

Case Report
Looking emmetropia in Keratoconus: Keratoconus Treatment
Complementary with phakic lenses Toric phakic ICL ® After intrastromal
rings and INTACTS ® Corneal Crosslinking.

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The authors do not have commercial interest.

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Summary

We report two eyes of a patient diagnosed with keratoconus, which underwent combined treatment Intacs ® and corneal crosslinking. In order to improve visual acuity without correction, decrease its refractive formula or contact lenses dependence , the patient was taken to surgery and a Toric phakic lens implantation was performed ICL ® in both eyes. In its latest assessment exist an evidence of a significant improvement visual acuity uncorrected and a significant decrease in its refractive formula.

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Introduction

Keratoconus is a degenerative disease in which the cornea has a progressive thinning and distortion (cone) resulting in blurred vision, irregular astigmatism, myopia and formation of walleys. Until recently, the only surgical treatment for this condition was penetrating keratoplasty, although with a high success rate, it exist at risk of intraoperative and postoperative² complications. The implantation of INTACS intrastromal rings (Addition Technology, Inc.) is a refractive procedure that originally was used to correct mild to moderate degrees of myopia, and for some time it has been used for the surgical treatment of keratoconus and ectasia postoperative iatrogenic^{3,15}. In these cases the implantation of Intacs ® is a safe and reversible which aims to postpone or prevent the need for corneal transplant⁴. In addition, once implanted INTACS ® improve uncorrected visual acuity and corneal topography^{7,8,15}, added to that increase tolerance to contact lenses^{9,10,15}. Besides intrastromal rings, there is a technique of photo-oxidative crosslinking or "cross linking", which uses riboflavin and ultraviolet light, and which was developed to handle the thinning of the cornea in patients with keratoconus.¹¹. Con la cruz corneal vinculación, adicionales enlaces covalentes se forman entre las moléculas de colágeno, lo que estabiliza y modifica la estructura de la córnea. La exposición a la luz ultravioleta y riboflavina crea un aumento de la rigidez corneal y aumento de la resistencia a las enzimas proteolíticas. La cruz que une la córnea es un procedimiento seguro con pocos efectos secundarios y muestra una completa restauración epitelial y reinervación después de la intervención.¹². Combined treatment with these two techniques, shows evidence of improvement of

keratoconus and ectasia after refractive surgery ¹³. We report a case of a patient with keratoconus in both eyes who besides perform Combined INTACS technique ® and cross linking, subsequently underwent implantation of toric phakic lens of colamero ICL ® (STAAR Surgical AG, Nidau, Switzerland) in order to improve their refractive formula and decrease their dependence on corrective lenses for daily activities.

CASE REPORT

Male patient, 25 years of age who consulted to evaluate possibility of refractive surgery for poor visual acuity AO. Studies showed in the right eye (OD) uncorrected visual acuity of 20/200, refraction $-7.25 = -2.75 \times 10^\circ$ that corrected to 20/40, 48.59×53.08 x keratometry 44° , pachymetry 535 micron. In the left eye (LE) uncorrected visual acuity was 20/200, refraction $= -2.75 -5.00 \times 135^\circ$ that corrected to 20/40, 47.75×51.15 x keratometry 138° , pachymetry 532 micron. The topography and queratacono aberrometry were compatible with both eyes (Figures 1 and No. 2) It was decided to perform implant INTACS ® intrastromal ring for ISK-OD 400-150 at a depth of 450 microns and ISK OI-450-150 to a depth of 450 microns, uncomplicated procedure. In the sixth month postoperatively the patient had uncorrected visual acuity of 20/200 in OD, refraction $-5.50 = -3.75 \times 25^\circ$ that corrected to 20/40, 44.30×49.80 x keratometry 42° and pachymetry of 545 microns. In OI uncorrected visual acuity was 20/100, refraction $-2.25 = -5.50 \times 125^\circ$, 44.50×48.50 x keratometry 130° and pachymetry of 566 microns. The anterior segment tomography showed adequate depth of the segments (Fig. 3). We performed corneal cross linking with riboflavin and ultraviolet A. At the fourteenth month postoperatively the patient had uncorrected visual acuity in the right eye of 20/200, refraction $-4.75 = -5.00 \times 18^\circ$ that corrected to 20/30, 44.29×47.64 x keratometry 32° , pachymetry 540 micron. In OI uncorrected visual acuity was 20/100, refraction $-3.00 = -6.00 \times 116^\circ$ that corrected to 20/30, 44.20×46.87 x keratometry 124° , pachymetry 546 micron. The corneal topography showed an effect of flattening the rings (Figure No. 4) and aberrometry evidenced significant

