Επιθηλιακό πάχος ως indicator για πρώιμο κερατόκωνο

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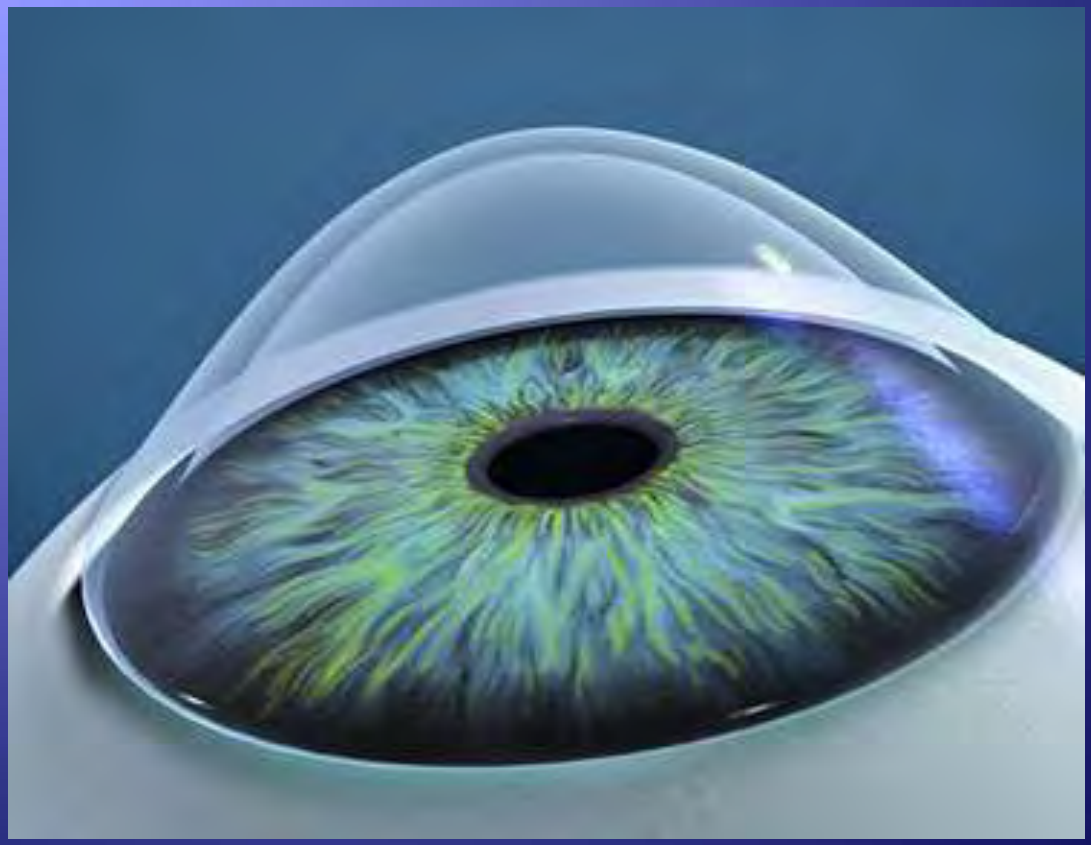
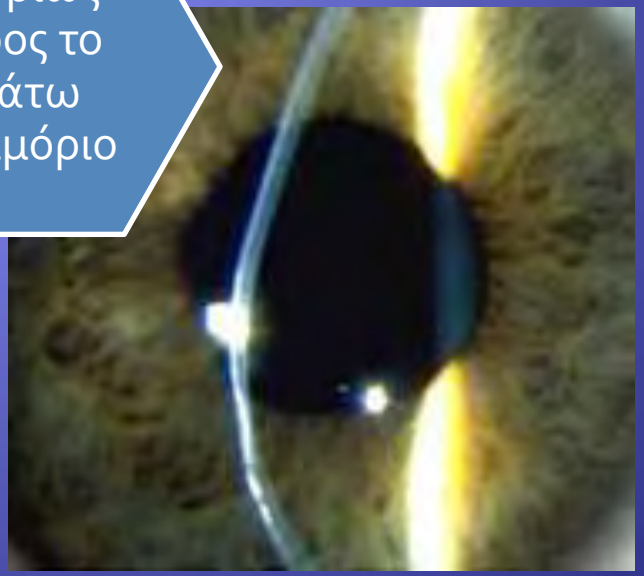
Always a challenge to define

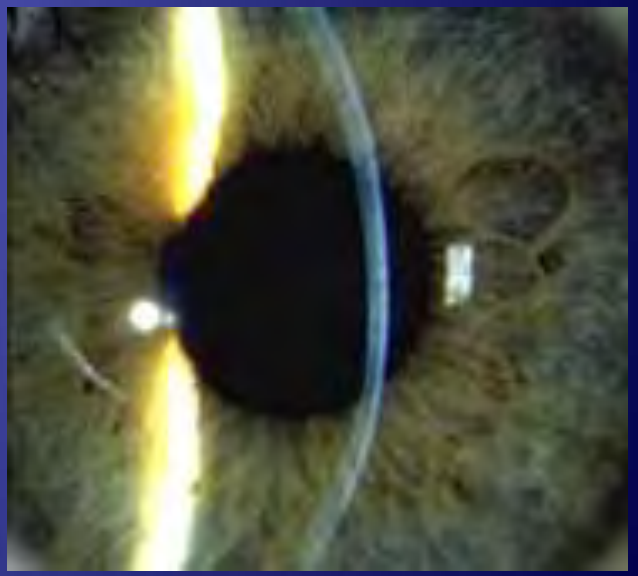


Κερατοειδι-κή ασυμμετρία

Ορατή ακόμα και με εξέταση στη λυχνία

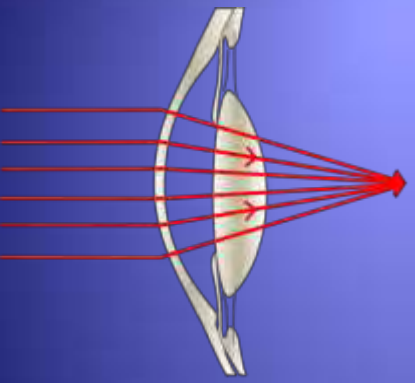
Κυρίως προς το κάτω ημιμόριο



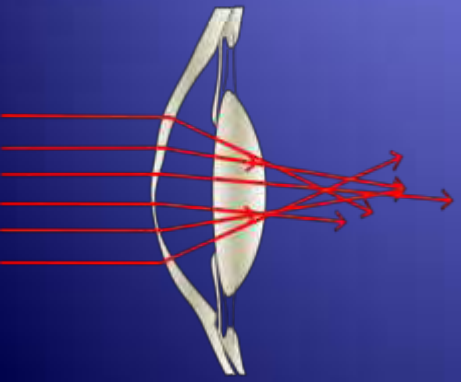


Εκτατική Λέπτυνση Κερατοειδή

Κύρια συμπτώματα



Φυσιολογικός κερατοειδής,
ομαλή διάθλαση,
ευκρινές είδωλο.



Κερατοκωνικός κερατοειδής,
ανώμαλη διάθλαση,
ασαφές είδωλο.

- Θολερότητα της όρασης
- Συνεχώς αυξανόμενη μυωπία και ιδιαίτερα αστιγματισμός (ανώμαλος)
- Παραμόρφωση εικόνων
- Ευαισθησία στο φως
- Ερεθισμοί και έντονο τρίψιμο βοηθά στην εξέλιξη της νόσου
- Κάθε μάτι προσβάλλεται ξεχωριστά!

What do we know about KCN?

