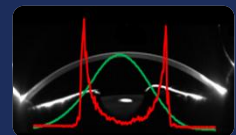


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Combined, Same Day Femtosecond Laser -assisted Intrastromal Corneal Ring Segments and Transepithelial Fast Cross-Linking for Keratoconus

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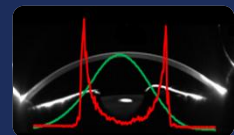


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Introduction

- ❖ Keratoconus is a bilateral, degenerative disorder of the cornea characterized by chronic biomechanical failure, progressive noninflammatory thinning and protrusion in which the cornea develops a conical shape causing progressive myopia and myopic astigmatism .
- ❖ The exact etiology of the disease is uncertain, however, a genetic origin, environmental trigger and an enzymatic imbalance with increased level of lysosomal and proteolytic enzymes and decreased concentration of protease inhibitors are involved in the pathogenesis of keratoconus resulting in stromal and epithelial corneal thinning, altered configuration of corneal collagen lamellae and biomechanical failure.
- ❖ Early disease can be successfully managed with glasses and contact lenses fitting. Patients with more advanced disease, low best correct visual acuity and contact lenses intolerance may benefit from **intra stromal corneal segment implantation**, making the corneal shape flatter and less irregular, and avoiding corneal transplant.

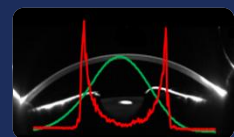


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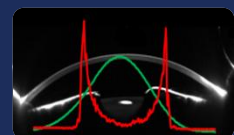
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Introduction

❖The available therapeutic options are performed to reduce the refractive errors caused by the corneal irregularity, not to treat the reduced degree of cross-links in the corneal collagen fibers observed in keratoconic corneas or to prevent evolution of the disease.

❖**Corneal collagen cross-linking** procedure, developed by Professor Seiler and colleagues, is a first line therapeutic modality that has been widely used to halt the progression of ectatic disorders by increasing biomechanical strength of the corneal stroma, and also has reduced the need of corneal transplant (Wollensak studies).





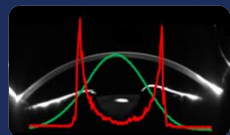
Purpose

❖To evaluate visual acuity, keratometric readings and corneal thickness after femtosecond laser (FS)-assisted intrastromal corneal ring segment implantation (ICRS) and transepithelial fast corneal cross-linking (CXL) performed at the same day in keratoconic eyes.

Methods

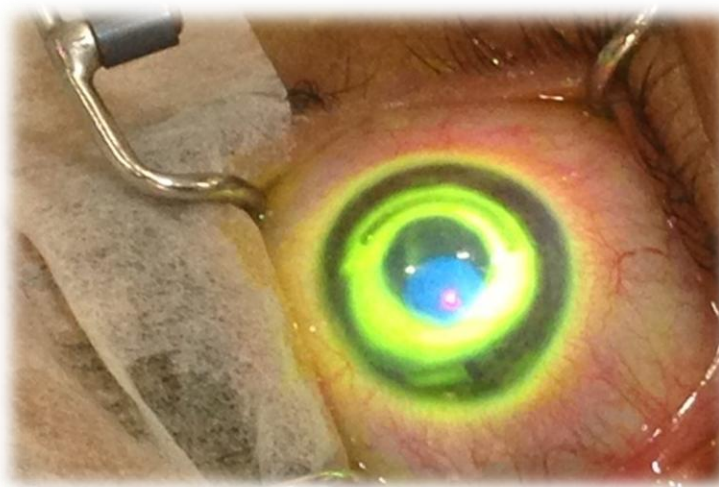
❖In this retrospective study, 14 eyes of 10 patients diagnosed with progressive keratoconus were included.

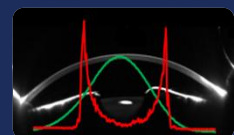
❖Uncorrected and best corrected visual acuity (UDVA, CDVA), mean keratometry (Kmean), maximal keratometry (Kmax), corneal astigmatism and corneal thickness at the thinnest point (TP) were taken preoperatively and postoperatively at 1, 3 and 6 months of follow-up using Pentacam HR (Oculus, Optikgerate, Wetzlar).



Methods

- ❖ All eyes underwent intrastromal corneal ring segment implantation (Keraring, Medphacos) using Femtosecond laser (Intralase AMO iFS or Alcon-Wavelight FS200) to create the channel followed by transepithelial fast corneal cross-linking.
- ❖ After dextran-free Riboflavin solution 0.1% instillation into the stromal channel, ultraviolet-A (370 nm) irradiation was performed over the intact corneal epithelium (CXL Opto), with 18 mw/cm² during 5 minutes (total dose of 5.4 J/cm²).
- ❖ Bandage contact lens was placed over the cornea surface during the first 24 hours, antibiotic drops moxifloxacin and dexamethasone were prescribed four times daily for 1 and 2 weeks, respectively.
- ❖ Preoperatively, average UDVA and CDVA in LogMar were 1(0.4 to 1.9) and 0.6 (0.2 to 1.9), respectively. Kmean, Kmax and corneal astigmatism were 51.8 D (43 to 66 D), 62.4 D (47 to 79.8 D) and 3.6 D (1 to 6.6 D), respectively. Corneal thickness at the thinnest point was 442 μ m (431 to 547 μ m).





