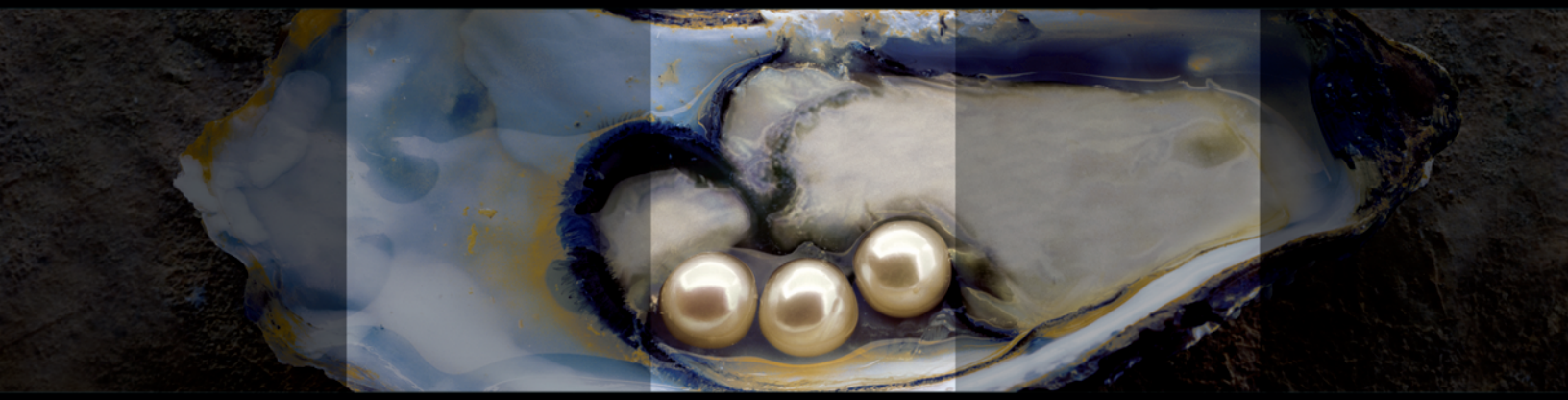
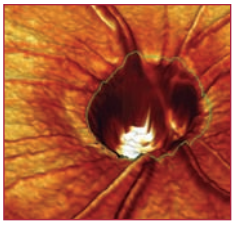
The Measure of Confidence



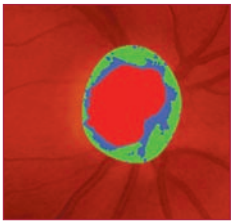
HRT 3

HEIDELBERG ENGINEERING

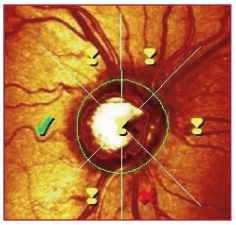
HRT3 with TruTrack™



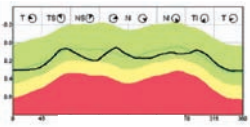
3-D Image of the Optic Nerve



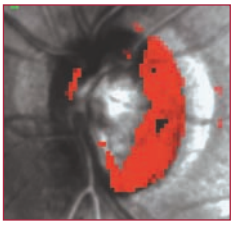
Topography Image: Neurotinal Rim (blue/green) and Optic Cup (red)



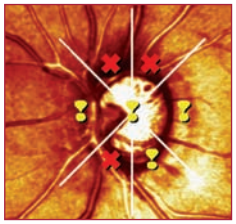
Moorfields Regression Analysis



RNFL Profile



Topographic Change Analysis



Glaucoma Probability Score™

Glaucoma Module—Premium Edition

Proven Performer in the Ocular Hypertension Treatment Study (OHTS)[1]

Advanced Glaucoma Analysis

- Enhanced version of Heidelberg Engineering's glaucoma software, including Moorfields Regression Analysis
- OU analysis provides asymmetry assessment
- RNFL profile plotted over normative data bands
- Expanded normative databases
- Ethnic-selectable databases customized to patient's ancestry
- All parameters adjusted for optic disc size
- Optic disc classified as "small", "average", or "large"