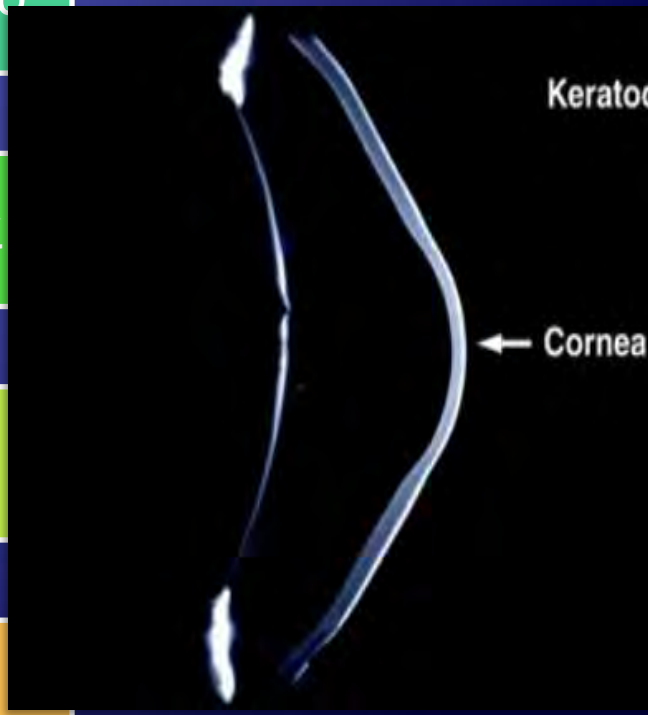
Κερατοειδής με κωνικό σχήμα

Λέπτυνση κερατοειδή στο σημείο του κώνου

Ανώμαλες καμπυλότητες – μεγάλη μυωπία

Ανώμαλος αστιγματισμός

Αίτια άγνωστα – 1/10 κληρονομικότητα



Οπτικές Εκτροπές Κερατόκωνου

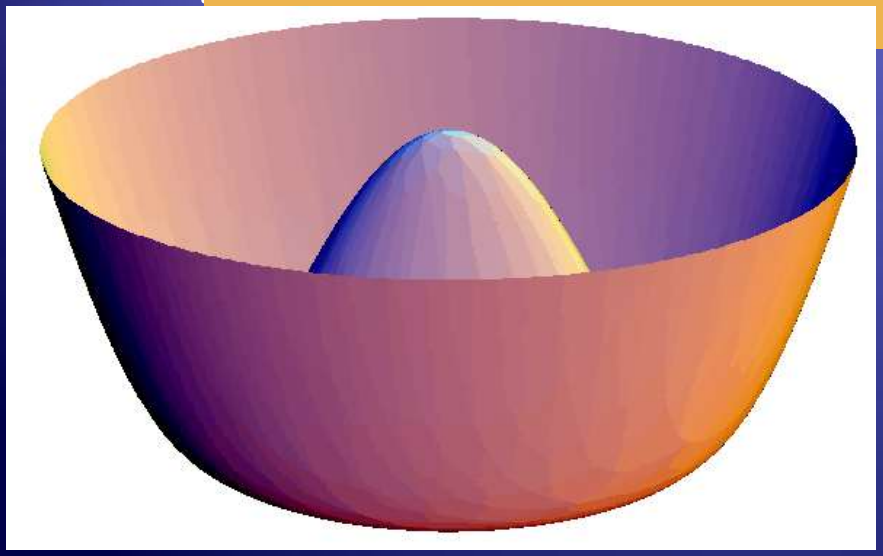
Κεντρικός Κερατόκωνος

Μεγάλη μυωπία

- Μεγάλες καμπυλότητες
- Απομάκρυνση κερατοειδή από τον αμφιβληστροειδή
- Διαθλαστική και αξονική

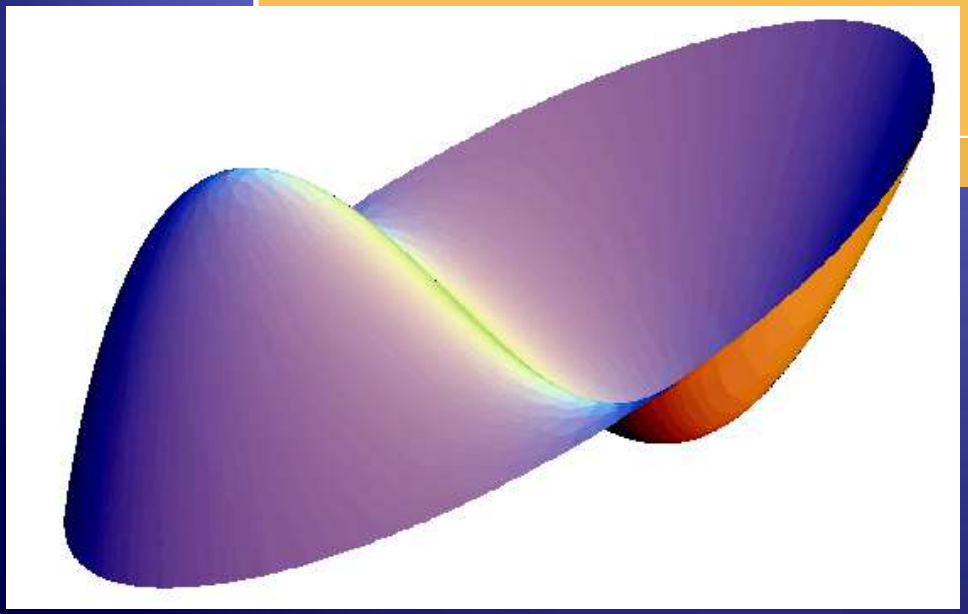
Σφαιρική Εκτροπή

- Εξάρτηση από οπτική ζώνη
- Συμμετρική ως προς τον οπτικό άξονα

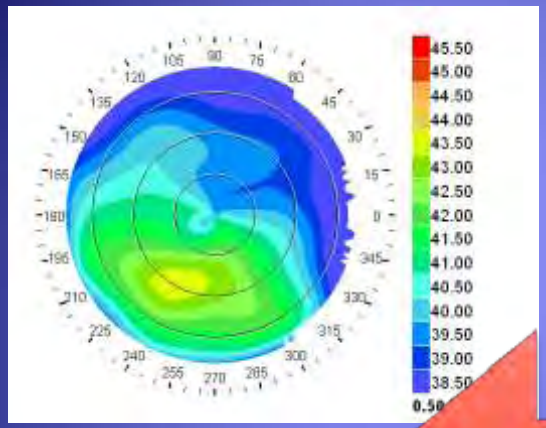


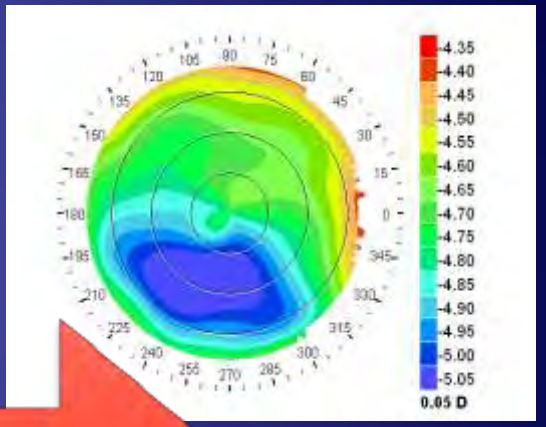
Οπτικές Εκτροπές Κερατόκωνου

Παράκεντρος Κερατόκωνος	
Ανώμαλος αστιγματισμός	Κόμη • Κυρίως κατακόρυφη (κάτω ημιμόριο) • Οριζόντια κόμη (κροταφικά ή ρινικά)



Οπίσθια επιφάνεια, θετική κόμη!





Πρόσθια κερατοειδική επιφάνεια

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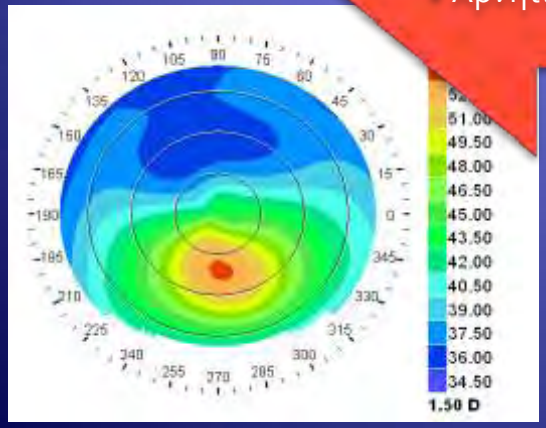
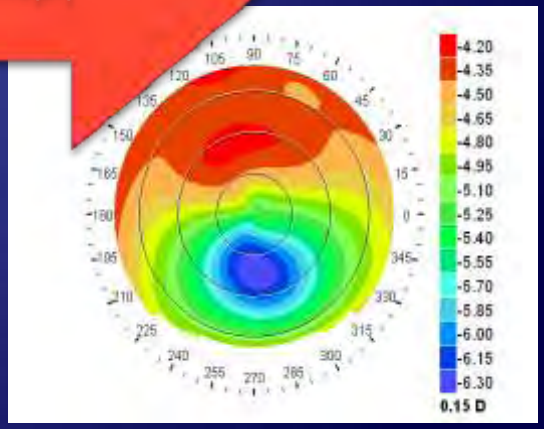


