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Use of Combined Biomechanical and Tomographic Data to Detect Keratoconus

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D. Gatinel and A. Saad are consultant for Technolas Perfect Vision
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Purpose

- The Ocular Response Analyzer (ORA; Reichert Inc, Depew, NY) is an instrument capable of measuring the biomechanical properties of the cornea.

- Preliminary clinical studies have demonstrated reduced corneal hysteresis in the presence of corneal disease, such as keratoconus.

References :

- *Assessment of the biomechanical properties of the cornea with the ocular response analyzer in normal and keratoconic eyes. Shah S et al. Invest Ophthalmol Vis Sci. 2007 Jul;48(7):3026-31.*
- *Corneal biomechanical properties in normal, post-laser in situ keratomileusis, and keratoconic eyes. Ortiz D et al. J Cataract Refract Surg. 2007 Aug;33(8):1371-5.*

Purpose

- In a previous study, we showed that Corneal Resistance Factor (CRF) and Corneal Hysteresis (CH) were lower in keratoconic eyes compared to normal eyes.

- The purpose of this study was to determine a new index using combined corneal biomechanical and tomographic data helping to detect keratoconus.

Reference :

- *Biomechanical properties of keratoconus suspect eyes. Saad A et al. Invest Ophthalmol Vis Sci. 2010 Jun;51(6):2912-6.*

Patients and methods

- Data of 213 eyes separated into two groups were retrospectively reviewed :
  - 109 eyes were classified as normal
  - 104 eyes were classified as keratoconus

- Corneal thickness (thinnest point (TP) and central corneal thickness (CCT)) was measured using a combined placido-scanning slit system (Orbscan II®)

Patients and methods

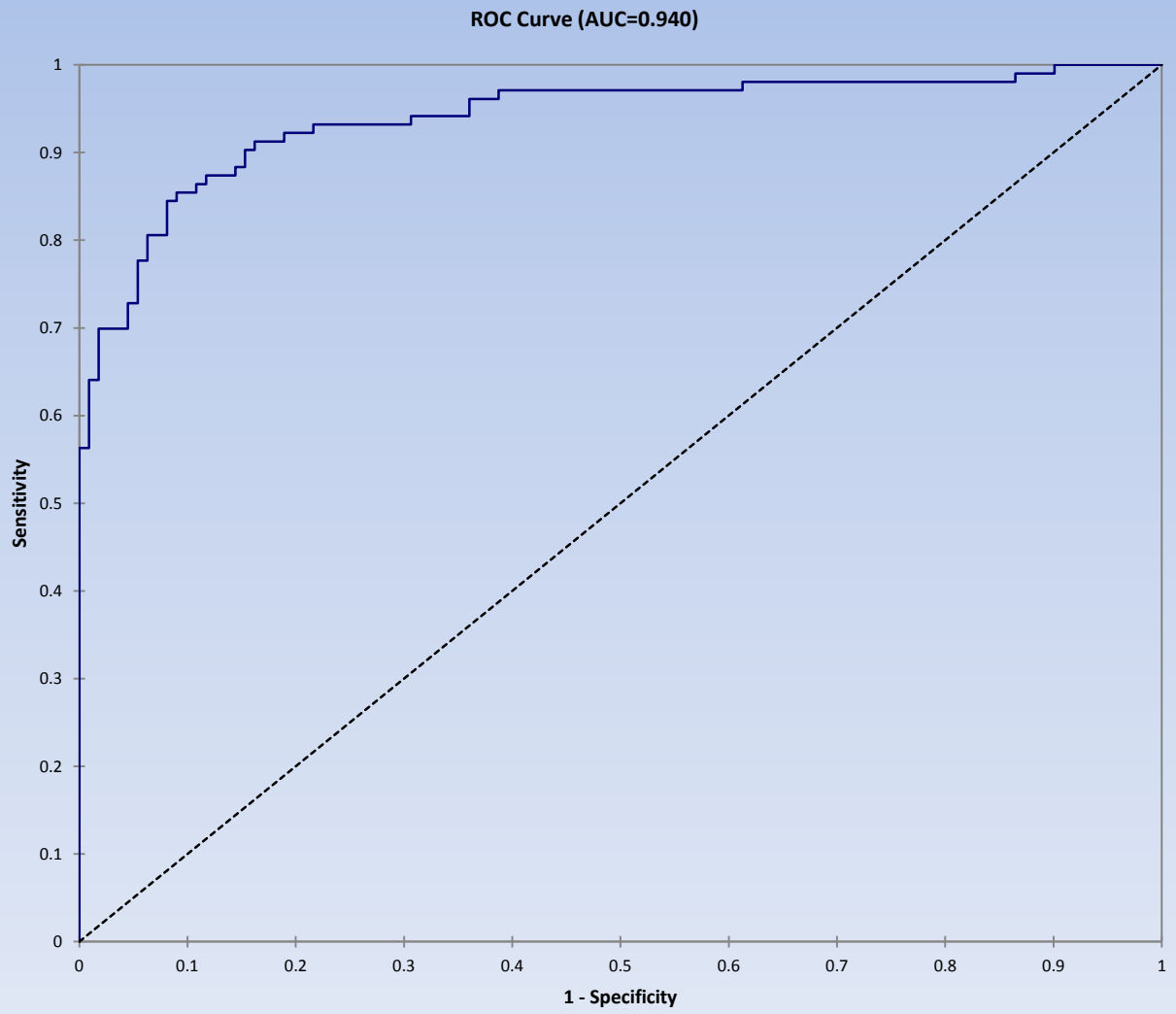
- Biomechanical parameters were measured with an Ocular Biomechanics Analyzer version 2 (ORA 2), including :
  - Corneal Resistance Factor (CRF)
  - Corneal Hysteresis (CH)
  - Corneal Compensated IOP (IOPcc)
  - Goldmann-correlated IOP (IOPg)
  - Other biomechanical parameters
- ROC curves were then established and sensitivity and specificity were calculated