improvement especially in the aberrations of third and fourth order (Figure # 5). Is offered the option of phakic lens ICL ® which is implanted in each eye without complications. In its latest assessment, eight months after phakic lens implantation, the patient has an uncorrected visual acuity in the right eye of 20/40, refraction - 1.00 = -1.25 X 160 ° which corrects to 20/30, keratometry 44.29 x 47.64 x 32 ° (figure No. 4), pachymetry 517 microns. The uncorrected visual acuity in the left eye is 20/25 = -2.50 +1.00 refractive X 160 ° that corrects to 20/20, 44.20 x 46.87 x keratometry 124 ° and 542 microns pachymetry Intrastromal rings are seen centered, respecting visual axis, posterior chamber phakic lens without touch of crystalline and porous (Figs. 6 and 7).

Discussion

Keratoconus remains a difficult management entity which currently presents valid alternative treatment such as implantation of the intrastromal rings and cross linking with riboflavin and ultraviolet light. These alternatives can produce synergistic effects combined, reducing the possibility of requiring a corneal transplant ^{10,11,13}, improving corneal topography and aberrations ^{altoorden} ¹⁸. The literature reports combination of phakic lens implants after intrastromal rings ^{15,16,17} with satisfactory results but without performing crosslinking. Our report shows an excellent functional outcome after implantation of intrastromal rings, crosslinking, and toric phakic lens ICL ®, improving significantly uncorrected visual acuity and reducing the need for optical correction.

The implant toric ICL after intrastromal rings and corneal crosslinking is a novel method that is an alternative that can potentially improve the visual quality of patients with keratoconus. Other prospective studies and comparison must be made to determine whether these findings have clinical relevance..

References:

1. Rabinowitz YS. Keratoconus. *Surv Ophthalmol* 1998; 42: 297-319.
2. Olson RJ, Pingree M, Ridges R, et al. Penetrating keratoplasty for keratoconus: a long-term review of results and complications. *J Cataract Refract Surg* 2000; 26: 987-991.
3. Koch DD. Refractive surgery for keratoconus: a new approach. *J Cataract Refract Surg* 2000; 26: 1099-1100.
4. Alió JL, Shabayek MH, Belda JI, et al. Analysis of results related to good and bad outcome of INTACS implantation correction for keratoconus. *J Cataract Refract Surg* 2006; 32: 756-761.
5. Zare MA, Hashemi H, Salari MR. Intracorneal ring segment implantation for the management of keratoconus; Safety and efficacy. *J Cataract Refract Surg* 2007; 33: 1886-1891.
6. Siganos CS, Kymionis GD, Kartakis N, et al. Management of keratoconus with INTACS. *Am J Ophthalmol* 2003; 135: 64-70.
7. Zare MA, Hashemi H, Salari MR, Intracorneal ring segment implantation for the management of keratoconus: safety and efficacy *J Cataract Refract Surg*. 2007 Nov;33(11):1886-91.
8. Rabinowitz YS. Intacs for Keratoconus. *Curr Opin Ophthalmol*. 2007 Jul;18(4):279-83.
9. Kymionis GD, Siganos CS, Long Term follow-up for INTACS in keratoconus. *Am J Ophthalmol*. 2007 Feb;143(2):236-244.
10. Colin J, Malet FJ. INTACS for correction of keratoconus: two year follow-up. *J Cataract Refract Surg*. 2007 Jan;33(1):69-74.
11. Wollensak G. Cross linking treatment of progressive keratoconus: new hope. *Curr Opin Ophthalmol* 2006; 17: 356-360.
12. Mazzota C, Traversi C et al. Conservative treatment of keratoconus by riboflavin-uva-induced cross-linking of corneal collagen: qualitative investigation. *Eur J Ophthalmol*. 2006 Jul-Aug;16(4):530-5.

