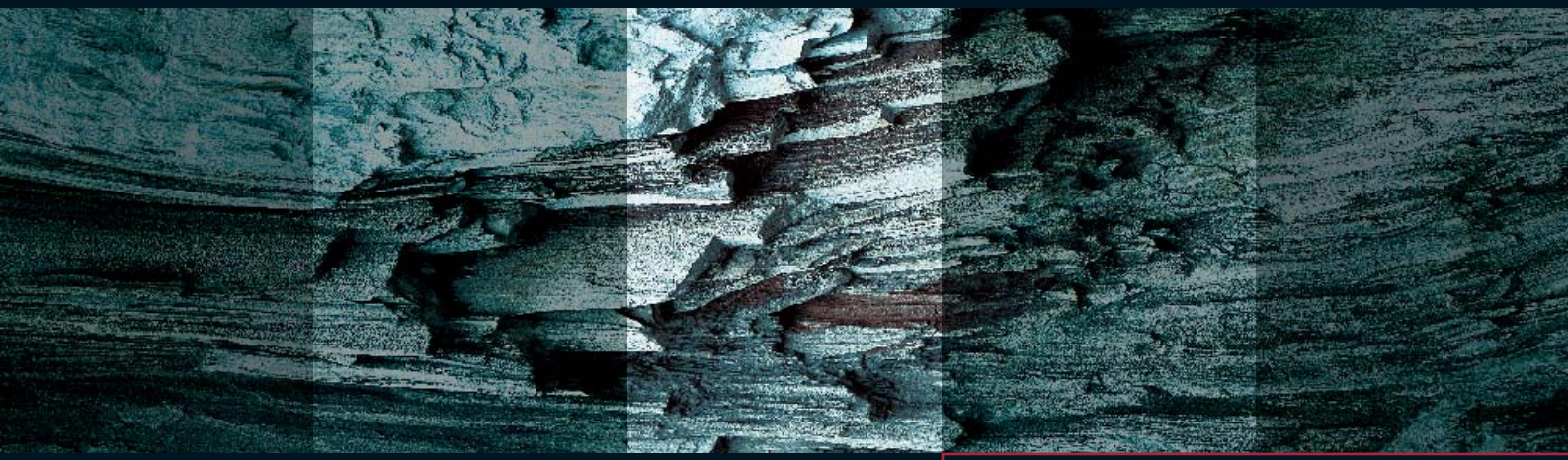
Distinction
layer by layer



HRT II Rostock Cornea Module

HEIDELBERG ENGINEERING

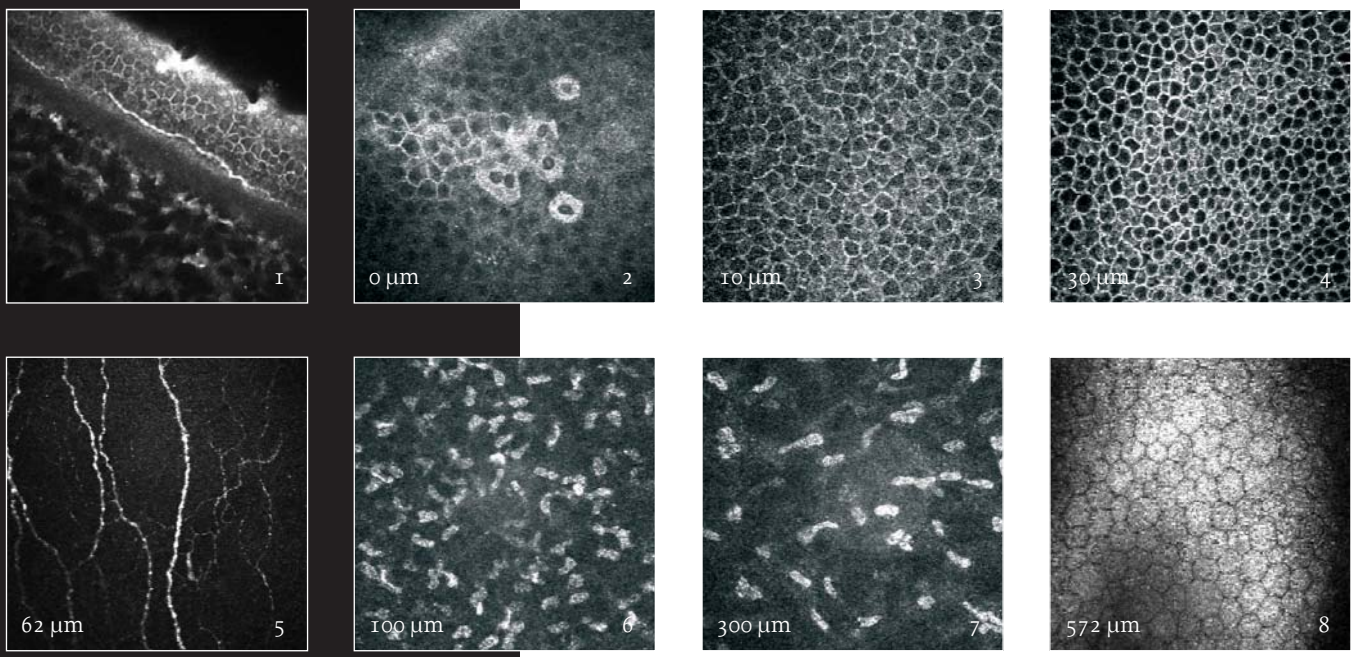
Confocal Laser Microscopy

- **Homogenously illuminated, undistorted images**
- **Movie capture**
- **Manual Pachymetry**
  - **Epithelial and intra-corneal pachymetry**
  - **Full corneal thickness**
  - **Post-LASIK flap thickness**
- **Semi-automated cell count**
- **Convenient monitoring of eye contact via CCD camera**

Crisp, clear corneal images are captured with a new confocal laser microscope which combines HRT II laser scanning technology and the Rostock Cornea Module, developed with ophthalmologists from Rostock University, Germany.

The unique qualities of confocal scanning allow the laser to sharply image cellular structures and move through the entire cornea layer by layer, from epithelium to endothelium.

This 'high definition' analysis produces resolution of superb detail in real time, with the ability to evaluate and monitor corneal pathology, post operative complications, and general corneal health. Views of the peripheral areas of the cornea and conjunctiva can also be seen.



