LETTER TO THE EDITOR

Visian Toric ICL Implantation for Residual Refractive Errors After ICRS Implantation and Corneal Collagen Cross-linking in Keratoconus

To the Editor:

Some patients with keratoconus have poor corrected distance visual acuity (CDVA) associated with high refractive errors. According to our treatment protocol, the best approach for these cases is intracorneal ring segments (ICRS) implantation (usually one segment) to improve CDVA followed by corneal collagen cross-linking (CXL) treatment 4 weeks later to stabilize the cornea and phakic toric implantable collamer lens (TICL) (Visian Toric V4b ICL; STAAR Surgical, Monrovia, CA) implantation 4 to 6 months after CXL to correct the residual refractive errors. We conducted a retrospective analysis of 11 eyes of 7 patients with moderate to severe keratoconus (according to the Amsler–Krumeich classification), 4 eyes had stage II keratoconus and 7 eyes had stage III) and poor CDVA who underwent three-step ICRS implantation-CXL-TICL implantation procedures at our eye hospital. The two procedures (ICRS implantation-CXL) were performed sequentially at an interval of 4 weeks and TICL implantation was performed at least 6 months after CXL. Data were collected preoperatively, at the 6-month follow-up visit after sequential ICRS implantation-CXL, and at the 6-month follow-up visit after TICL implantation.

Mean age was 29.20 years (range: 22 to 46 years). Uncorrected distance visual acuity (UDVA) showed significant improvement after three sequential procedures (mean UDVA improved from 1.47 ± 0.38 logMAR at baseline to 1.13 ± 0.50 logMAR after ICRS implantation-CXL procedures and to 0.27 ± 0.20 logMAR after ICL implantation). Overall, 63.7% of eyes (7 of 11) had UDVA greater than 20/40 by 6 months after ICL insertion. CDVA also showed significant change 6 months after ICRS implantation-CXL (CDVA improved from 0.50 ± 0.22 logMAR at baseline to 0.29 ± 0.23 logMAR 6 months after ICRS implantation-CXL). However, CDVA did not show any significant improvement after ICL insertion (0.19 ± 0.11 logMAR).

Refraction significantly improved after the three procedures. The spherical equivalent changed significantly from -9.70 ± 3.1 diopters (D) at baseline to -7.65 ± 3.23 D 6 months after ICRS implantation-CXL and to -0.58 ± 1.01 D 6 months after TICL implantation. The cylindrical component also changed significantly from 3.81 ± 1.15 D at baseline to 1.84 ± 0.35 D 6 months after ICRS implantation-CXL (3.81 ± 1.15 D at baseline vs 4.06 ± 1.58 D 6 months after ICRS implantation-CXL). Keratometric readings (central corneal power obtained by topography) decreased after ICRS implantation-CXL: mean K (flat) decreased from 48.51 ± 4.26 D at baseline to 45.19 ± 3.98 D 6 months after ICRS implantation-CXL and mean K (steep) decreased from 54.24 ± 4.96 D at baseline to 50.41 ± 4.32 D 6 months after ICRS implantation-CXL. Mean K (max) decreased from 57.41 ± 6.32 D at baseline to 54.01 ± 4.75 D 6 months after ICRS implantation-CXL.

In this retrospective study, all patients had poor CDVA and ICRS insertion (performed using femto-second laser to create the tunnel) was effective in decreasing corneal distortion and improving CDVA; CXL treatment after ICRS insertion and before ICL implantation has the advantage of stabilizing the corneal topographic properties and providing greater stability of refraction without compromising safety and efficacy of TICL implantation that decreased significantly the refractive errors and improved significantly the UDVA. No complications occurred during surgery or over the entire follow-up (6 months after the third procedure).

Our results indicate that this three-step procedure is safe, effective, and predictable in the treatment of selected cases of keratoconus with poor CDVA and high refractive errors. However, a larger number of patients and a longer follow-up period are needed to further assess the safety and efficacy of phakic TICLs in the management of keratoconus with high refractive errors and poor CDVA.

REFERENCES


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