

Effects of accelerated corneal crosslinking on the topographic parameters of patients with progressive keratoconus

Avaliação dos parâmetros topográficos antes e após o crosslinking acelerado da córnea em ceratocone progressivo

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Dear Editor,

We read with great interest the article by Uzel et al.⁽¹⁾, where the authors evaluated changes in corneal biomechanical properties after accelerated corneal crosslinking (CXL) using ocular response analyzer waveform derived parameters.

We have some comments on the execution of this remarkable study.

While ultrasound pachymetry is the gold standard for evaluating corneal thickness (CT), it has several limitations, such as the lack of an exact axial placement site for the probe at the corneal center and the fact that measurement reproducibility is low due to differing examiners' skills and the influences of different anesthetic drops during follow up examinations.

Moreover, the corneal water content may alter ultrasound pachymetric measurements, as it does in cases of corneal edema or corneal stiffness, because the sound speed is lower in edematous tissues (enlarging measurements) and higher in stiff tissues (reducing their size).

For these reasons, other devices have been tested to achieve reliable measurements⁽²⁾.

Thus, we believe a Pentacam was a good choice for measuring topographic parameters. The Pentacam can measure not only the central and thinnest CT, but also the corneal volume. However, we wondered why

the authors did not include this last parameter in their evaluations given its sensitivity for assessing potential keratoconus progression. Indeed, ectasies and thinning may involve corneal regions different from the central and thinnest one, and they may be disregarded if only the central or thinnest CT is appraised.

In addition, according to the published results, the astigmatic correction was evaluated without considering potential astigmatic axis changes. Proper astigmatic correction estimation requires assessment of astigmatic axis changes. A cylindrical correction misalignment will result in a fake astigmatic under correction with a spherical change, and methods to identify such influence exist⁽³⁾.

Finally, the authors included 50 eyes from 45 patients in their study. From this number, both eyes in some patients were considered, while only one eye was evaluated in the others. Given the small number of eyes, a bias may have been introduced, reducing the power of the study^(4,5).

REFERENCES

1. Uzel MM, Koc M, Can C, Polat S, Yilmazbaş P, Ileri D. Effect of accelerated corneal crosslinking on ocular response analyzer waveform-derived parameters in progressive keratoconus. *Arq Bras Oftalmol.* 2019;82(1):18-24.
2. De Bernardo M, Borrelli M, Mariniello M, Lanza M, Rosa N. Pentacam vs SP3000P specular microscopy in measuring corneal thickness. *Cont Lens Anterior Eye.* 2015;38(1):21-7.
3. Rosa N, De Bernardo M, Romano MR, Scarfato G, Verdoliva F, Mastropasqua R, et al. Analysis of photoastigmatic keratectomy with the cross-cylinder ablation. *Indian J Ophthalmol.* 2012;60(4):283-7.
4. De Bernardo M, Zeppa L, Forte R, Cennamo M, Caliendo L, Zeppa L, et al. Can we use the fellow eye biometric data to predict IOL power? *Semin Ophthalmol.* 2017;32(3):363-70.
5. Rosa N, De Bernardo M, Iaccarino S, Cennamo M. Intraocular lens power calculation: a challenging case. *Optom Vis Sci.* 2014;91(2):e29-31.

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Reply: effects of accelerated corneal crosslinking on the topographic parameters of patients with progressive keratoconus

Resposta: avaliação dos parâmetros topográficos antes e após o crosslinking acelerado da córnea em ceratocone progressivo

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Dear Editor:

We would like to thank De Bernardo et al. for replying to our article about the effects of accelerated corneal crosslinking on the ocular response analyzer waveform-derived parameters in patients with progressive keratoconus.

The name of our study is not “Topographic parameters evaluation before and after accelerated corneal crosslinking in progressive keratoconus”. Our aim was to evaluate the effect of accelerated corneal crosslinking (CXL) on corneal biomechanics, based on ocular response analyzer-waveform derived parameters, in patients with progressive keratoconus. Therefore, we discussed changes in corneal biomechanics rather than topographic changes after CXL treatment.

De Bernardo et al. stated that corneal volume should be much more sensitive than the methods we used to assess potential keratoconus progression. However, this assertion is not supported by published studies. Therefore, we defined progression as an increase in the diopter (D) value of the maximum keratometry 1.0 over a period of three months in children and of six months in adults⁽¹⁻³⁾.

Also De Bernardo et al. indicated that assessing the astigmatic axis changes is a requirement to estimate the astigmatic correction properly. As they have stated in their own work, the advantage of the method described by Calossi⁽⁴⁾ is the simplicity of a computer program using vectorial analysis of the refractive changes induced by surgery. However, surgically induced, refractive changes are not the subject of our study, and we think that they are sufficient to show spherical and cylindrical refractive changes as in many CXL studies.

We analyzed crosslinking-treated eye parameters in our study, and studies evaluating the effect of CXL treatment on the cornea, do not need to choose sides⁽⁵⁻⁷⁾.

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REFERENCES

1. Mathews PM, De Rojas JO, Rapuano PB, Zemsky CJ, Florakis GJ, Trokel SL, et al. Correlation of Scheimpflug densitometry changes with clinical outcomes after corneal crosslinking. *J Cataract Refract Surg.* 2018;44(8):993-1002.
2. Gore DM, Leucci MT, Anand V, Fernandez-Vega Cueto L, Arba Mosquera S, Allan BD. Combined wavefront-guided transepithelial photorefractive keratectomy and corneal crosslinking for visual rehabilitation in moderate keratoconus. *J Cataract Refract Surg.* 2018;44(5):571-80.
3. Mazzotta C, Traversi C, Baiocchi S, Bagaglia S, Caporossi O, Villano A, et al. Corneal collagen cross-linking with riboflavin and ultraviolet a light for pediatric keratoconus: ten-year results. *Cornea.* 2018;37(5):560-6.
4. Calossi A, Verzella F, Penso A. Computer program to calculate vectorial change of refraction induced by refractive surgery. *Refract Corneal Surg.* 1993;9(4):276-82.
5. Lang PZ, Hafezi NL, Khandelwal SS, Torres-Netto EA, Hafezi F, Randleman JB. Comparative functional outcomes after corneal crosslinking using standard, accelerated, and accelerated with higher total fluence protocols. *Cornea.* 2019 Jan 23. doi: 10.1097/ICO.0000000000001878. [Epub ahead of print]
6. Spadea L, Di Genova L, Tonti E. Corneal stromal demarcation line after 4 protocols of corneal crosslinking in keratoconus determined with anterior segment optical coherence tomography. *J Cataract Refract Surg.* 2018;44(5):596-602.
7. Fischinger I, Seiler TG, Santhirasegaram K, Pettenkofer M, Lohmann CP, Zapp D. Corneal crosslinking (CXL) with 18-mW/cm² irradiance and 5.4-J/cm² radiant exposure-early postoperative safety. *Graefes Arch Clin Exp Ophthalmol.* 2018;256(8):1521-5.