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Anterior-segment OCT epithelial mapping in early and advanced keratoconic eyes

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Purpose: Safety and efficacy of anterior segment optical coherence tomography epithelial thickness mapping as an ectasia prognosis.

Methods: Epithelial thickness mapping was studied with anterior-segment optical coherence tomography (AS OCT) and high-frequency ultrasound biomicroscopy (HF UBM). Comparative study was conducted in eyes in normal group (N), keratoconic group (KCN) and keratoconic eyes treated with collagen-cross linking group (K CXL).

Results: Our study indicates substantial topographic variation in epithelium thickness in the KCN group, however, there was an overall thickening of the epithelium, particularly over the pupil center of the order of + 3 µm, while the mean epithelium thickness is on average + 1.1 µm compared to the N group. No statistically significant difference was found between the N group and the K CXL group in terms of overall epithelium thickness. This finding was more pronounced among younger patients, and in agreement with high-frequency ultrasound epithelium thickness imaging.

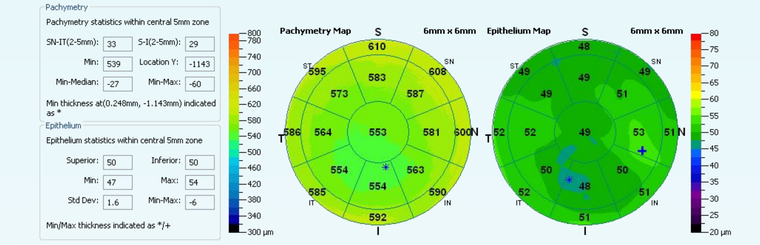
Conclusions: AS OCT and HF UBM epithelial imaging indicates that on average, epithelium thickness in the K group was thicker, possibly as a reaction to ectasia. This may aid in the sub-clinical screening, particularly among young patients.

In-vivo measurement of corneal epithelium

The challenge of two-dimensional epithelium thickness mapping:

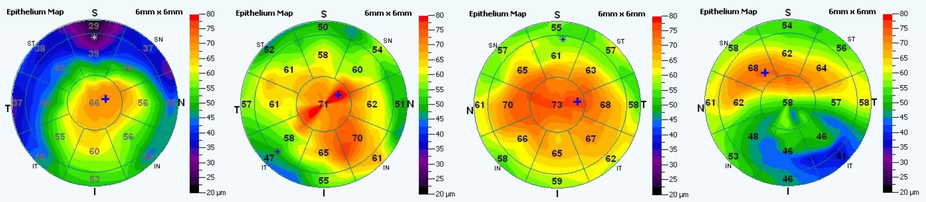
- High-Frequency Ultrasound Biomicroscopy → Requires immersion
- Confocal microscopy through focusing → Long Acquisition Time
- Anterior-Segment Optical Coherence Tomography → Non-contact, Fast (Spectral Domain)

Clinically-available modality: AS-OCT epithelium 2-dimensional mapping



Numeric data | Total Corneal Thickness | Epithelium Thickness

The Epithelium in Keratoconus



substantial topographic variation → overall thickening of the epithelium, → particularly over the pupil center

Normal eyes vs Keratoconus eyes epithelium statistics

	(µm)	EPI Center	Epi minimum	Epi maximum	Epi Variability	Epi Average
Normal population	**Average**	**52.23**	**48.00**	**53.67**	**± 1.53**	**51.97**
	Stdev	0.60	1.20	0.77	0.21	0.70
	Max	53	49	55	1.70	52.80
	min	50	47	53	1.30	50.40
Keratoconus	**Average**	**56.75**	**36.50**	**72.75**	**± 9.80**	**55.65**
	Stdev	1.50	1.73	0.96	0.41	1.22
	Max	58	38	74	10.30	56.80
	min	55	35	72	9.30	54.60

Clinical Ophthalmology	A. John Kanellopoulos, Ioannis M. Aslanides, and George Asimellis
6 789–800 (2012)	Correlation between overall epithelial thickness in normal corneas, ectatic and ectatic previously treated with CXL corneas. Can overall epithelial thickness become a very early ectasia prognostic factor?
Journal of Refractive Surgery	A. John Kanellopoulos and George Asimellis
JRS-2013-030	Qualitative and quantitative corneal epithelial thickness distribution of dry-eyes in comparison to normal, with anterior-segment Optical Coherence Tomography.
Case Reports in Ophthalmology	A. John Kanellopoulos and George Asimellis
DOI: 10.1159/000350630	Anterior segment optical coherence tomography - assisted topographic corneal epithelial thickness distribution imaging of a keratoconus patient.

Commercial Relationship(s) Disclosure:
Feilin Zhu: Commercial Relationship: Code N (No Commercial Relationship)
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