Glaucoma Probability Score™ (GPS)

- A disease probability value based on computer learning
- Provides similar sensitivity and specificity as Moorfields Regression Analysis
- No need to draw a contour line
- More objective, less operator skill dependent

Topographic Change Analysis (TCA)—Progression Detection

- Using TruTrack™ Image Alignment technology, statistically significant progression is identified and tracked
- Computes both area and volume of change
- Gradient color scale differentiates degree of change
- Validated against a database with over 10 years of follow-up

The HRT Glaucoma Module Advantage

The HRT is the most studied imaging technology shown to accurately measure all aspects of the optic nerve head.

CUP

The HRT quantifies the size and shape of the optic disc cup, providing crucial information—including cup-to-disc ratio.

RIM

Rim measurements are included in the Moorfields Regression Analysis, which evaluates the size of the rim with respect to the size of the optic disc.

RNFL

RNFL information facilitates evaluation of the integrity and symmetry of the double-hump pattern as well as analysis of superior and inferior thickness profiles.

Image Acquisition Quality Control

1. Zangwill LM, Weinreb RN, Beiser JA, et al. Baseline topographic optic disc measurements are associated with the development of primary open-angle glaucoma: the Confocal Scanning Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study. *Arch Ophthalmol.* 2005;123(9):1188-1197.

Image Alignment

Retina Module—Premium Edition

Retinal Thickness and Edema Index

HRT Retina Module features retinal thickness measurements that enable identification and tracking of structural changes due to retinal pathologies including age-related macular degeneration (AMD), diabetic macular edema (DME), and cystoid macular edema (CME).

- Color-coded 2-D and 3-D thickness maps of the retina
- Edema Index can reveal early structural change
- Automatic TruTrack™ image alignment for follow-up investigations
- Thickness map overlaid on vessel pattern for comparison with color fundus, FA and ICGA
- Detect structural change from DME at a preclinical stage[2]
- Real-time quality checks with instant operator feedback
- Quick patient review, non-invasive, with or without dilation
- Free positioning of ETDRS grid

The HRT Retina Module Advantage

SPEED

Compared to the Time Domain OCT Fast Macular Thickness Map, HRT Retinal Images are 10x faster—minimizing eye movement artifact.

VOLUME

Compared to the Time Domain OCT Fast Macular Thickness Map, the HRT acquires 200x more data and scans 32x more images per exam that help the HRT separate fact from artifact.

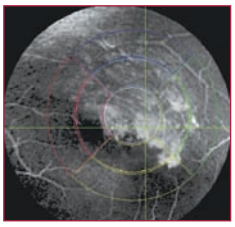
PRECISION

Utilizing vessel patterns and other landmarks, the HRT's TruTrack™ Image Alignment technology aligns scans for composite images which enables clinicians to track changes over time.

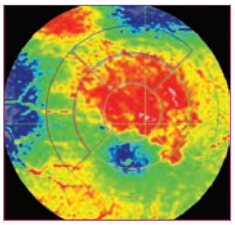
Interactive quality control. Operator prompts to correct focus, centering, and brightness. Plain-language quality indicator on printout.

2. Kisilevsky M, Hudson C, Flanagan JG, et al. Agreement of the Heidelberg Retina Tomograph II macula edema module with fundus biomicroscopy in diabetic maculopathy. *Arch Ophthalmol.* 2006;124(3):337-347.

