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TRANS-EPITHELIAL (EPITHELIUM-ON) CORNEAL COLLAGEN CROSSLINKING USING A NOVEL ULTRAVIOLET LIGHT-EMITTING CONTACT LENS DEVICE

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PURPOSE

- To determine the efficacy and safety of a novel ultraviolet (UV) light-emitting contact lens device for corneal collagen crosslinking (CXL).

METHODS

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- A prospective, non-masked, non-randomized, clinical trial was performed in 8 eyes of 8 patients with advanced keratoconus.
- Only patients 18 years old or older with advanced keratoconus confirmed by pentacam and ultrasound pachymetry of greater than 385 microns were included.
- Screening pre and post-treatment included visual acuity measured with ETDRS chart with notations for testing at 4 meter (13 feet) 70 letters, slit lamp exam, fundus exam, intraocular pressure, pentacam, ultrasound pachymetry, specular microscopy and anterior segment OCT.

METHODS

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- CXL was performed using a scleral contact lens reservoir containing benzalkonium chloride (BAK) preserved riboflavin 0.25% for 30 minutes followed by an exchange to the UV light-emitting contact lens device.
- UV light at a 4 mW/cm2 intensity was delivered for 30 minutes, for a total dose of 7.2 J/cm2.
- Follow up visits were scheduled at 1 day, 1 week, 1 month, 3 months and 6 months after the procedure.

RESULTS

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- UCVA improved in 87.5% of eyes (figure1), BCVA is either stable or improved in 75% of eyes.

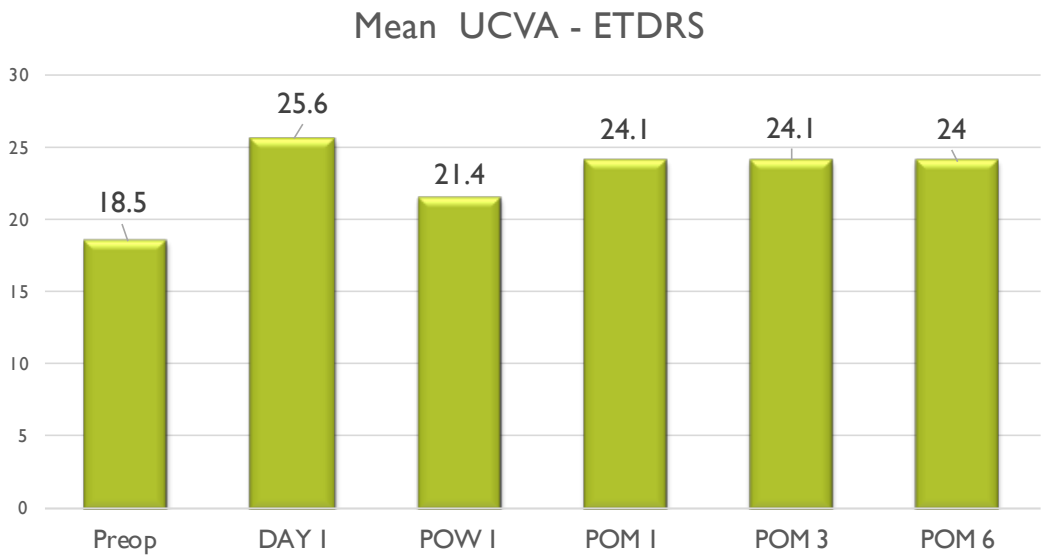

Figure 1
Batlle L. J; Rivera, C et al.
Trans-epithelial (epithelium-on) corneal collagen crosslinking using novel ultraviolet light-emitting contact lens device.

RESULTS

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- MRSE remained stable in 50% of eyes. (Figure 2)

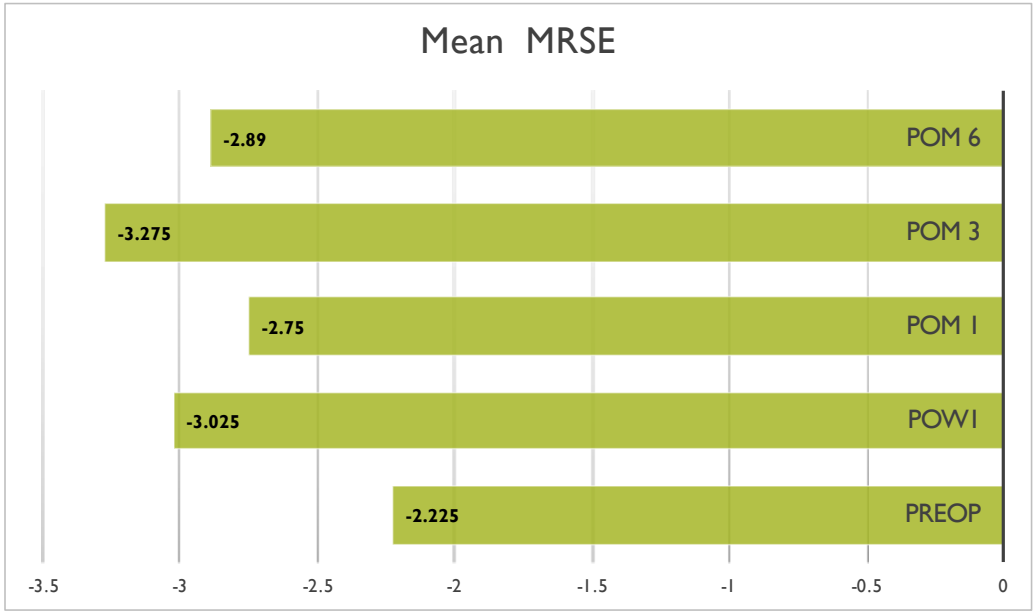

Figure 2
Batlle L. J; Rivera, C et al.
Trans-epithelial (epithelium-on) corneal collagen crosslinking using novel ultraviolet light-emitting contact lens device.

