ± 0.18 LogMAR. We also observed significant reduction of refractometric indices; the spherical equivalent ranged from -3.65 ± 3.30 D to -2.32 ± 2.87 D, and the cylinder was ranged from 3.99 ± 1.51 D to -2.24 ± 2.03 D. The analysis of higher-order aberrations separately showed reduction of the TILT 5.26 ± 2.38 to 3.16 ± 1.79 and the coma from 1.77 ± 0.71 to 1.31 ± 0.75 . The other analyzed aberrations (tetrafoil, spherical aberration and high order astigmatism, showed a significant increase ($p < 0.001$). The analysis of the sum of higher-order aberrations showed no statistically significant increase.

Conclusion: The intrastromal corneal ring implant in patients with early Keratoconus is a safe and effective procedure, with good topographic, refractive and wave front results.