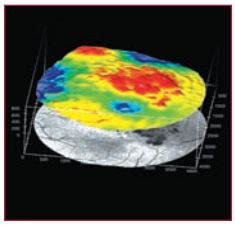
DME



Edema Index Map

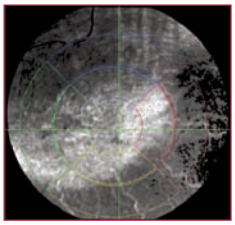


2-D Retinal Thickness Map

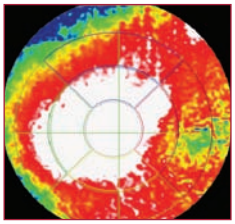


3-D Retinal Thickness Map

AMD



Edema Index Map

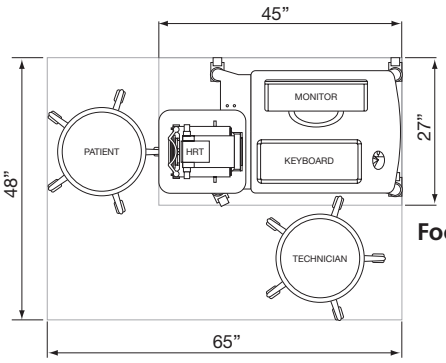


2-D Retinal Thickness Map

Five Powerful Solutions to Fit Your Practice

HRT3

	FastCheck+™ GPS Software and Retina Edema Index	PowerCheck™ Glaucoma Glaucoma Module Premium Edition	PowerCheck™ Retina Retina Module Premium Edition	Advanced Glaucoma and Retina Premium Edition Modules	Elite Glaucoma, Retina, and Cornea
Software Included					
Eye Explorer Data Management	●	●	●	●	●
GPS – Glaucoma Probability Score™	●	●		●	●
Image Quality Control	●	●	●	●	●
Advanced Glaucoma Analysis		●		●	●
TCA – Topographic Change Analysis		●		●	●
Retinal Edema Index	●		●	●	●
Retinal Thickness			●	●	●
Rostock Cornea Module					●
Network Ready	●	●	●	●	●
Hardware Included					
Scanning Laser	●	●	●	●	●
Computer	●	●	●	●	●
External Data Drive	●	●	●	●	●
Printer	●	●	●	●	●
Custom Table		●	●	●	●
Cornea Microscope Adapter Package					●



Footprint: HRT on custom table

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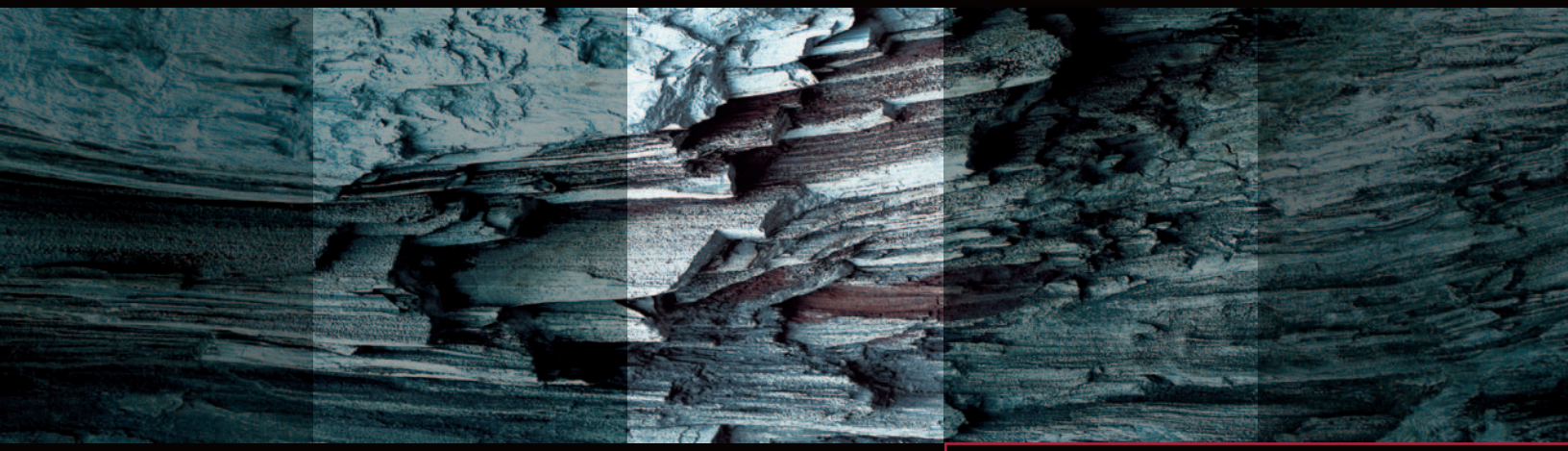
Distinction layer by layer