Οπίσθια κερατοειδική επιφάνεια

- Θετική κατακόρυφη κόμη



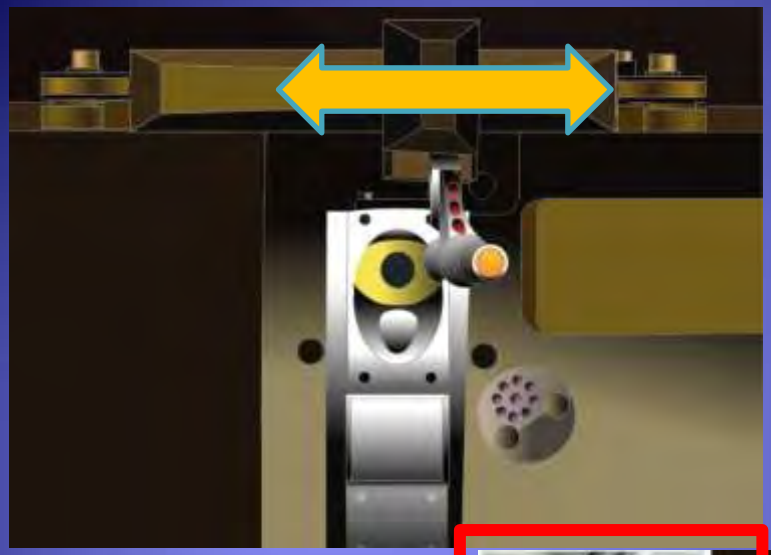
Μια ‘διαφορετική’ τεχνική

Απεικόνιση με υπερήχους

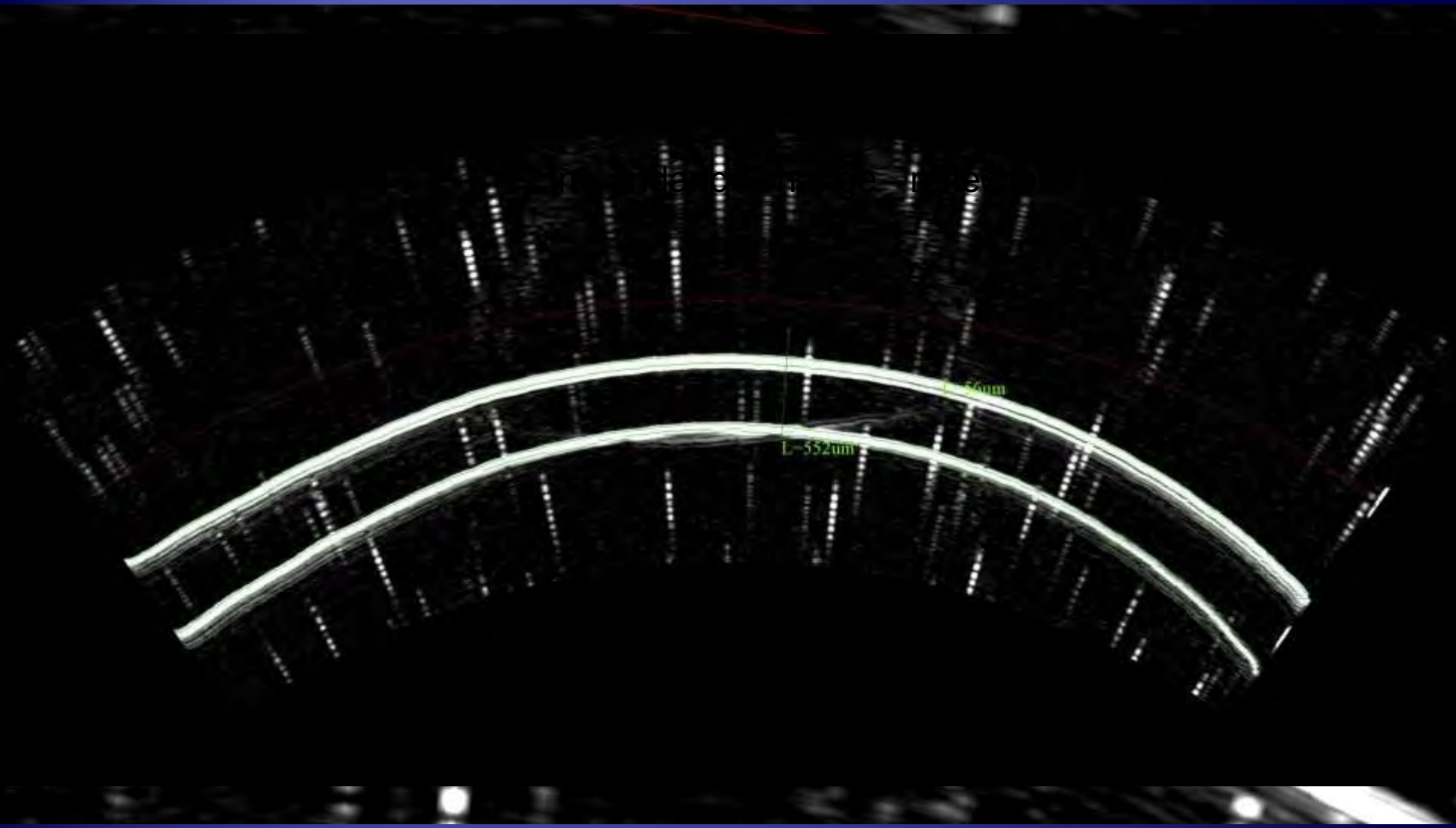
Υψηλής συχνότητας	• Διακριτική ικανότητα
Τοξοειδής σάρωση	• Καθετότητα • Πιστότητα απεικόνισης

Not the UltraSound most of us know…

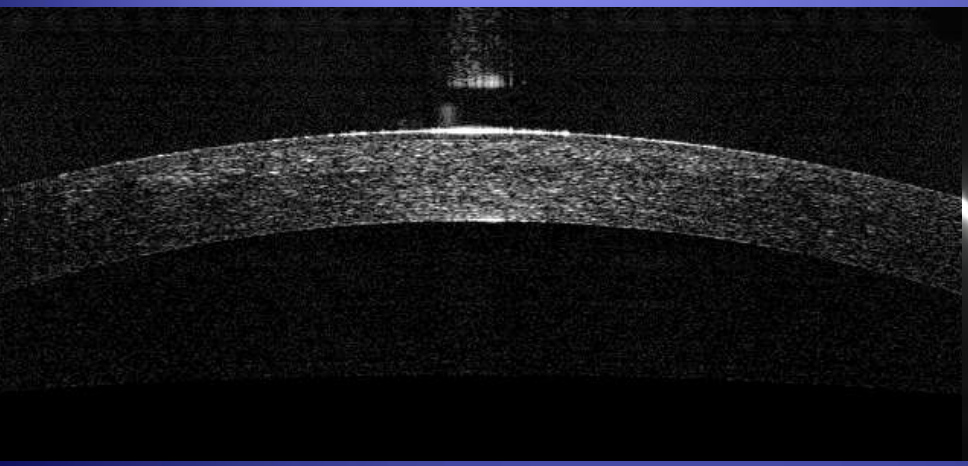
Artemis 2 HD Ultrasound Corneal Imaging: a novel approach