Results

❖Average UDVA (LogMAR) improved from 1.0 to 0.8 and average CDVA (LogMAR) improved from 0.6 to 0.25 in 6-month follow-up (N=5).

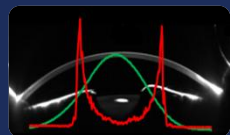
	Pre-operative	1 month	3 months	6 months
UDVA (average LogMAR)	1.0	0.8	0.66	0.8
CDVA (average LogMAR)	0.6	0.5	0.5	0.25

❖Average UDVA and CDVA improved at least 1 line of vision in around 60% of eyes at the 1st month post-operatively, and in 80% of eyes in 6-month follow-up (N=5).

❖BSCVA improved or remained stable in 100% of eyes at 6 months of follow-up (no eyes got worse in the final visit of follow up).

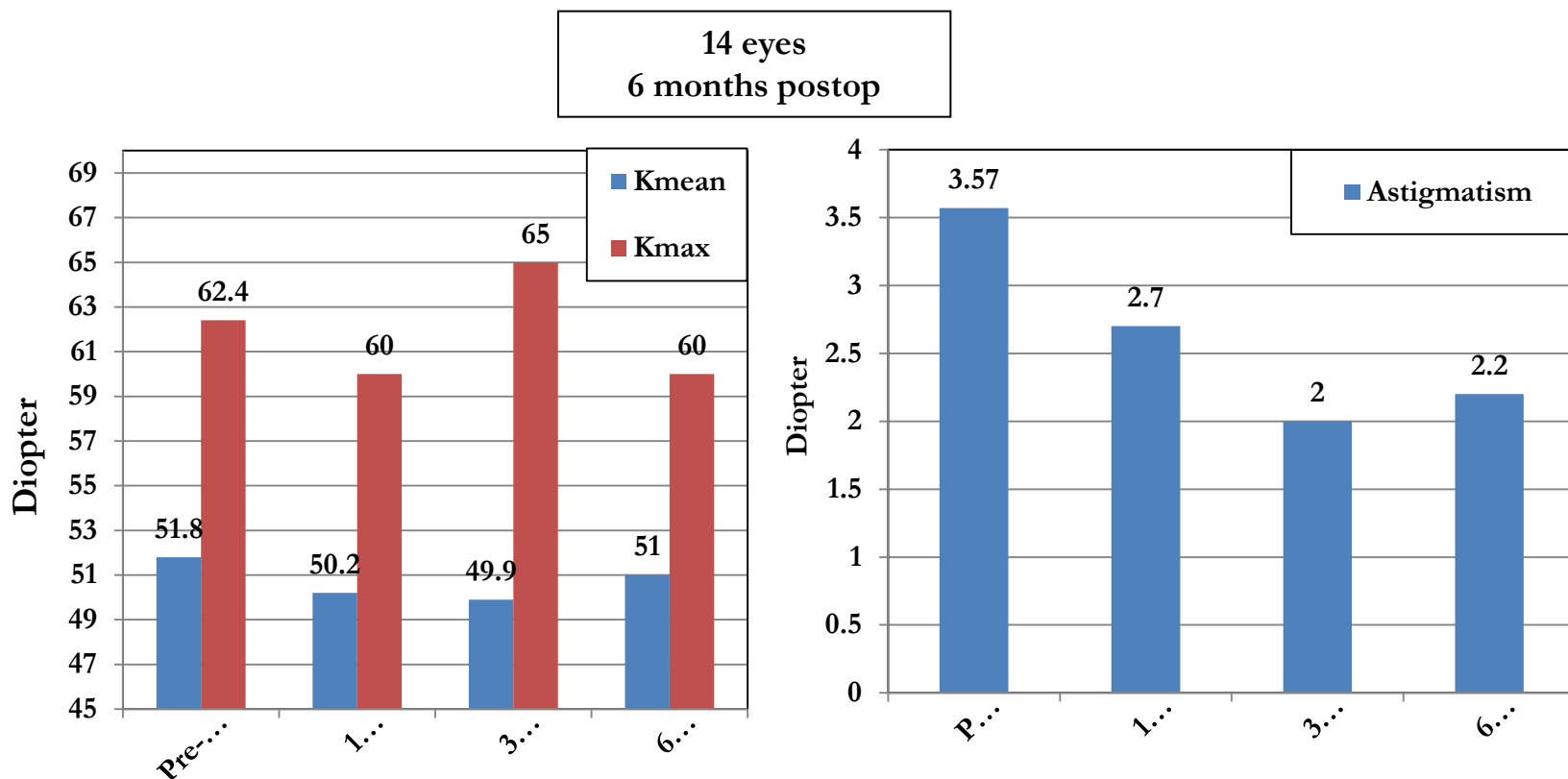
UDVA	1 month (N=9)	3 months (N=3)	6 months (N=5)
Improved	63%	100%	80%
Stable	18%	0	0
Worsed	18%	0	20%