HRT Rostock Cornea Module

HEIDELBERG ENGINEERING

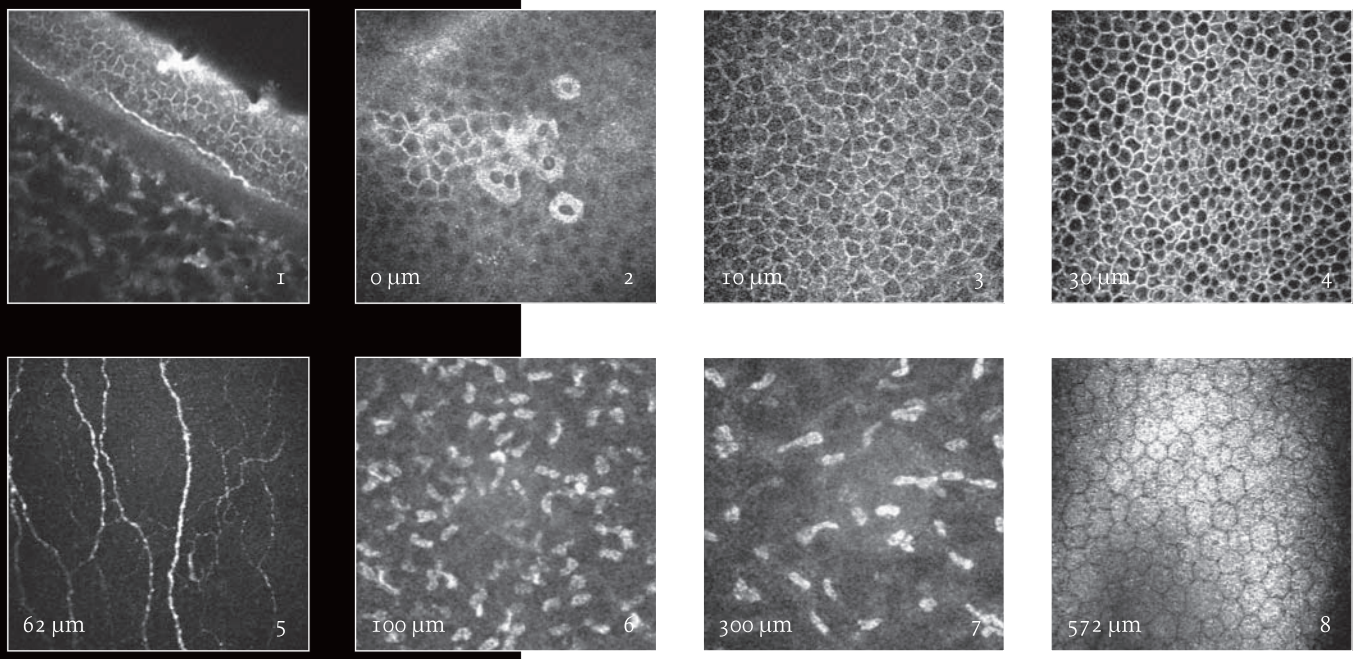
Confocal Laser Microscopy

- **Uniform illumination, undistorted image**
- **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 laser scanning technology and the Rostock Cornea Module, developed at Rostock University in 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

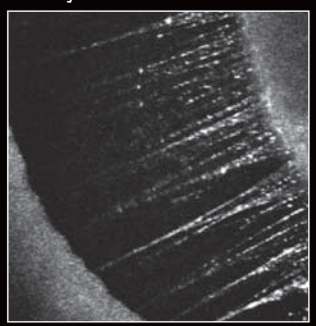


Image of a subluxated lens in-vivo non-contact imaging with a 10 x microscope objective (not included in standard configuration)