13. Kamburoglu G, Ertan A. Intacs implantation with sequential collagen cross-linking treatment in postoperative LASIK ectasia. *J Refract Surg.* 2008 Sep;24(7):S726-9
14. Reeves S, Tinnett S, Adelman R, Afshari N. Risk Factors for Progression to Penetrating Keratoplasty in Patients with Keratoconus. *Am J Ophthalmol* 2005;140: 607–611.
15. Coskunseven E, Onder M, Kymionis G, Diakonis V et al. Combined Intacs and Posterior Chamber Toric Implantable Collamer Lens Implantation for Keratoconic Patients with Extreme Myopia. *Am J Ophthalmol* 2007;144:387–389.
16. Kamiya K, Shimizu K, Ando W, Asato Y, Fujisawa T. Phakic toric Implantable Collamer Lens implantation for the correction of high myopic astigmatism in eyes with keratoconus. *J Refract Surg.* 2008 Oct;24(8):840-2
17. Alfonso JF, Palacios A, Montés-Micó R. Myopic phakic STAAR collamer posterior chamber intraocular lenses for keratoconus. *J Refract Surg.* 2008 Nov;24(9):867-74.
18. Chan CC, Wabsler CS. Reduced best spectacle-corrected visual acuity from inserting a thicker Intacs above and thinner Intacs below in keratoconus. *J Refract Surg.* 2007 Jan;23(1):93-5.

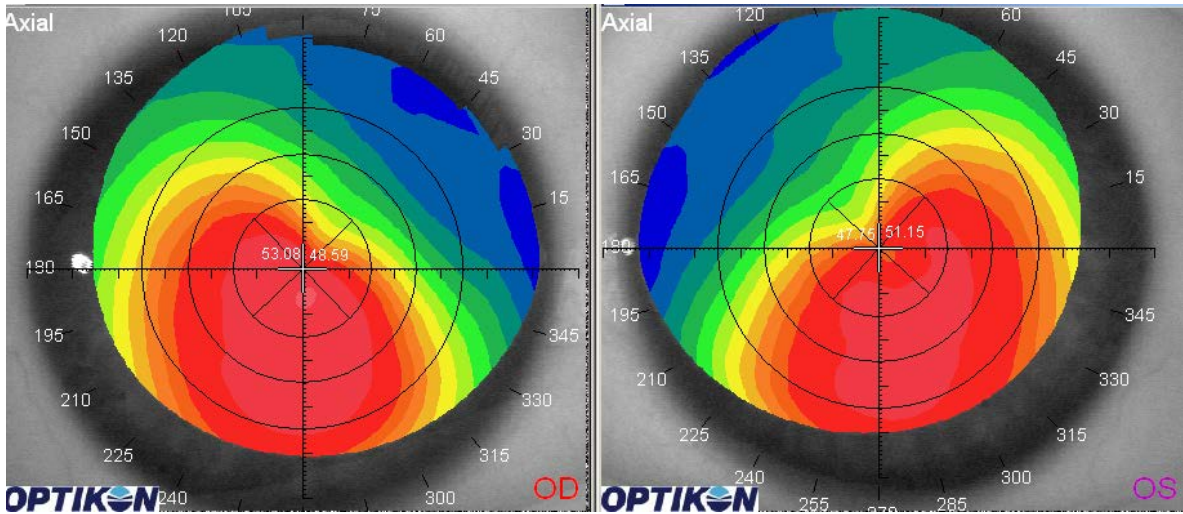


Figure Number. 1. Corneal topography before starting treatment.

