Arquivos Brasileiros de
Oftalmologia

Corneal epithelial thickness mapping in the diagnosis of ocular surface disorders involving the corneal epithelium: a comparative study

Monica Alves[1]

1. Department of Ophthalmology and Visual Science, Faculdade de Medicina, Universidade de Campinas, Campinas, SP, Brazil.

This article was recently published in the journal *Cornea* and brings very interesting insights about the role of epithelial evaluation in different ocular surface diseases. The epithelial layer serves as a barrier between the cornea and the outside environment, and in concert with the tear film, guarantees comfort and optical quality. The human corneal epithelium has five to seven cell layers, with a central thickness of approximately 50 to 52 μm. The theory that the epithelial thickness (ET) profile is remodeled in response to stromal irregularities was first proposed in 1962 by Vogt, who stated that "corneal stromal defects are filled with surface epithelial cells." Therefore, the analysis of corneal ET may play an important role in the early diagnosis and evaluation of ocular surface disorders.

The aim of this study was to evaluate the use of corneal ET as a test complementary to clinical evaluation in the diagnosis and differentiation of ocular surface diseases using epithelial maps obtained by spectral domain optical coherence tomography (SD-OCT) corneal evaluation.

After a comprehensive clinical diagnosis, seven diseases were included [keratoconus, limbal stem cell deficiency (LSCD), epithelial basal membrane dystrophy (EBMD), dry eye, pterygium, trachoma, and in situ carcinoma] and compared with a control group. Reproducibility of corneal epithelial map classification was considered when full agreement among the three readers was reached.

In summary, each ocular surface disorder was significantly associated with an ET mapping pattern:

1. Keratoconus: doughnut pattern (sensitivity/specificity = 56/94%), inferior thinning pattern (47/96%), max–min ET ≥13 mm (84/43%), and ET SD >5 mm (47/58%).
2. LSCD: spoke-wheel pattern (66/98%), max–min ET ≥14 mm (91/59%), ET SD >5 mm (82/63%), and minimal ET <43 mm (88/58%).
3. EBMD: inferior thickening pattern (55/92%), ET SD >5 mm (67/58%), and central ET >56 mm (53/81%).
4. Dry eye: superior thinning pattern (67/88%), and minimal ET ≥44 mm (86/47%).
5. Pterygium: nasal thickening pattern (100/86%), nasal ET >56 mm (80/71%), max–min ET ≥19 mm (100/50%), and ET SD >5 mm (70/57%).
6. Trachoma: max–min ET ≥15 mm (100/38%), and minimal ET <44 mm (73/46%).
7. In situ carcinoma: max ET >60 mm (91/60%), ET SD >5 mm (100/58%), and max–min ET ≥22 mm (73/56%).

The authors demonstrated that ET patterns and data were relevant for distinguishing diseased from normal corneas. Different patterns and several ET measurements were useful for distinguishing diseased corneas among a panel of normal and abnormal corneas. This proposed diagnostic method is highly objective, because pattern classification was found to be repeatable among different observers. The results presented in this study can be incorporated in the diagnostic evaluation of ocular surface diseases. Epithelial map pattern recognition combined with quantitative analysis of ET may help the clinician in the differential diagnosis of different ocular surface conditions. The last step of the precise diagnosis is still to be made by the clinician. However, artificial intelligence using deep learning analysis of large amounts of data may lead to fully automated diagnosis of these ocular surface conditions.

Corresponding author: Monica Alves
E-mail: monicalves@me.com

Article reference of the review

Levy A, Georgeon C, Knoeri J, Tourabaly M, Leveziel L, Bouheraoua N, et al. Corneal Epithelial Thickness Mapping in the Diagnosis of Ocular Surface Disorders Involving the Corneal Epithelium: A Comparative Study. Cornea. 2022;41(11):1353-1361.