Layers of the cornea – Oblique section (1) and surface-parallel sections (2 – 8).

Ciliary Zonules

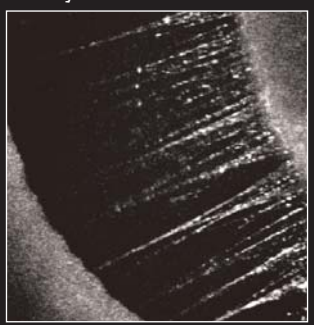


Image of a subluxated lens in-vivo non-contact imaging with a 10 x microscope objective (not included in standard configuration)

Enhanced Clinical Applications

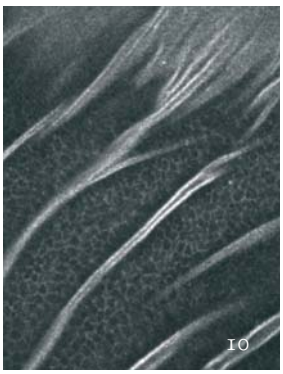
- Pre- and post-surgical assessment for LASIK, LASEK, lamellar and penetrating keratoplasty
- Evaluation of corneal and conjunctival infections
- Early diagnosis of corneal dystrophies
- Diagnosis of conjunctival and lid tumors
- Monitoring contact lens wear
- Post-surgical monitoring of filter blebs

In Vivo Histology

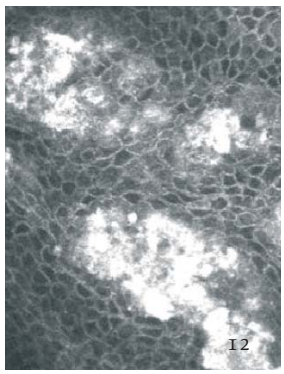
Differentiating corneal dystrophies and infections

For a long time, clinical evaluation and differentiation of corneal dystrophies were dependent on slit-lamp biomicroscopy. The Rostock Cornea Module provides information on infections and dystrophies on a cellular level in a non-invasive procedure.