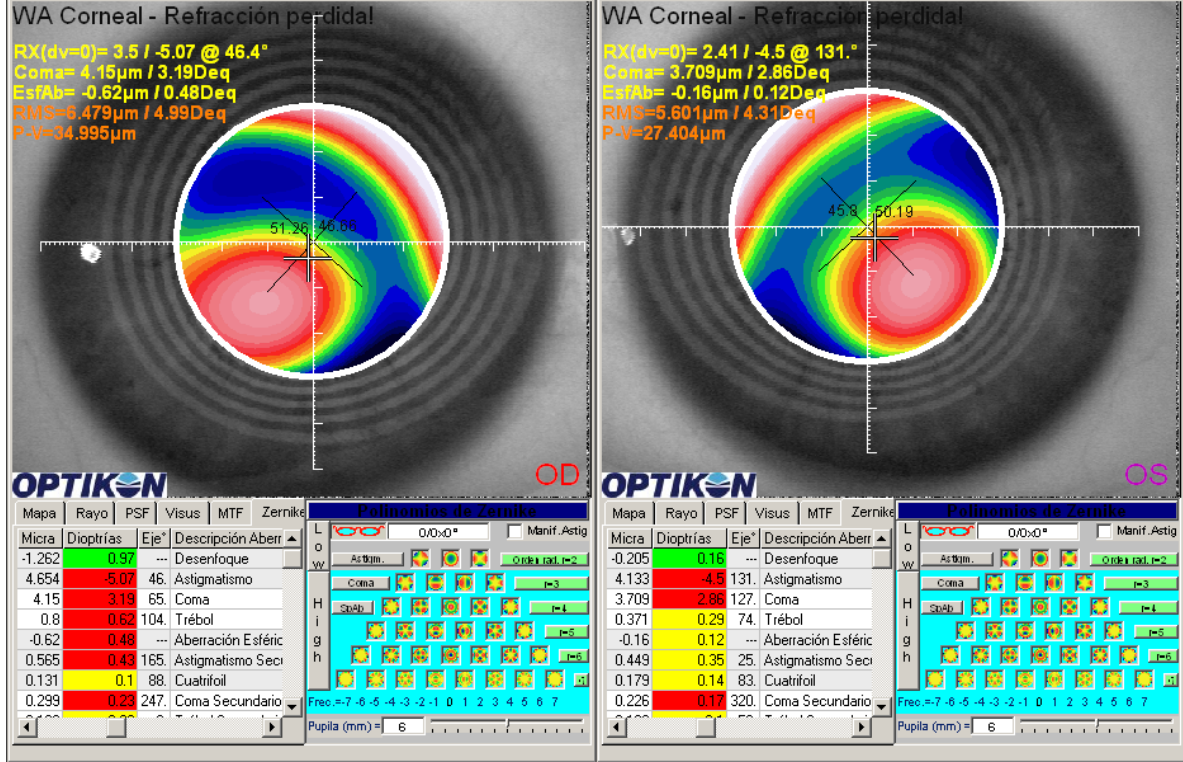


Figure Number 2. Aberrometry before starting treatment.

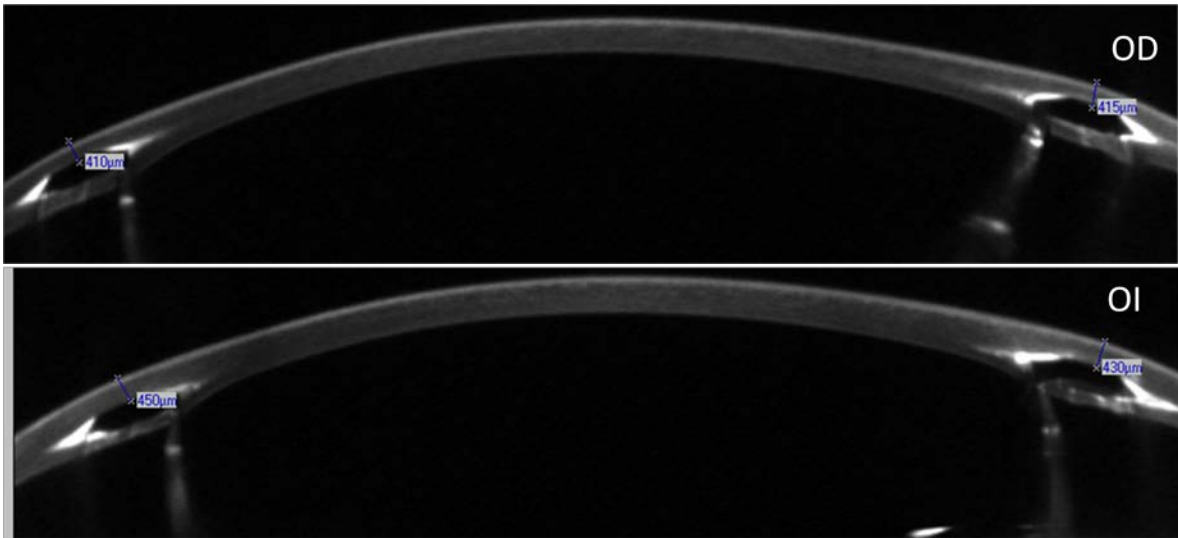


Figure Number. 3. Anterior Segment, Tomography of both eyes showing proper depth and position of the rings.