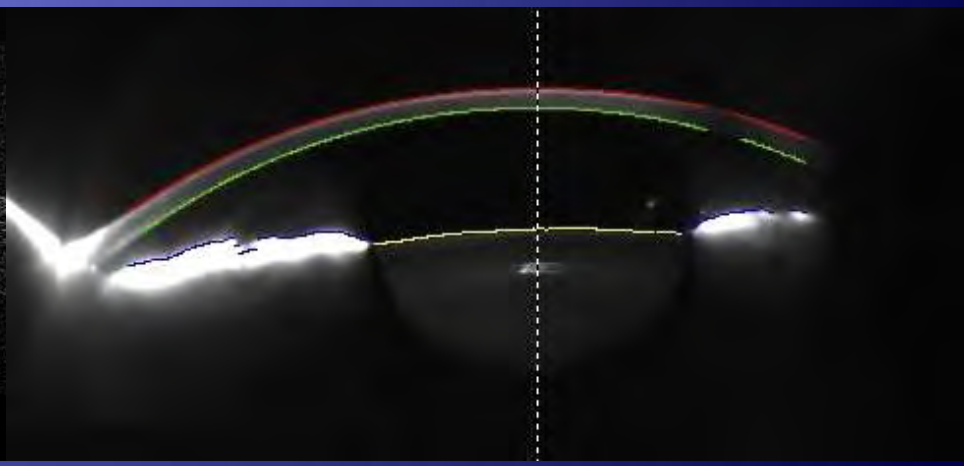


Scanning Select Meridians



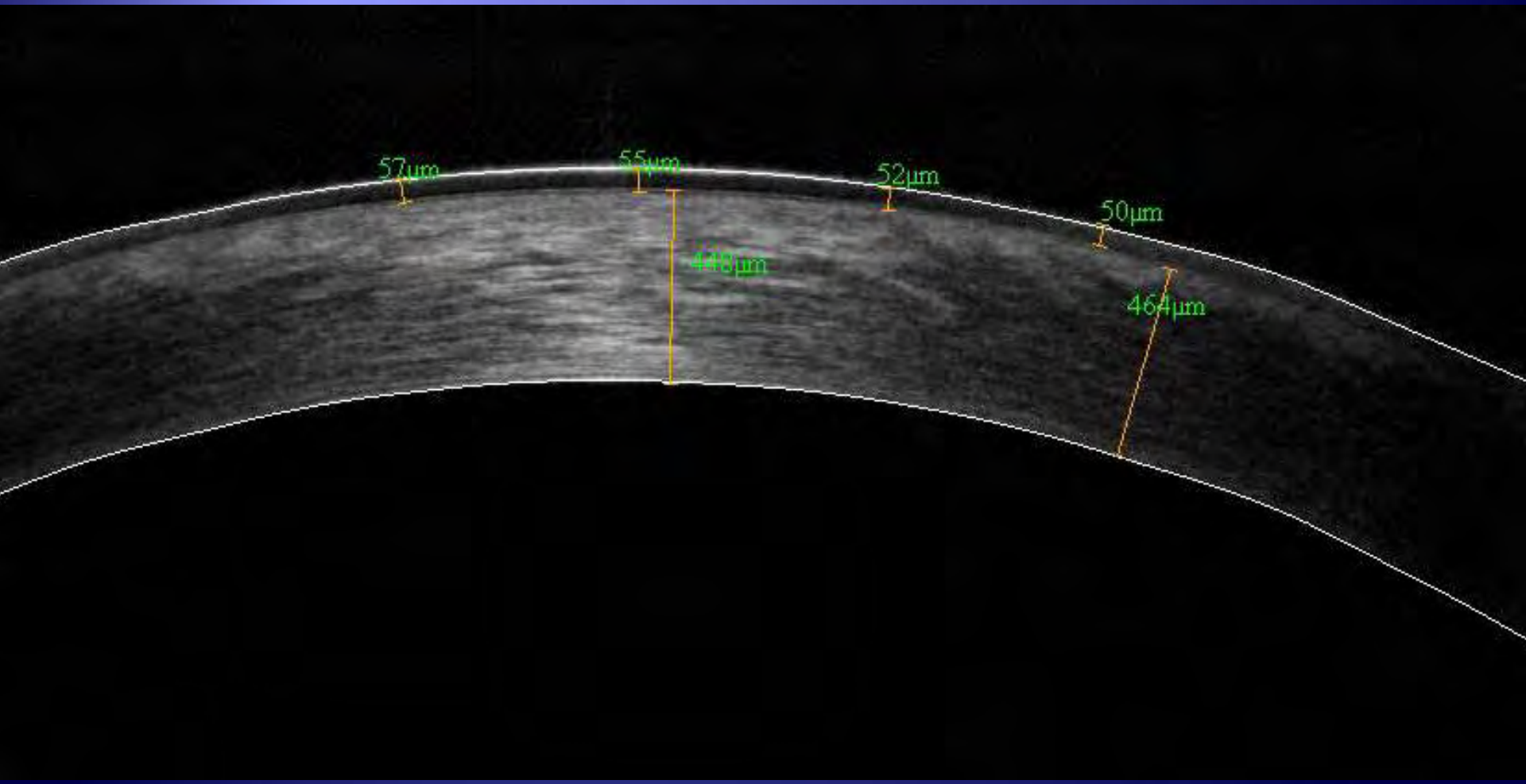
Raw Image – Epithelium

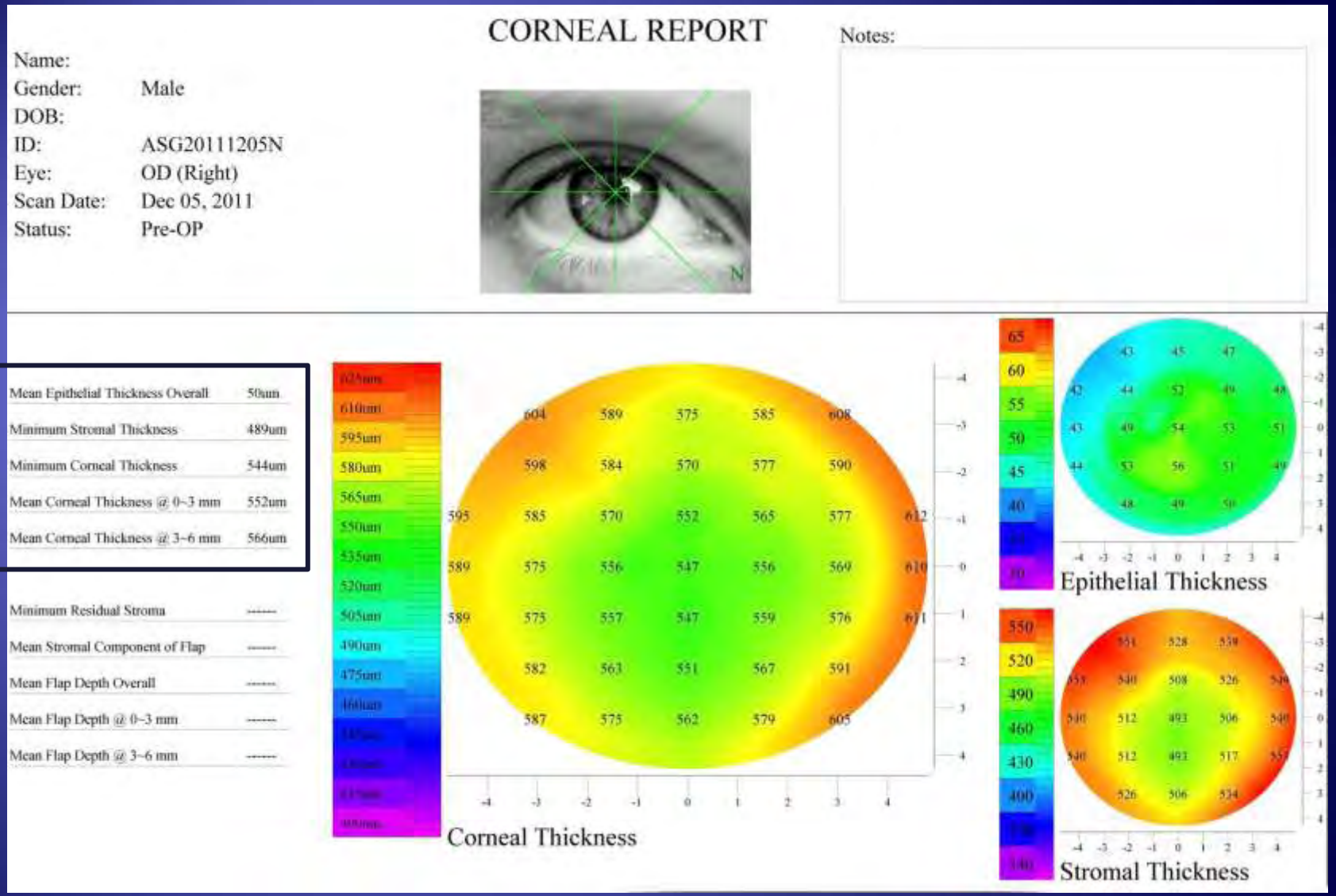




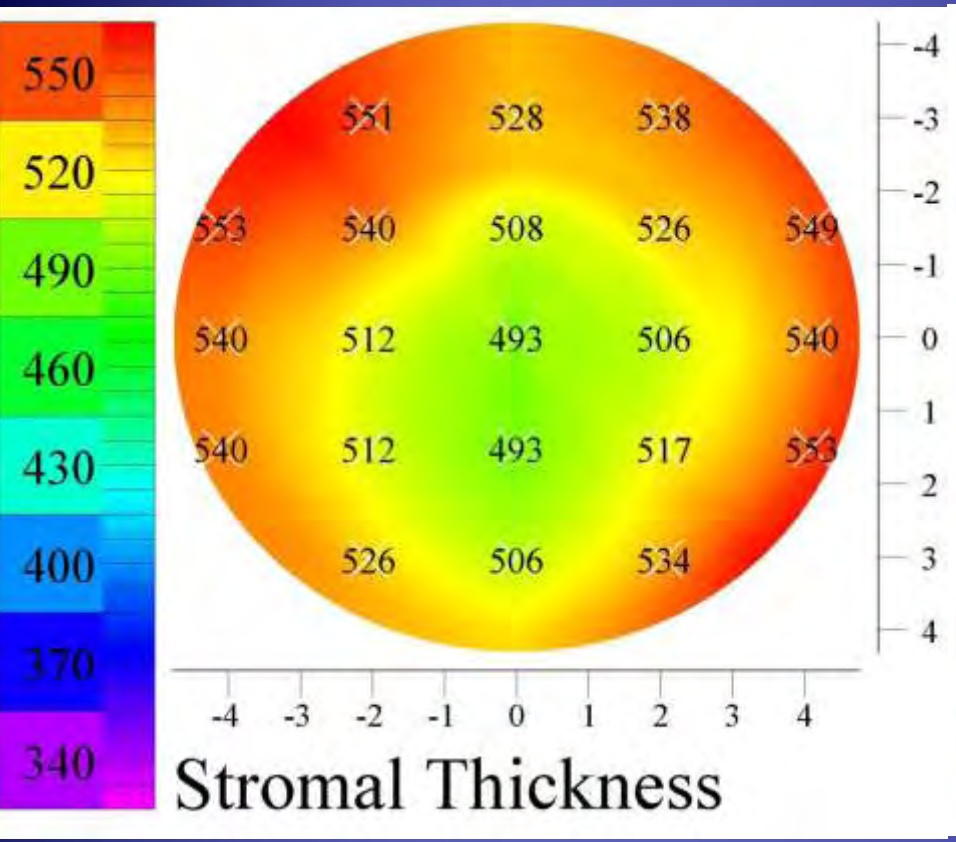
Raw Image & Other Techniques

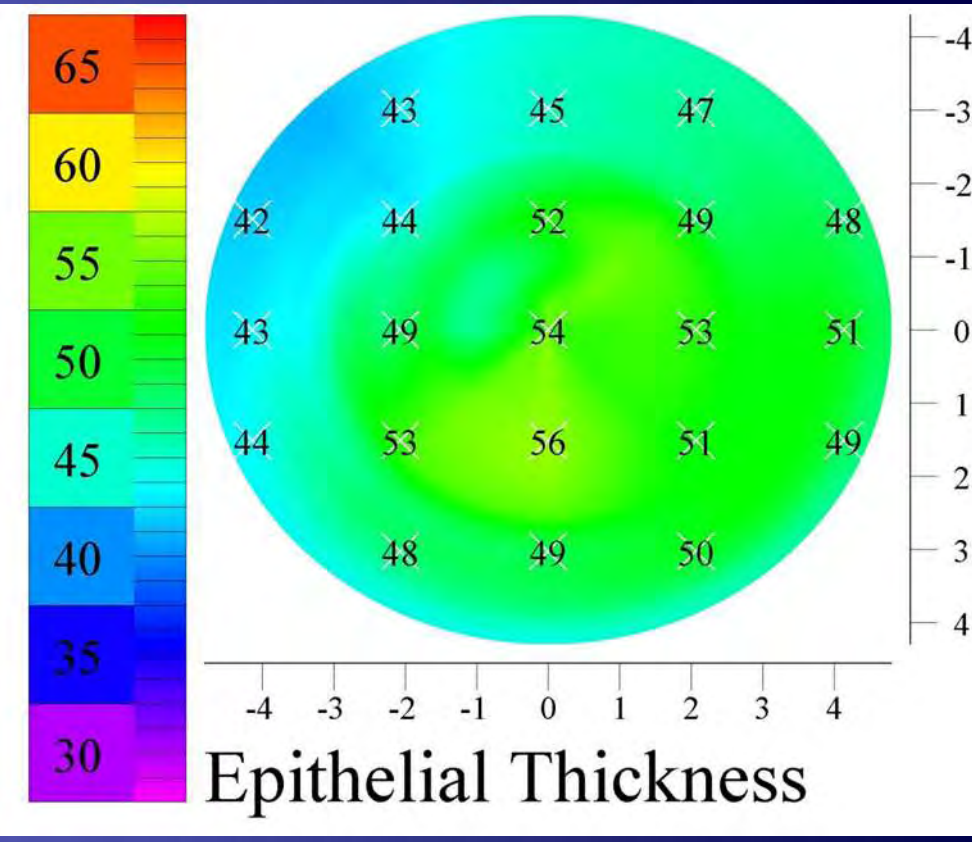
Measuring epithelium via caliper



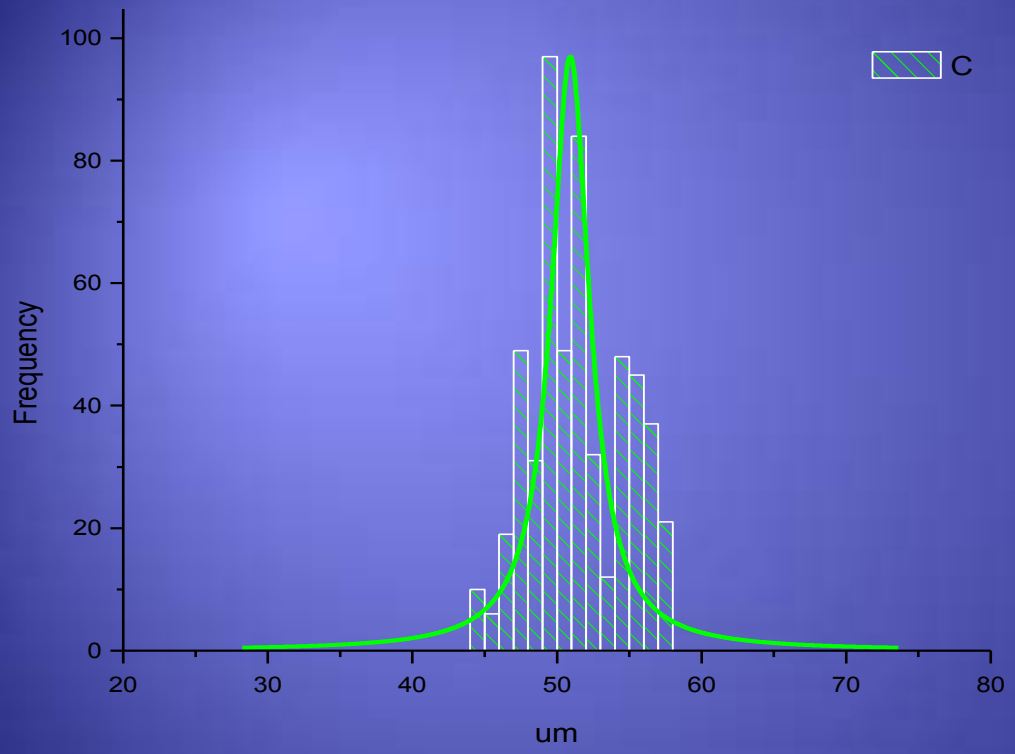


Thickness maps



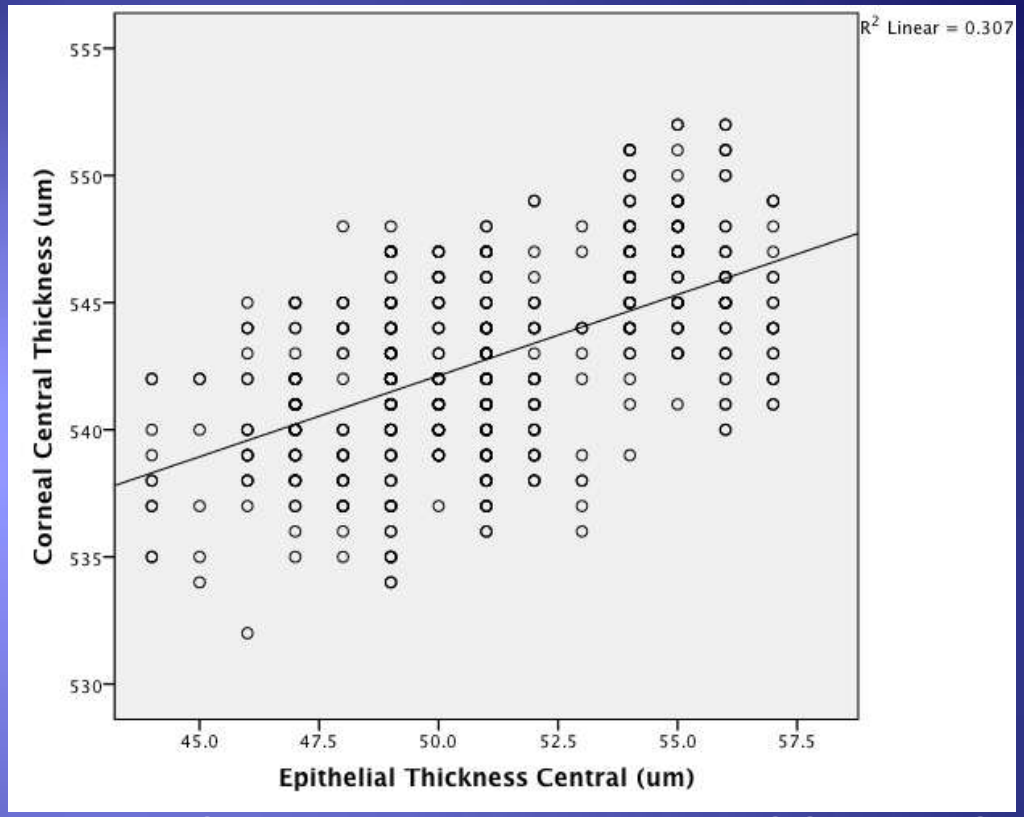


Stromal & Epithelial Thickness



	Central Epithelial Thickness (µm)
mean	50.92
stdev	3.22
stdev %	6.3%
N	540

Epithelial Thickness Histogram



There was a statistically significant correlation between CCT and Central epithelium thickness: r = 0.529