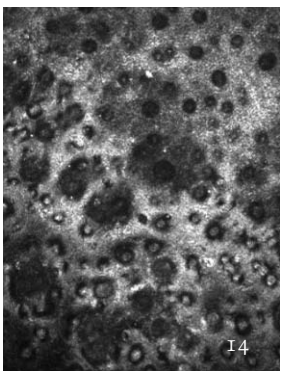
The confocal scanning technology creates a uniformly illuminated image. Cellular structures are shown in fine detail, facilitating in vivo histology.

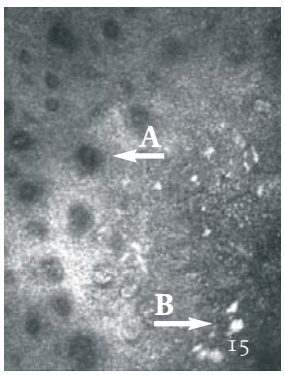


Map-Dot-Fingerprint Dystrophy
The multilaminar basement membrane extends into the epithelium (10, 11).

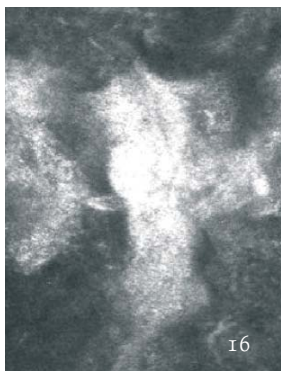


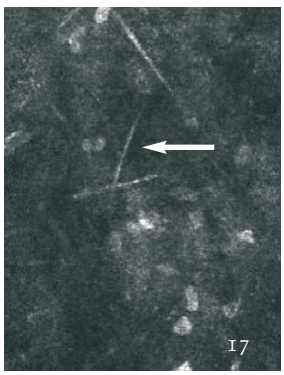
Granular Dystrophy
Hyperreflective granular opacities in the epithelium (12) and subepithelially (13).





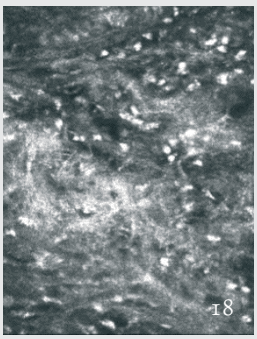
Fuchs' Endothelial Dystrophy
Endothelium with guttae (14); oblique endothelial section (15) with guttae (A) and retrocorneal pigment granules (B).

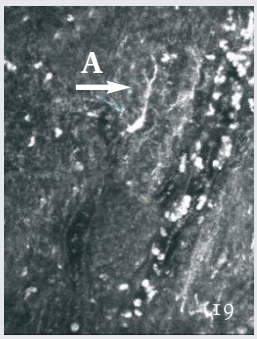




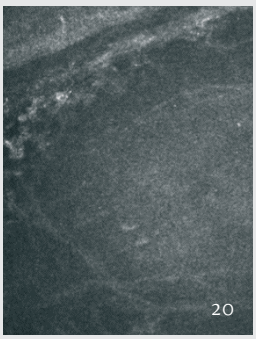
Lattice Dystrophy
Subepithelial hyperreflective lesion (16), deep stroma (17) demonstrating abnormally few keratocytes interspersed with hyperreflective lattice lines.

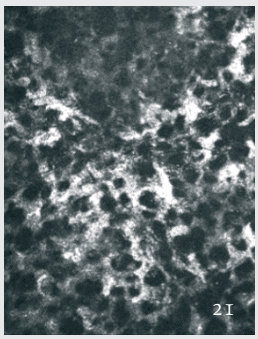
Corneal infections





Bacterial Keratitis
Leucocytes infiltrating the corneal stroma (18) and adhering to vessel walls (19); dendritic cell (A).