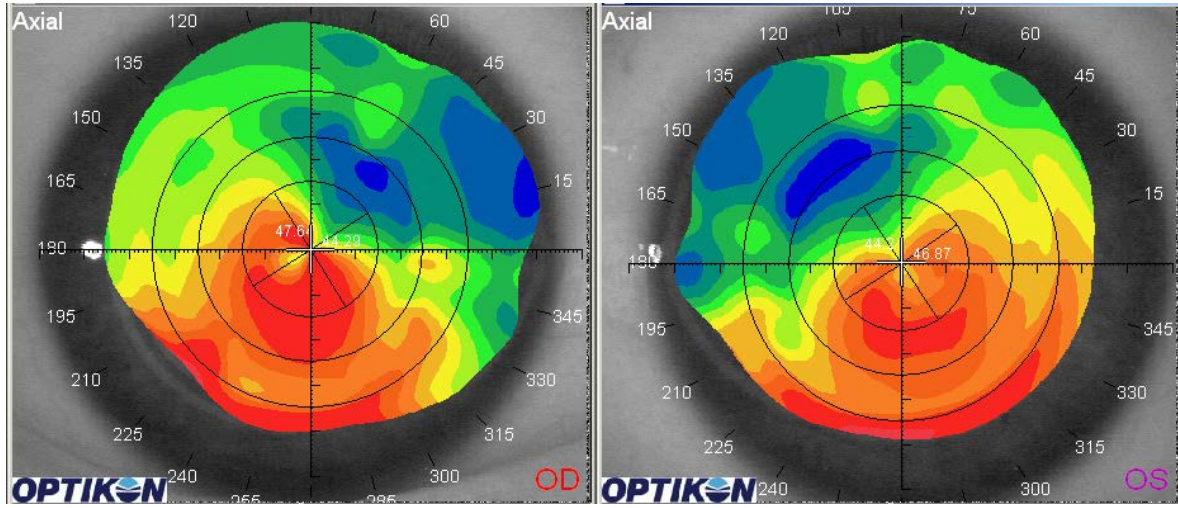


Figure Number. 4. Topography after implantation of INTACS ® and after performing corneal Cross linking.

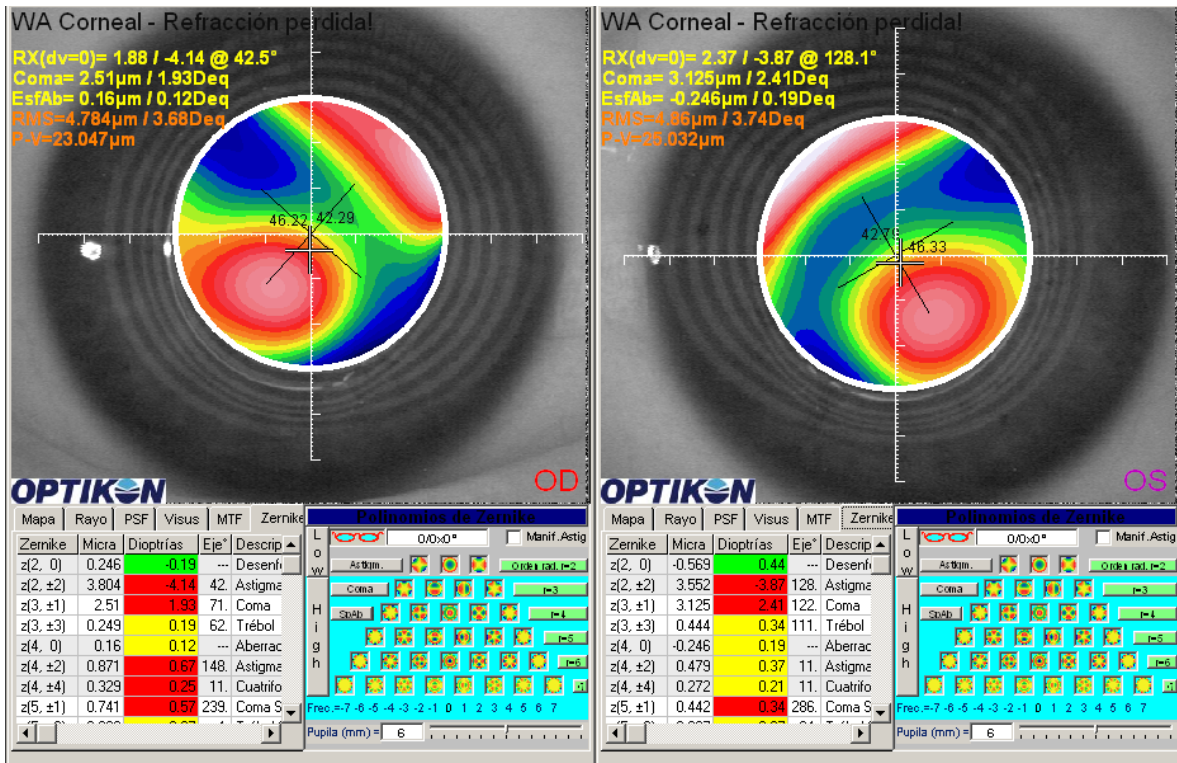


Figure Number. 5. Aberrometry after intrastromal ring implantation and after performing corneal crosslinking. Note the improvement in higher-order aberrations.