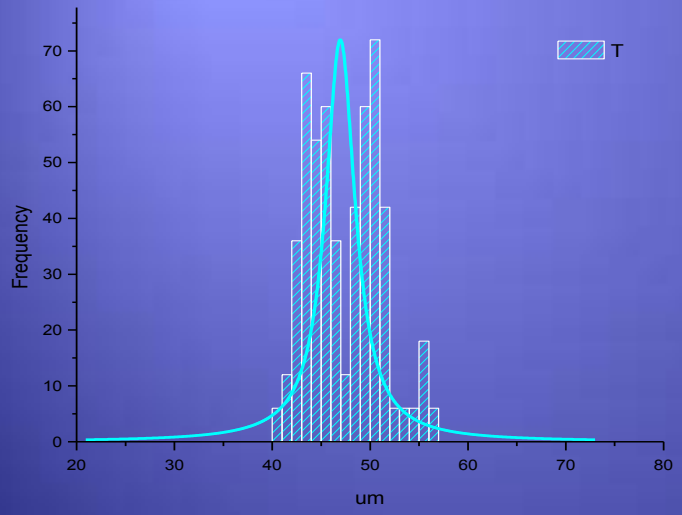
However, this correlation was not very strong suggesting that epithelium does not necessarily follow equally proportional thickness increments as CCT.

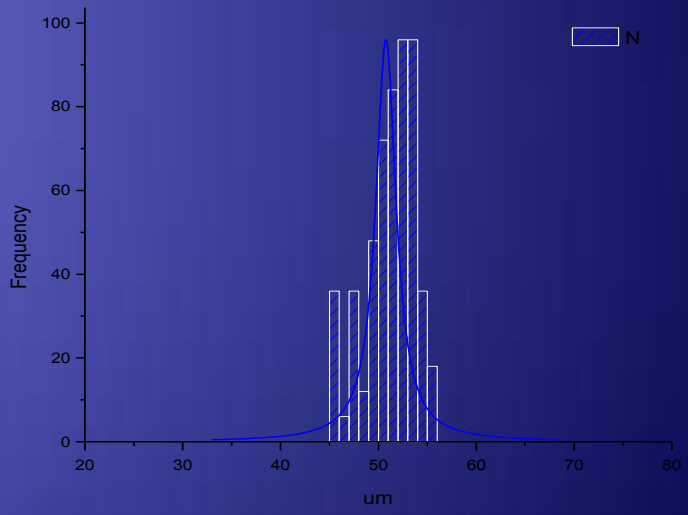
More than 30% of the total sample size was responsible for this correlation

Epithelial & Corneal Thickness Correlation

	Temporal Epithelial Thickness
mean	46.96
stdev	3.69
stdev %	7.9%

	Nasal Epithelial Thickness
mean	50.77
stdev	2.53
stdev %	5.0%





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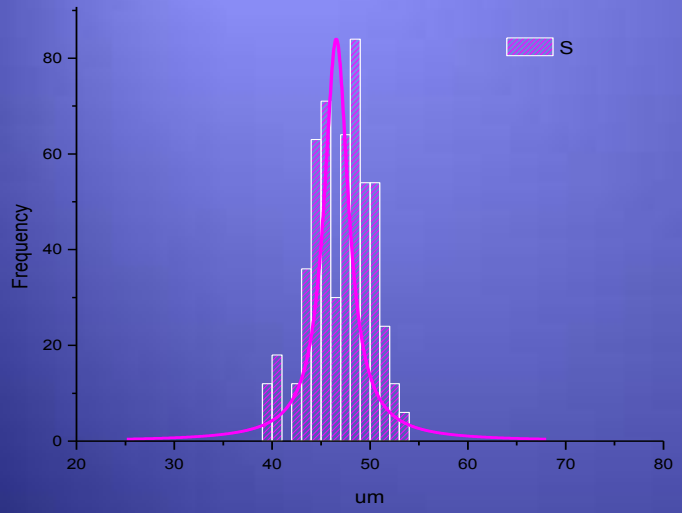
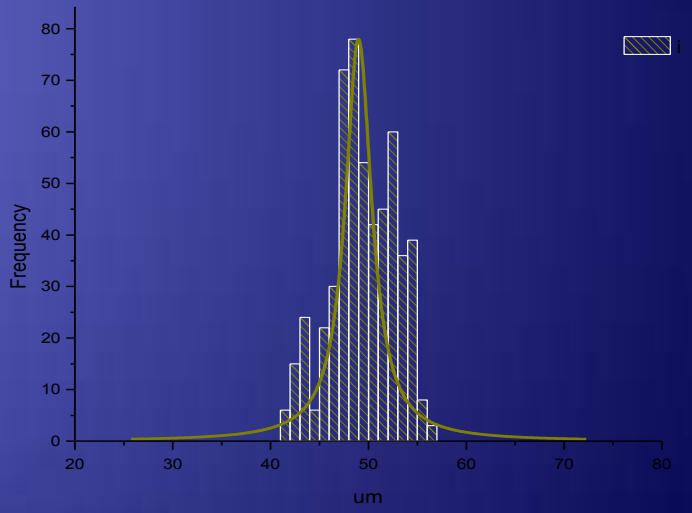
	Superior Epithelial Thickness
mean	46.55
stdev	3.04
stdev %	6.5%