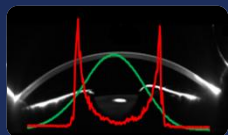
CDVA	1 month (N=9)	3 months (N=3)	6 months (N=5)
Improved	66,6%	100%	80%
Stable	33.3%	0	20%
Worsed	0	0	0



Results

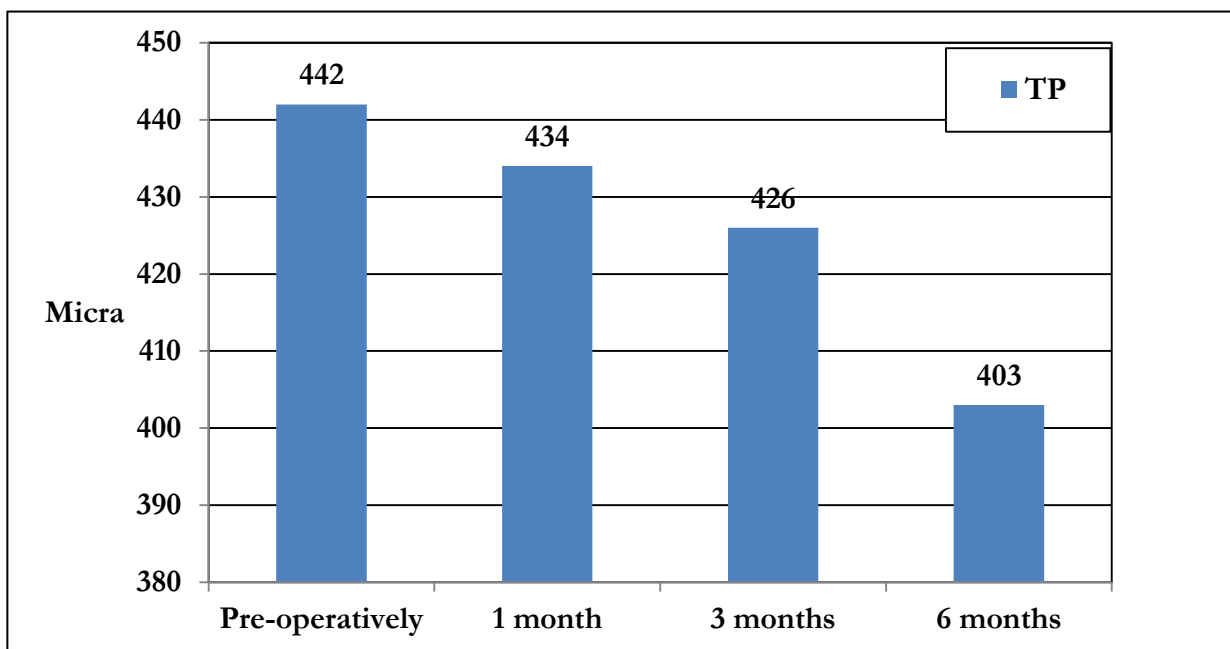
Average keratometric readings and corneal astigmatism preoperatively and in 1, 3 and 6 months of follow-up:





Results

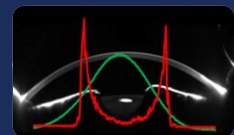
Corneal thickness at the thinnest point (TP)
preoperatively and 1, 3 and 6 months of follow-up.



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Conclusion

- ❖ Intra corneal stromal ring segment implantation has been used successfully in patients with transparent irregular corneas, who do not fit contact lenses, remodeling corneal stroma by adding corneal tissue in the thinnest corneal zone and causing flattening and centralization of the cone.
- ❖ Transepithelial corneal crosslinking has proved to be as effective and safe procedure as the epithelium removed technique to stop corneal ectatic process, with the advantage of having faster recovery of vision and minimal post-operative discomfort.
- ❖ Combined, same day FS-assisted ICRS and fast transepithelial provided significant improvement on visual acuity and corneal shape. Fast Cxl technique seems to be at least as safe and effective as FS-assisted ICRS procedure to halt progressive keratoconus and make the corneal shape less irregular.
- ❖ The small number of eyes analysed in this study has to be considered and a long-term follow-up is necessary.