RESULTS

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- K1 and K2 values remained stable in 50%, improved in 37.5% and worsened in 12.5% of eyes. (Figure 3)

Figure 3
Batlle L. J; Rivera, C et al.
Trans-epithelial (epithelium-on) corneal collagen crosslinking using novel ultraviolet light-emitting contact lens device.

RESULTS

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- Kmax values improved in 62.5%, remained stable in 25% and worsened in 12.5% of eyes. (Figure 4)

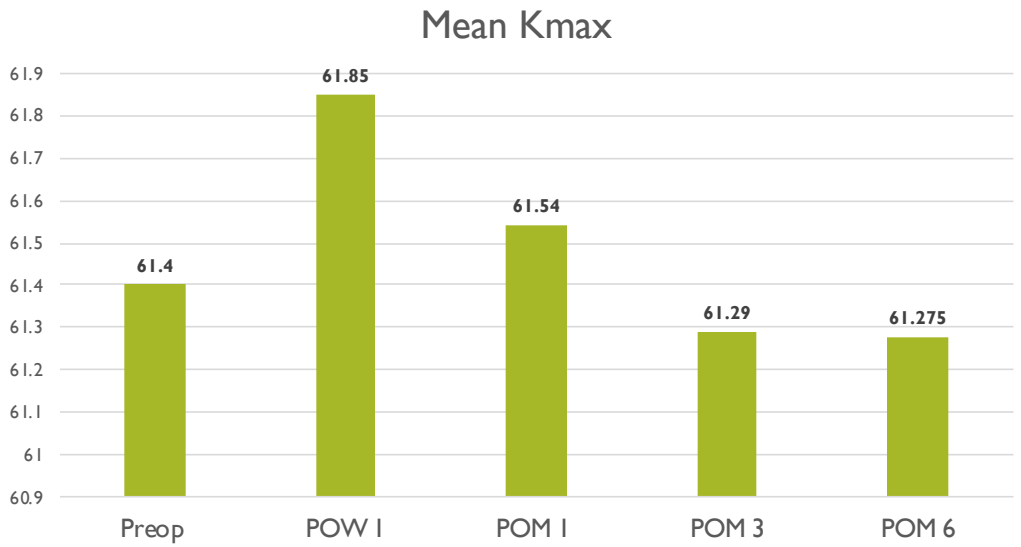

Figure 4
Batlle L. J; Rivera, C et al.
Trans-epithelial (epithelium-on) corneal collagen crosslinking using novel ultraviolet light-emitting contact lens device.

DISCUSSION

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- This is the first study of trans-epithelial corneal collagen crosslinking performed in eyes with advanced keratoconus using an ultraviolet light-emitting contact lens device.
- Progression of keratoconus stopped in almost all treated eyes included in this study, with regression in 5 eyes (62.5%) and a reduction of maximal keratometry reading by 3.1 by post-operative month 6.[1, 3]
- Uncorrected visual acuity improved in 7 eyes (87.5%), meanwhile best corrected visual acuity improved in 4 eyes (50%) by post-operative month 6.[1,2]
- Mean manifest refractive spherical equivalent remained stable from -2.225 pre-operatively to -2.89 by post-operative month 6.[1]

1. Wollensak G., Spoerl E., Seiler T. Riboflavin/ultraviolet-A-induced collagen crosslinking for the treatment of keratoconus. American Journal of Ophthalmology, 2003, 135(5) , pp. 620-627.
2. Stulting, R.D, Trattler, WB, Woolfson, JM, Rubinfeld, RS. Corneal crosslinking without epithelial removal. J Cataract Refract Surg. 2018 Nov; 44(11):1363-1370.
3. Hersh, Peter S.Binder, Perry S. et al. U.S. Multicenter Clinical Trial of Corneal Collagen Crosslinking for Treatment of Corneal Ectasia after Refractive Surgery. Ophthalmology, October 2017. Volume 124, Issue 10, 1475 - 1484

DISCUSSION

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- Other than BAK related diffuse punctate epithelial erosions or small epithelial abrasions that healed within the first 24 hours, there were no other adverse events. [1,2] Pain related to epithelial erosions and/or abrasions was mild and resolved within 24 to 48 hours.[2]
- Endothelial cell density, lens and retina aspect, as well as intraocular pressure, were unchanged after the use of the ultraviolet light-emitting contact lens device for corneal , therefore no complications related to the use of the device were observed.[1,2,3]

1. Wollensak G., Spoerl E., Seiler T. Riboflavin/ultraviolet-A-induced collagen crosslinking for the treatment of keratoconus. American Journal of Ophthalmology, 2003, 135(5) , pp. 620-627.
2. Stulting, R.D, Trattler, WB, Woolfson, JM, Rubinfeld, RS. Corneal crosslinking without epithelial removal. J Cataract Refract Surg. 2018 Nov; 44(11):1363-1370.
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CONCLUSIONS

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- The ultraviolet light-emitting contact lens device for corneal collagen crosslinking is a novel, safe and effective procedure for stabilizing or flattening corneas with keratoconus.