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Enhanced tomographic assessment to detect corneal ectasia based on artificial intelligence.

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**ABSTRACT**

**Purpose:** To improve the detection of corneal ectasia susceptibility using tomographic data.

**Design:** Multicenter case control study

**Methods:** Data from patients from five different clinics from South-America, United States and Europe were evaluated. Artificial intelligence models were generated using Pentacam HR (Oculus, Wetzlar, Germany) parameters to discriminate the preoperative data of three groups: stable LASIK cases (2,980 patients with minimum follow up of 7 years), ectasia susceptibility (71 eyes of 45 patients that developed post-LASIK ectasia [PLE]) and clinical keratoconus (182 patients [KC]). Models accuracy was independently tested in a different set of stable LASIK cases (298 patients with minimum follow up of 4 years) and in 188 unoperated patients with very asymmetric ectasia (VAE), these patients presented normal topography (VAE-NT) in one eye and clinical diagnosed ectasia in the other (VAE-E). Accuracy was evaluated with ROC curves.

**Results:** The random forest (RF) provided highest accuracy among AI models in this sample with 100% sensitivity for clinical ectasia ([KC+VAE-E]; cut-off 0.52), being named Pentacam Random Forest Index (PRFI). Considering all cases, the PRFI had AUC of 0.992 (94.2% sensitivity; 98.8% specificity; cut-off 0.216) being statistically higher than Belin/Ambrósio deviation ([BAD-D] AUC=0.960, 87.3% sensitivity, 97.5% specificity; p=0.006, De Long's). The optimized cut-off 0.125 provided sensitivity of 85.2% for VAE-NT, and 80% for PLE, with 96.6% specificity.

**Conclusion**: The PRFI enhances ectasia diagnosis. Further integrations with corneal biomechanical parameters and with the corneal impact from laser vision correction (LVC) are needed for assessing ectasia risk.