Enhanced Clinical Applications

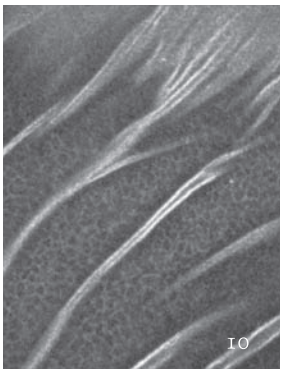
- Pre- and post-surgical assessment for LASIK, LASEK, lamellar and penetrating keratoplasty
- Evaluation of corneal and conjunctival infections
- Assessment of corneal dystrophies
- Assessment of conjunctival and lid tumors
- Monitoring contact lens wear
- Post-surgical monitoring of filter blebs

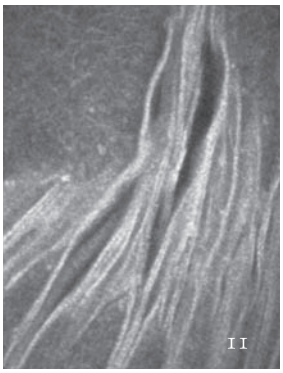
In Vivo Histology

Corneal dystrophies and infections

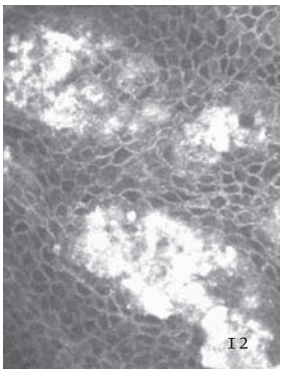
Clinical evaluation and differentiation of corneal dystrophies have been dependent on slit-lamp biomicroscopy.
The Rostock Cornea Module provides information on infections and dystrophies on a cellular level in a non-invasive procedure.

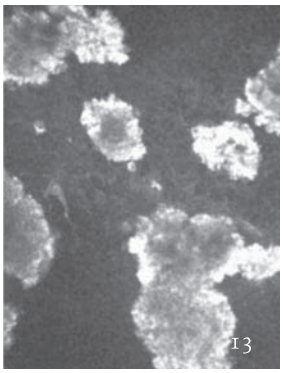
The confocal scanning technology creates a uniformly illuminated image. Cellular structures are shown in fine detail, facilitating in vivo histology.



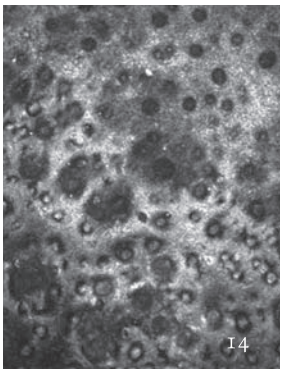


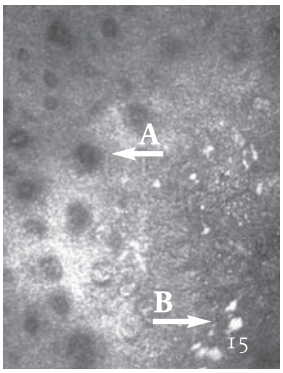
Map-Dot-Fingerprint Dystrophy
The multilaminar basement membrane extends into the epithelium (10, 11).



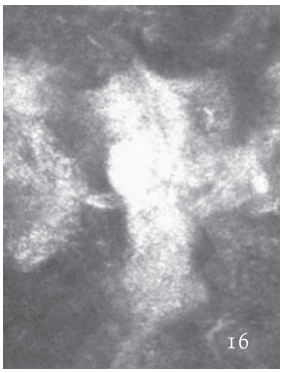


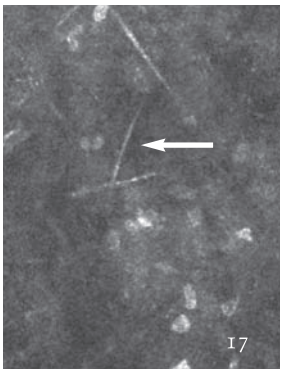
Granular Dystrophy
Hyperreflective granular opacities in the epithelium (12) and subepithelially (13).