Picture : www.reichert.com

Results

Using ORA 2 measurements only, normal eyes could be separated from keratoconic eyes with a sensitivity of 86 % and a specificity of 88 %.

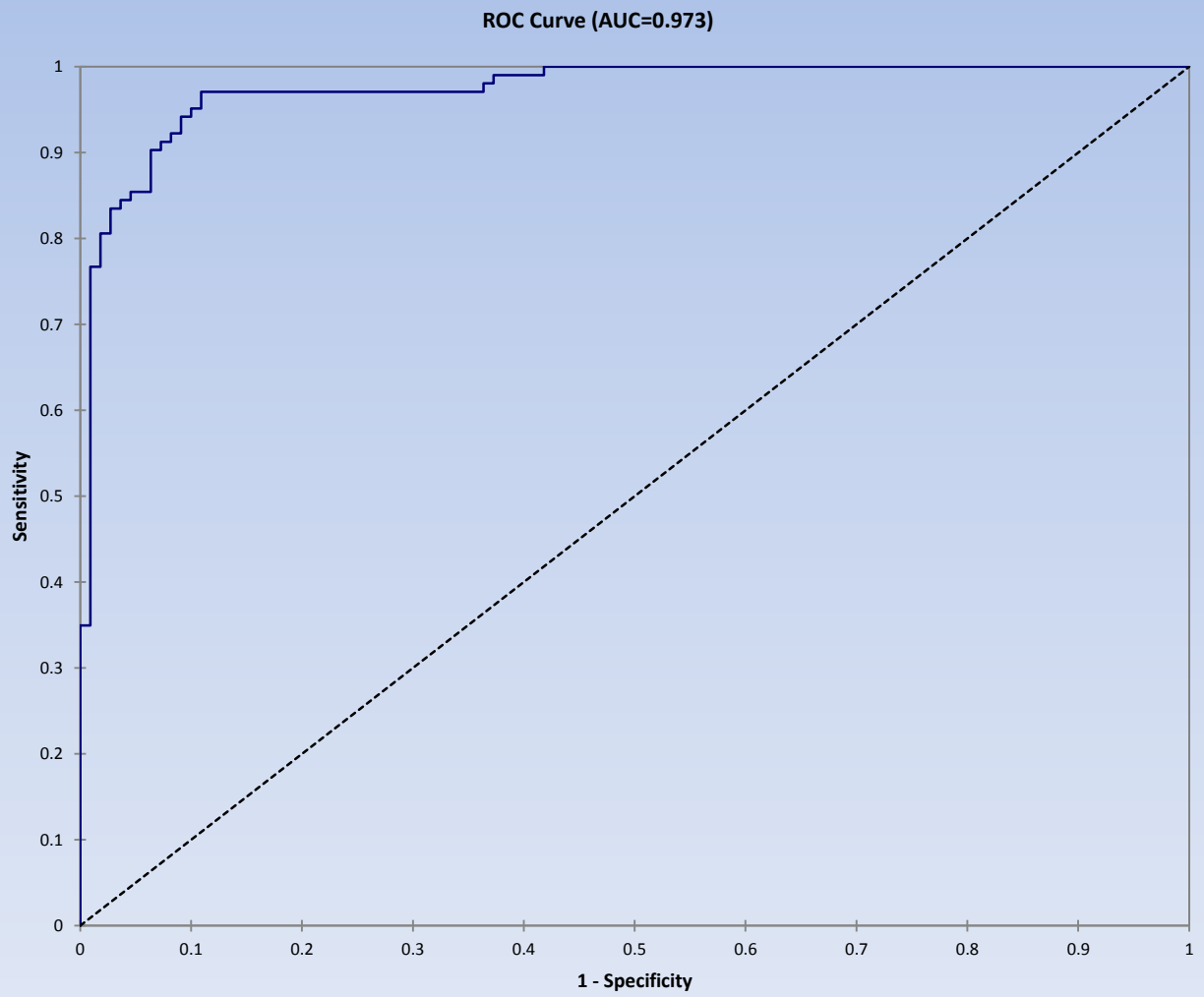
Parameters used : CRF and IOPg



Results

Using combined ORA 2 and pachymetry measurements, we were able to separate normal eyes from keratoconic eyes with a sensitivity of 92.6 % and a specificity of 90.5 %.

Parameters used : CRF, IOPg, H1, CCT and TP



Conclusions

- Our new index, combining biomechanical and tomographic data, can separate keratoconic from normal eyes with both good sensitivity and good specificity.

- Further analysis with more data may provide an index capable of separating forme fruste keratoconus from normal eyes.