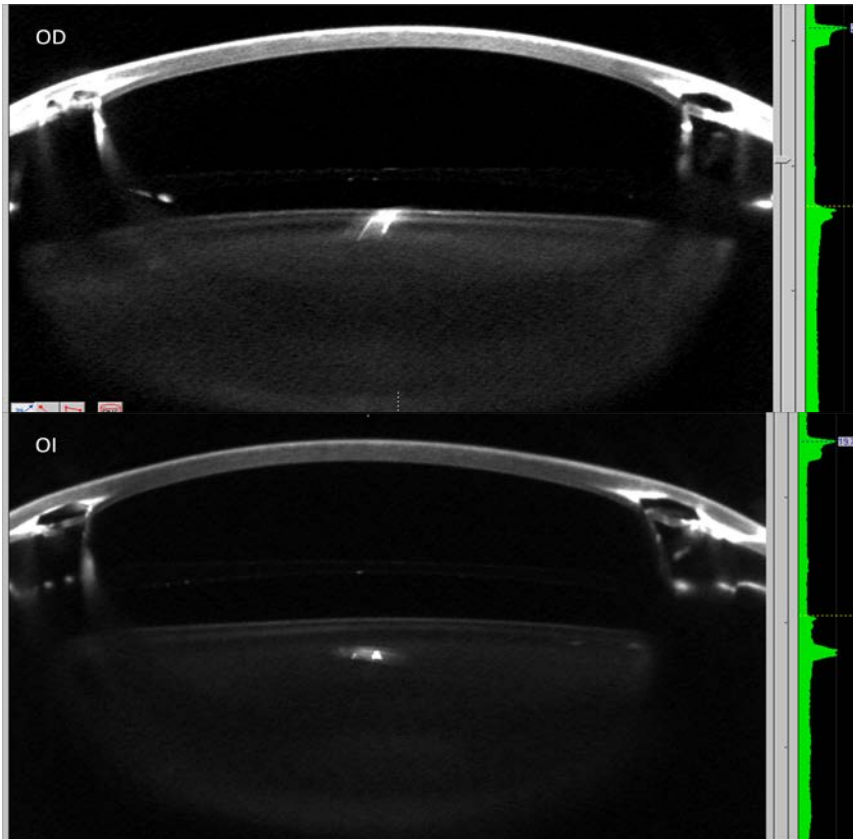


Figure Number. 6. Anterior Chamber OCT. Segments of INTACS ® properly implanted and phakic lens in posterior chamber ICL ®

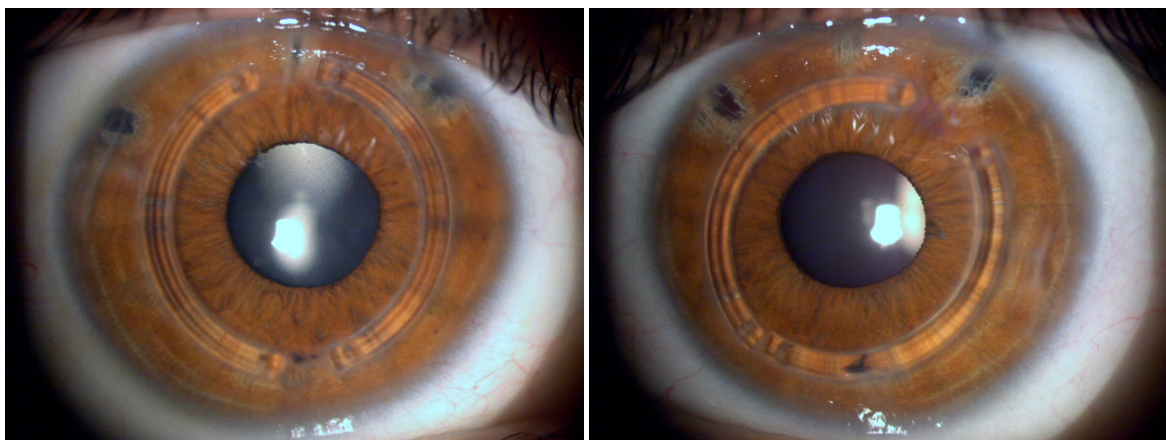


Figure Number. 7. Pictures at the end of treatment, there are segments in position, intraocular lens in posterior chamber, lens and wide transparent and permeable iridotomies.