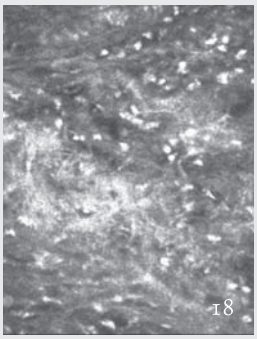
Fuchs' Endothelial Dystrophy
Endothelium with guttae (14); oblique endothelial section (15) with guttae (A) and retrocorneal pigment granules (B).

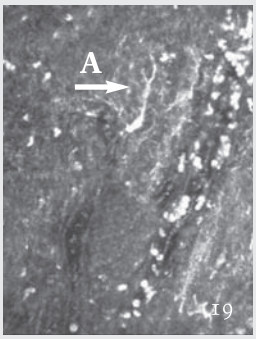




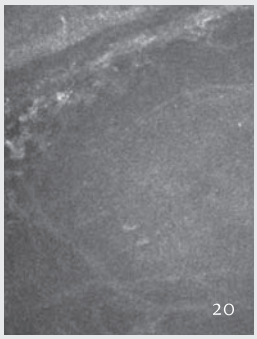
Lattice Dystrophy
Subepithelial hyperreflective lesion (16), deep stroma (17) demonstrating abnormally few keratocytes interspersed with hyperreflective lattice lines.

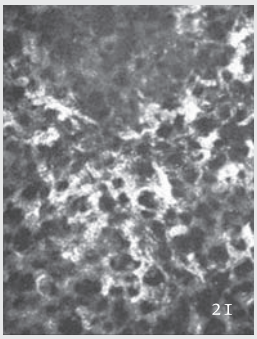
Corneal infections





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 + 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 and HRT 3

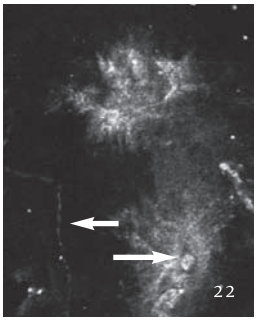
Focus range:	max. 1500 µm
Image size:	400 µm x 400 µm or 300 µm x 300 µm
Resolution (transversal):	~1 µm/pixel
Digital image size:	384 x 384 pixels
Microscope lens:	63 x, exchangeable (W 0,8 x 1/36')
Light source:	diode laser, 670 nm wavelength
	max. output power 200 µW
	laser class 1
Image acquisition 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 PMMA cap, 50 pcs./box

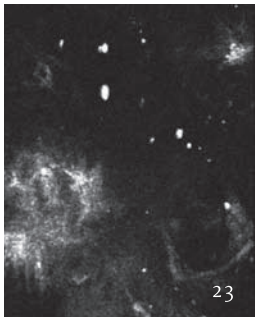
Made in Germany

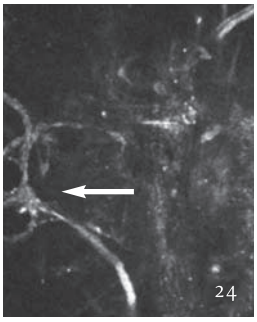
*HRT II serial no. <4222. Technical specifications are subject to change without notice. Patents: US 5,170,276; DE 41 03 298; EP 0 498 280, JP 0 511 92 77, DE 296 12 466, DE 296 19 361

Clinical Applications

LASIK

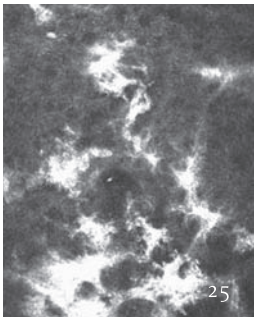


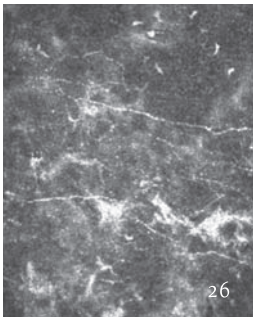




- Flap area (22) 6 months following LASIK: regenerated nerve loop, activated keratocyte (22), debris in corneal stroma (23).
- Flap area (24) 4 years post-operatively; subepithelial nerve plexus with regenerated nerve loops and highly reflective crystalline bodies.