	Inferior Epithelial Thickness
mean	48.99
stdev	3.30
stdev %	6.7%





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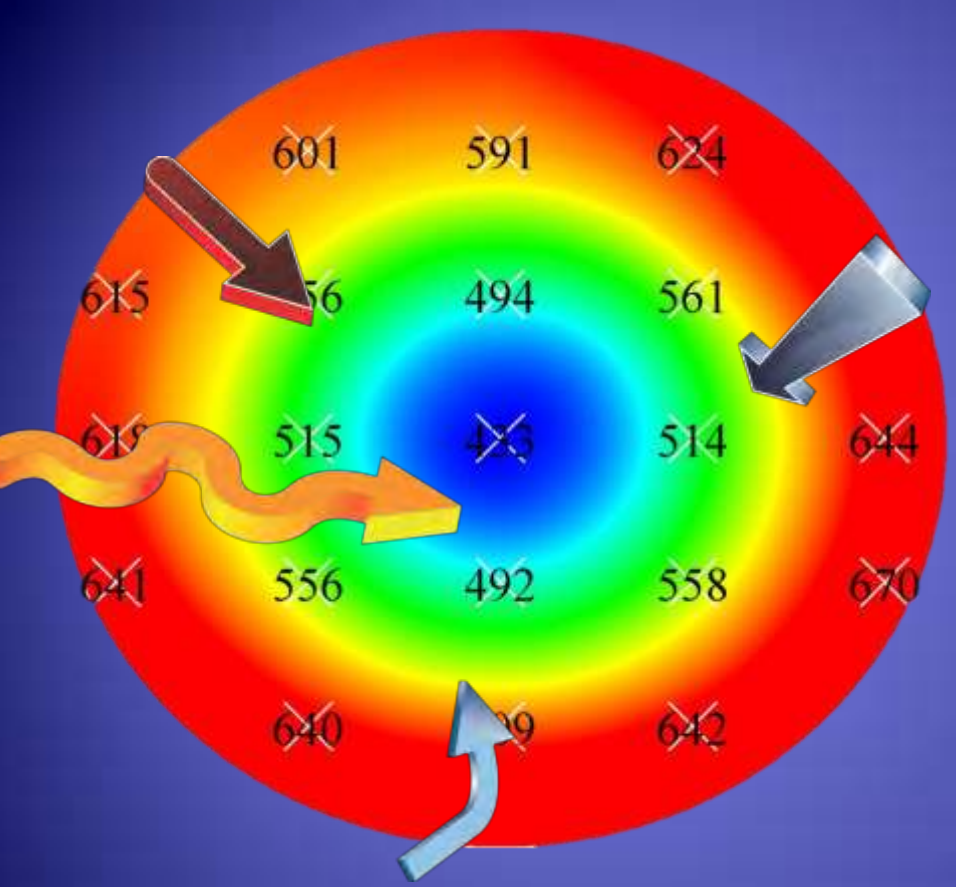
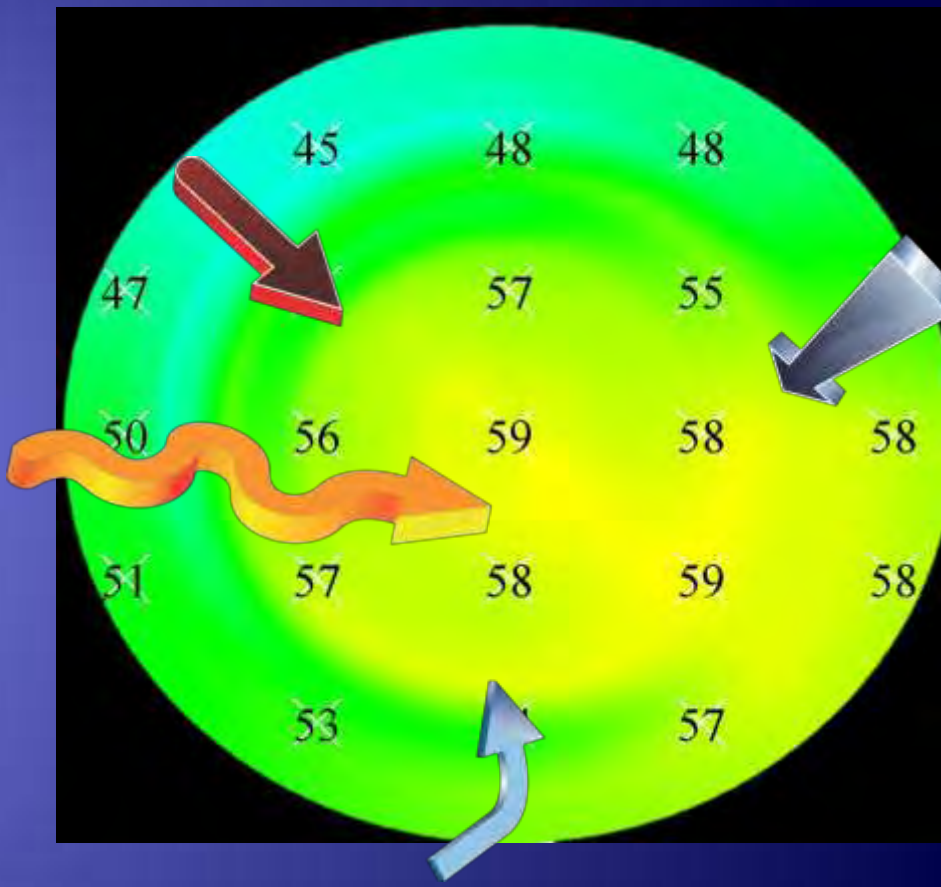
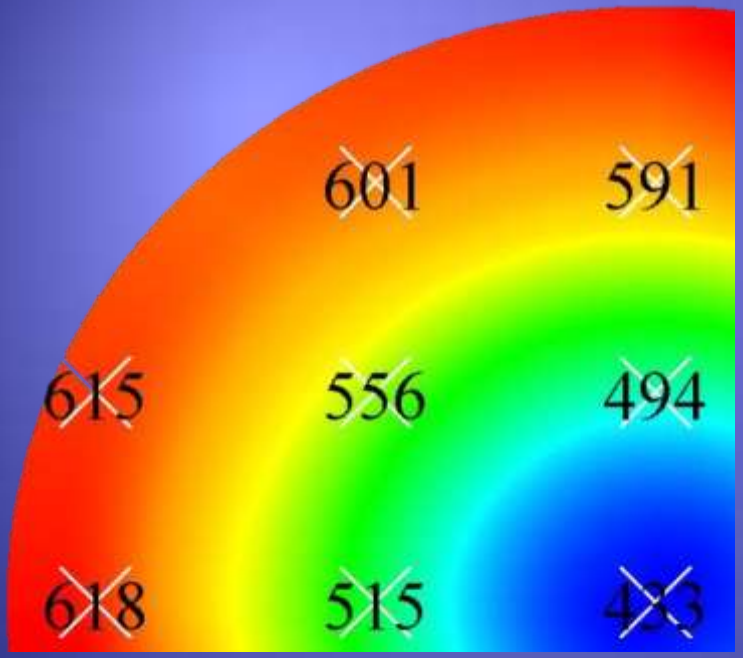




Epithelial Smoothening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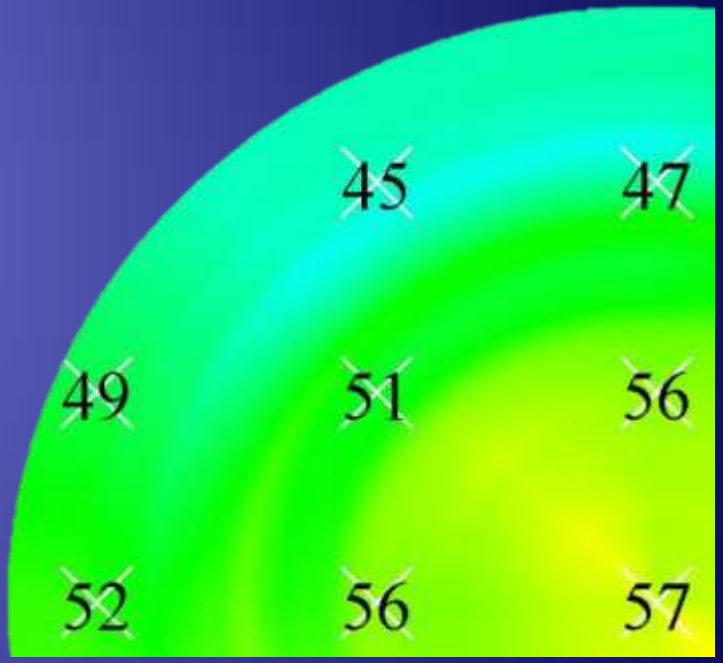
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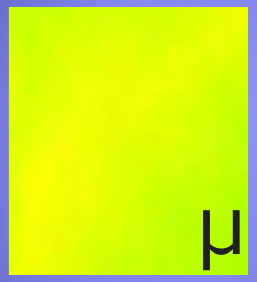
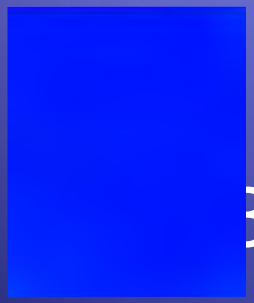


µm 56 47



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Clinical Ophthalmology

Dovepress

ORIGINAL RESEARCH

Correlation between epithelial thickness in normal corneas, untreated ectatic corneas, and ectatic corneas previously treated with CXL; is overall epithelial thickness a very early ectasia prognostic factor?