Viral Keratitis
Subepithelial (20) absence of nerve plexus; anterior stroma (21): hyperreflective keratocytes.

HRT II + Rostock Cornea Module
= Confocal Laser Microscope

Technical Specifications

Confocal imaging parallel to corneal surface
Acquisition modes:

- Section – single image
- Volume – 40 (30*) images over max. 80 (60*) µm depth scan
- Sequence – movie of 1–30 frames, variable depth

Manual choice of depth position
Automatic brightness adjustment, no focussing necessary
Manual pachymetry of corneal substructures
Semi-automated cell count
Upgradeable for all HRT II

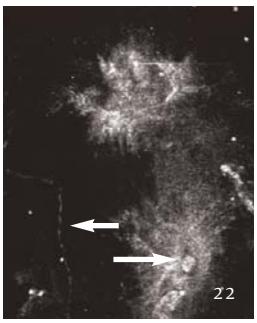
Focus range:	max. 1500 µm
Image size:	400 µm x 400 µm
Resolution (transversal):	~1 µm/pixel
Digital image size:	384 x 384 pixels
Microscope lens:	63 x, exchangeable (W 0,8 x 1/36')
Light source:	diode laser, 670 nm wavelength max. output power 200 µW laser class 1
Image acquisition time:	0.024 sec (2D image)
CCD camera image:	640 x 480 pixels
Power source:	~110–230 V/50–60 Hz
Disposable:	TomoCap, disposable sterile PPMA cap, 50 pcs./box

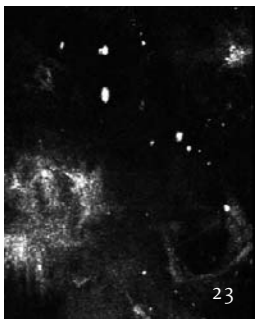
Made in Germany

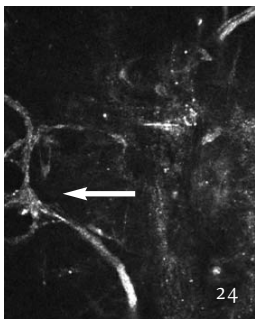
* HRT II serial no. <4222. Technical specifications are subject to change without notice. Patents: US 5,170,276; DE 41 03 298 C2; EP 0 498 280 B1, DE 296 12 466 U1, DE 296 19 361 U1

Clinical Applications

LASIK

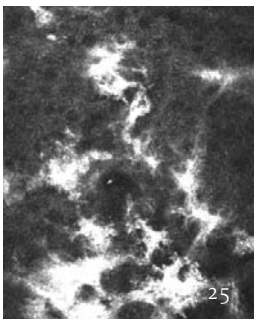


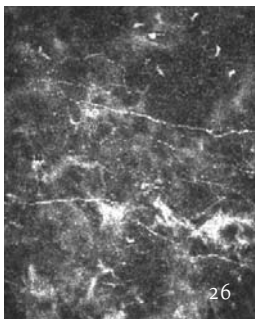




- Flap area (22) 6 months following LASIK: regenerated nerve loop, activated keratocyte (22), debris in corneal stroma (23).
- Flap area (24) 4 years post-operatively; subepithelial nerve plexus with regenerated nerve loops and highly reflective cristalline bodies.

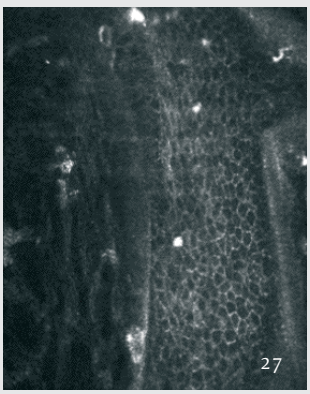
LASEK





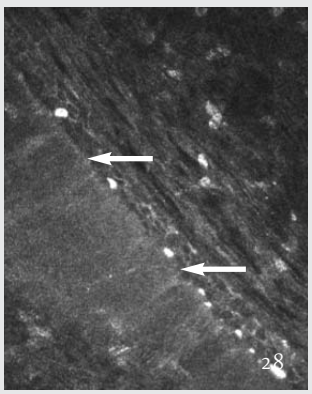
- Subepithelial tissue 3 months following LASEK (25): nearly complete loss of nerve plexus and hyperreflective lesion.
- Subepithelial tissue 22 months post-operatively (26): regenerating nerve plexus, hyperreflective “scar tissue”.