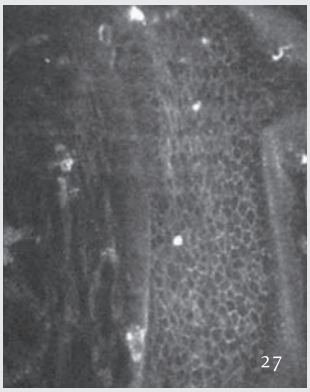
LASEK





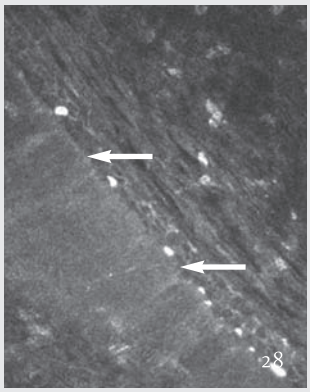
- Subepithelial tissue 3 months following LASEK (25): nearly complete loss of nerve plexus and hyperreflective lesion.
- Subepithelial tissue 22 months post-operatively (26): regenerating nerve plexus, hyperreflective “scar tissue”.

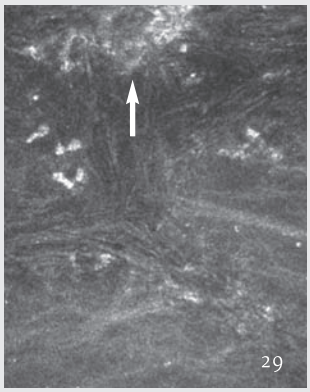
Radial Keratotomy



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

Lamellar Keratoplasty



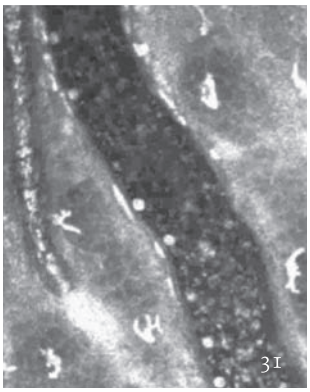


- Location of a corneal scar at 103 µm depth (28).
- Clear cornea 3 weeks following Femtosecond-Laser Keratoplasty. Interface at 118 µm depth (29): transparent matrix material.

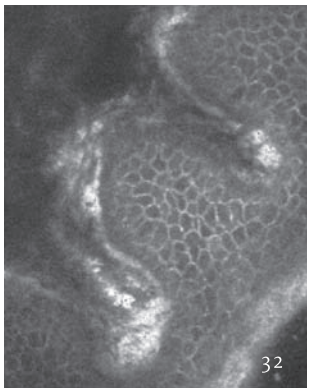
Penetrating Keratoplasty

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

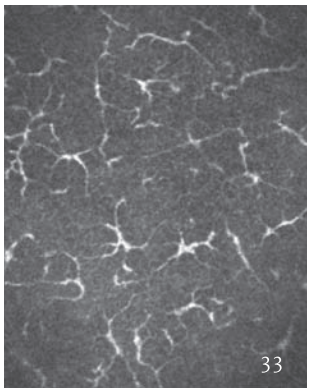
Limbus and conjunctiva



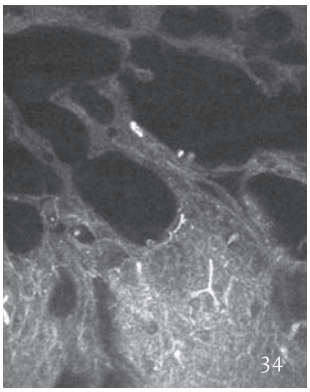
Erythrocyte and lymphocyte flow



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);
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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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