Anastasios John Kanellopoulos[1,2]
Ioannis M Aslanides[3]
George Asimellis[1]

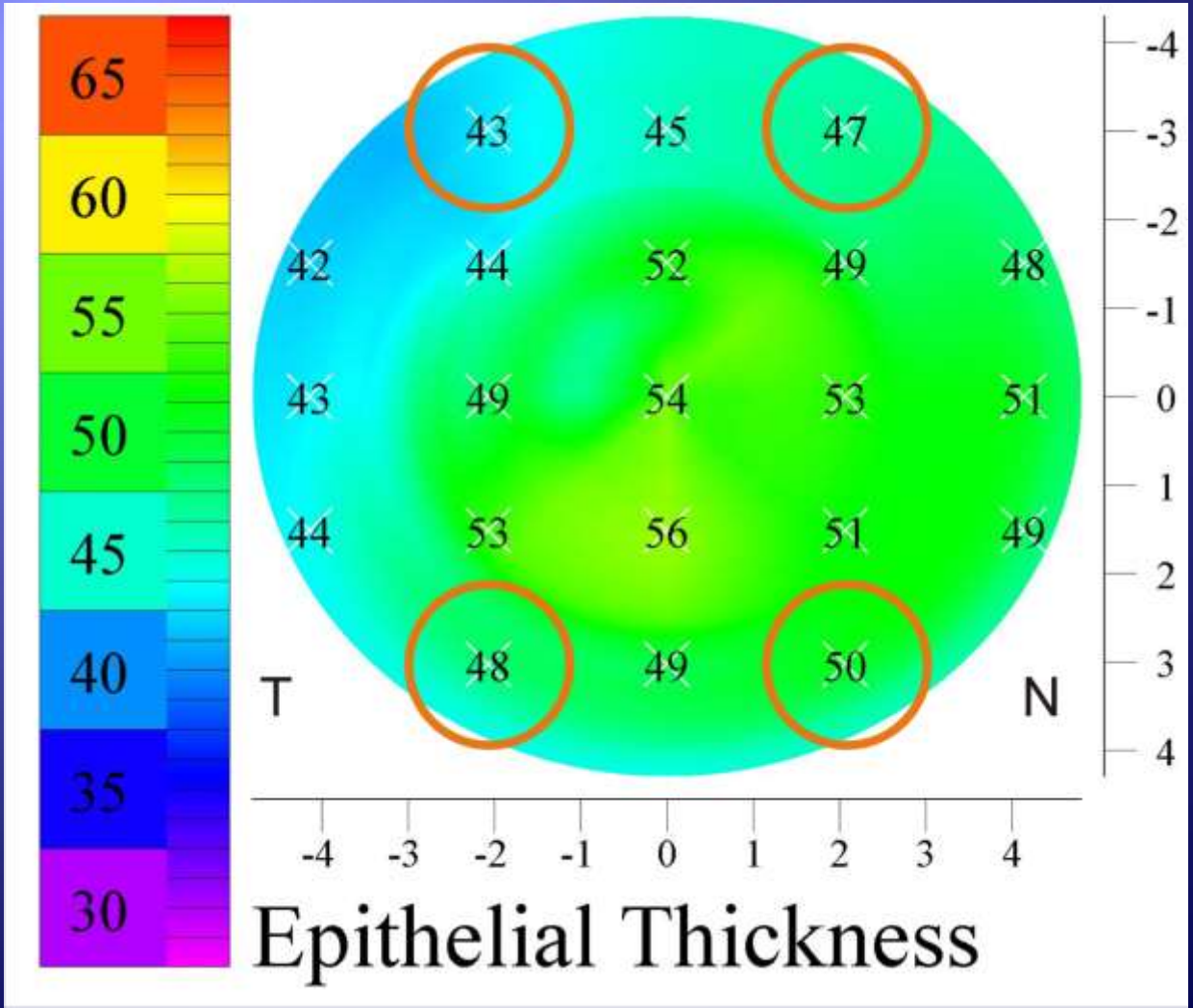
[1]Laservision Eye Institute, Athens, [2]Emmetropia Mediterranean Eye Clinic, Crete, Greece, [3]New York University School of Medicine, NY, USA

Purpose: To determine and correlate epithelial corneal thickness (pachymetric) measurements taken with a digital arc scanning very high frequency ultrasound biomicroscopy (HF UBM) imaging system (Artemis-II), and compare mean and central epithelial thickness among normal eyes, untreated keratoconic eyes, and keratoconic eyes previously treated with collagen crosslinking (CXL).

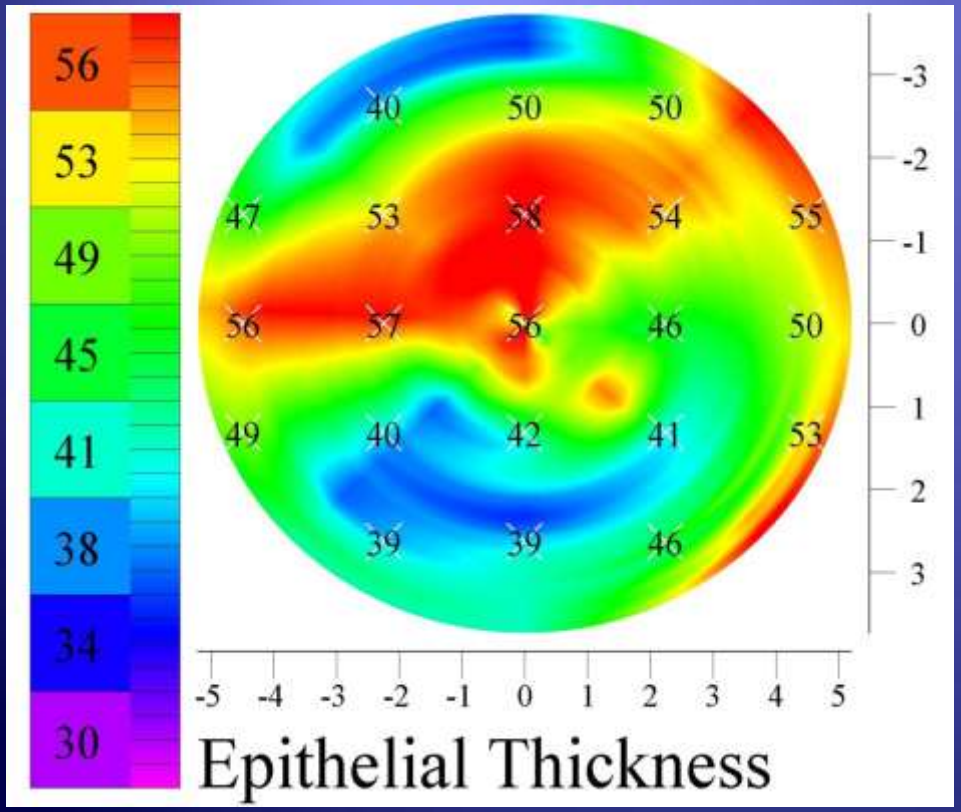
Methods: Epithelial pachymetry measurements (topographic mapping) were conducted on 100 subjects via HF UBM. Three groups of patients were included: patients with normal eyes (controls), patients with untreated keratoconic eyes, and patients with keratoconic eyes treated with CXL. Central, mean, and peripheral corneal epithelial thickness was examined for each group, and a statistical study was conducted.