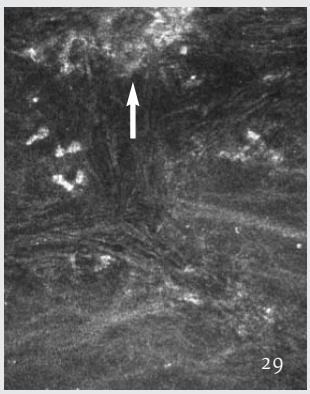
Radial Keratotomy



- Deep infiltration of the incisions by epithelial cells after radial keratotomy at 127 µm depth (27).

Lamellar Keratoplasty



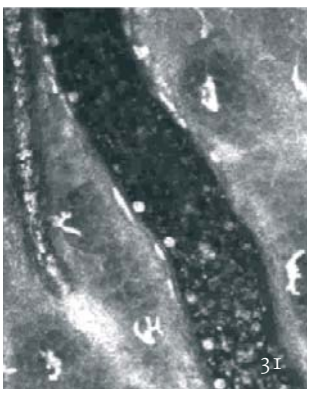


- Location of a corneal scar at 103 µm depth (28).
- Clear cornea 3 weeks following Femtosecond-Laser Keratoplasty. Interface at 118 µm depth (29): transparent matrix material.

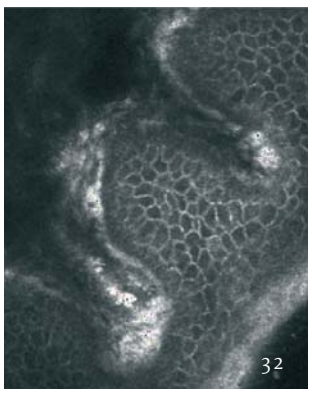
Penetrating Keratoplasty

- Corneal stroma: 10.0 nylon suture surrounded by inflammatory cells (30).

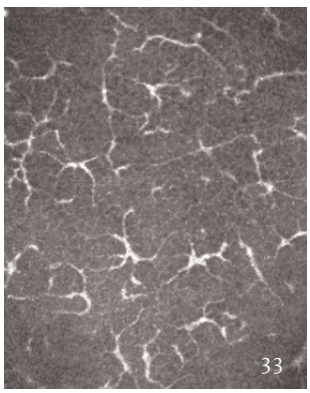
Limbus and conjunctiva



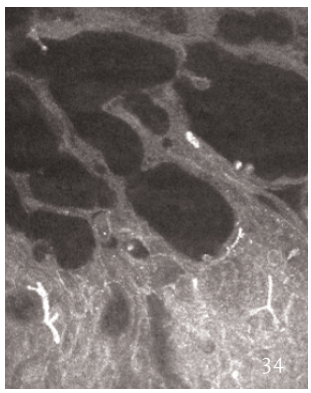
Erythrocyte and lymphocyte flow



Vogt Palisades



Limbal Langerhans cells



Aqueous humor blebs after trabeculectomy

Images courtesy of **Prof. R. Guthoff, MD, Prof. J. Stave, PhD, A. Zhivov, MD,** University of Rostock, Germany (1-9, 14, 15, 23);
Prof. C. Baudouin, MD, Professor and chairman, National Ophthalmology Hospital Paris, France (10, 11, 27, 31–34);
E. M. Messmer, MD, Ludwig-Maximilians University, Munich, Germany (12, 13, 16-22, 24-26, 30); **B. Pajic, MD,** Pallas Klinik Olten, Olten, Switzerland (28, 29).

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