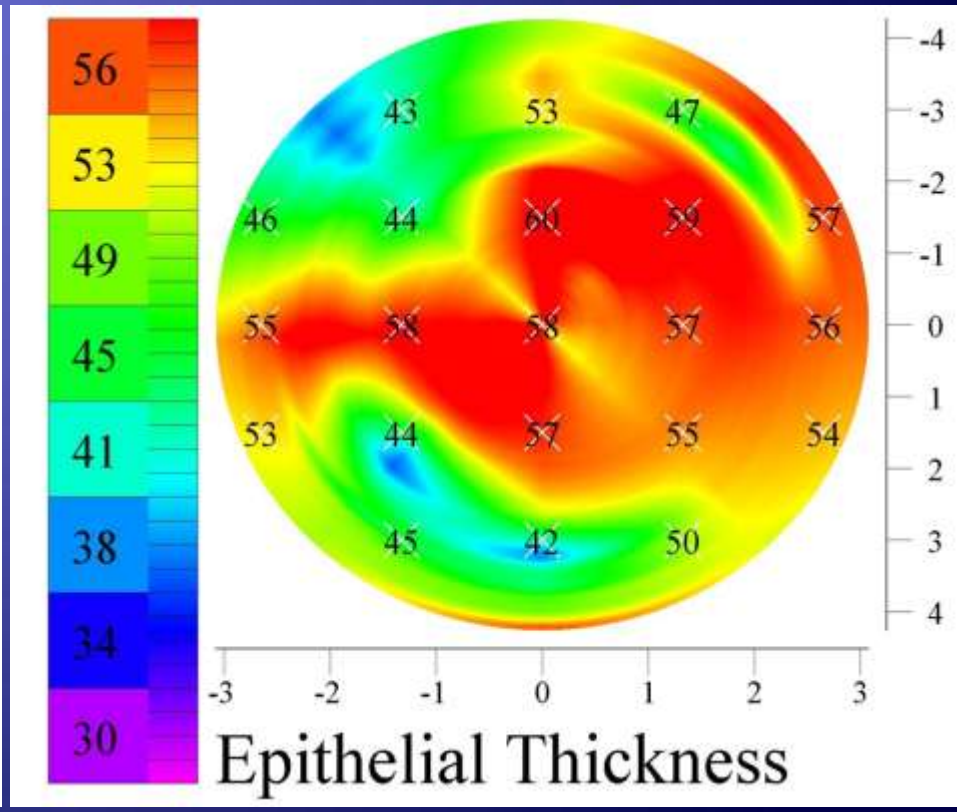
Results: Mean, central, and peripheral corneal epithelial thickness was compared between the three groups of patients. Epithelium thickness varied substantially in the keratoconic group, and in some cases there was a difference of up to 20 μm between various points of the same eye, and often a thinner epithelium coincided with a thinner cornea. However, on average, data from the keratoconic group suggested an overall thickening of the epithelium, particularly over the pupil center of the order of +3 μm, while the mean epithelium thickness was on average +1.1 μm, compared to the control population ($P = 0.005$). This overall thickening was more pronounced

Overall, Central and peripheral Epi thickness

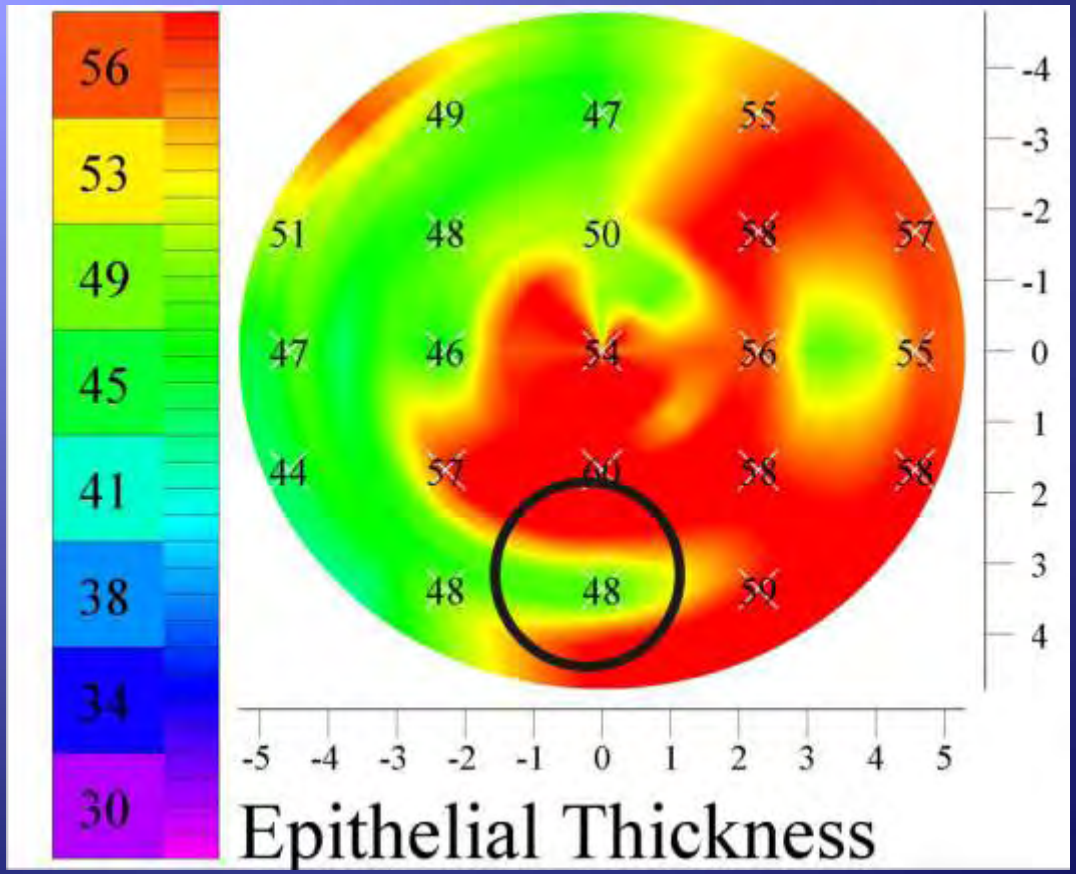


KCN epithelium maps





PMD patient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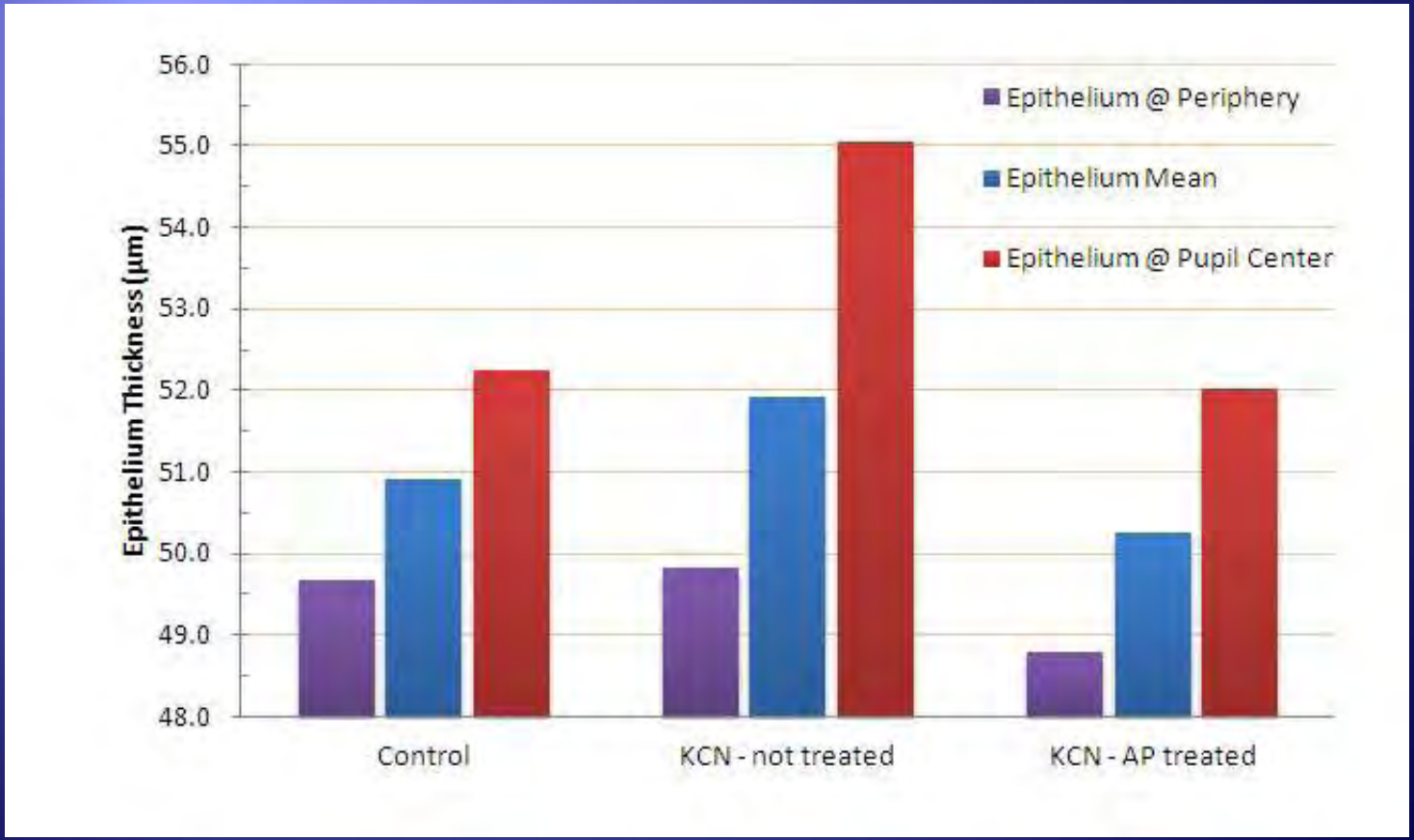
Epithelial Thickness

Comparison normal, KCN, CXL



More pronounced on younger patients

Table 5 Mean, center, and peripheral epithelium thickness, as examined separately for the five younger and the five elder patients from the KCN group

	Age (years)	Epi mean	Epi center	Epi peripheral 4 mm	Age (years)	Epi mean	Epi center	Epi 4 mm
Average	20.9	52.0	55.9	49.7	33.1	51.4	53.4	49.7
Max		57.0	60.0	55.0		55	58	55.00
Min		48	48	44		46	46	43
SD	3.5	3.1	3.8	3.2	3.8	3.6	3.5	4.2

Abbreviations: Epi, epithelium thickness; SD, standard deviation.

Conclusions

Very high-frequency digital ultrasound topography of cornea,

Unique feature is the ability to map epithelium and flap thickness over the entire cornea,

The epithelium is thinner over the keratoconic protrusion,

Highly irregular epithelium may be suggestive of an ectatic cornea,

Overall, there is thicker –on average- epithelium in this group of patients,

This difference, appears be clinically significant and may become a screening tool of eyes suspected for ectasia.