OCTs & Fundus Photography

Explore what they are & how they allow us to better understand retinal pathology

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At the end of the workshop, you'll be able to:

- Describe the basic parts of the posterior ocular anatomy being imaged during OCTs and Fundus Photography.
- List common ocular diseases/conditions for which OCT and Fundus Photography may be ordered.
- Describe 2-4 reasons why an image may be blurred, display artifacts, or be difficult to capture and what to do to maximize image quality for each.
- Demonstrate how to capture clear images on OCT and Fundus Photography.

DID YOU KNOW?

The retina is about the size of a **postage stamp**.

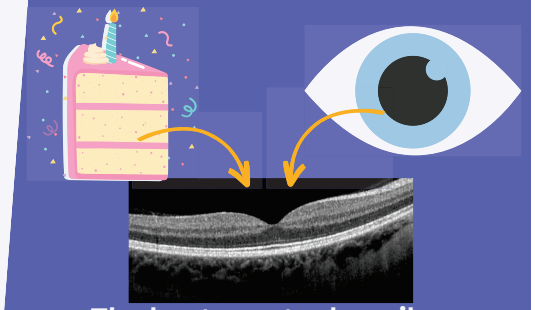
Inside that small space there are ~**3.5 million** retinal pigment epithelium (RPE) cells, **4-5 million** cones, & about **77-107 million** rods!

I make a lot of jokes about eyes...

You could say I have vitreous humor.

What is an OCT?

Optical coherence tomography (OCT) is a non-invasive imaging test that uses light waves to take high-resolution, three-dimensional images of different structures within the eye.



The best way to describe it is like a slice of Birthday Cake!

The OCT allows us to see all of the retinal layers that we wouldn't be able to see without cutting a slice out!

Heidelberg / Zeiss

Heidelberg / Zeiss

What are the differences?

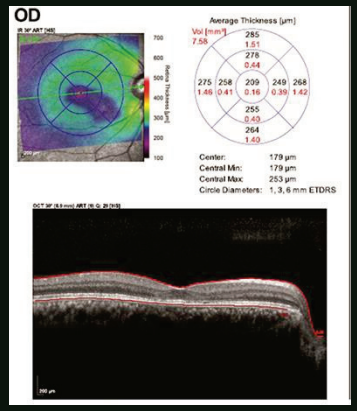
Technical Specs for Heidelberg:

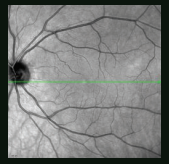
- Confocal Scanning Laser Ophthalmoscopy: cSLO provides image detail and clarity not available from fundus photography.
- TruTrack Active Eye Tracking: allows for precise, automated retinal follow-up scanning, & retinal thickness measurement reproducibility to 1 micron.
- AutoRescan: Automatically places follow-up scans in precisely the same position.
- SPECTRALIS® Noise Reduction: Acquires multiple images in the exact same location, differentiating structural information from noise and removes the noise.
- High resolution OCT images of Retinal layers, Optic Nerve Head, Retina Nerve Fiber Layers, Cornea, Sclera, & Anterior Chamber Angle.

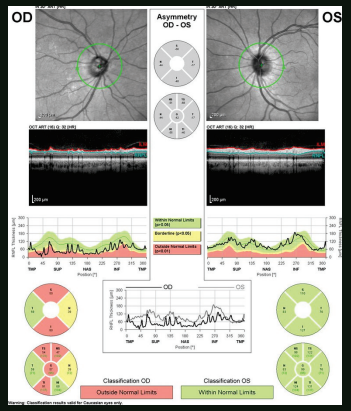
Technical Specs for Zeiss:

- FastTrac™: reduces eye motion artifacts with a proprietary scan acquisition strategy, high speed 20 Hz LSO camera, and single-pass alignment scanning. It also allows you can scan at the highest resolution at the same location at each visit.
- 60-degree OCTA widefield view
- High resolution OCT images of Retinal layers, Optic Nerve Head, Retina Nerve Fiber Layers, Cornea, & Anterior Chamber Angle.

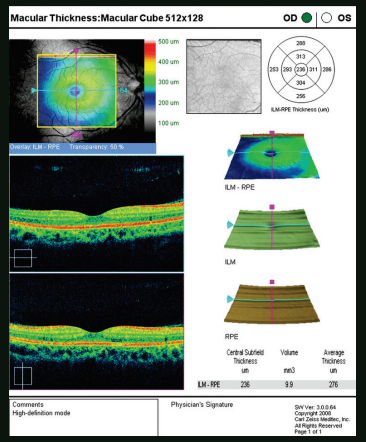
Imaging - Heidelberg

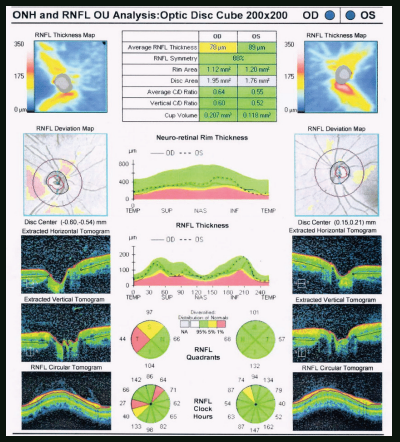






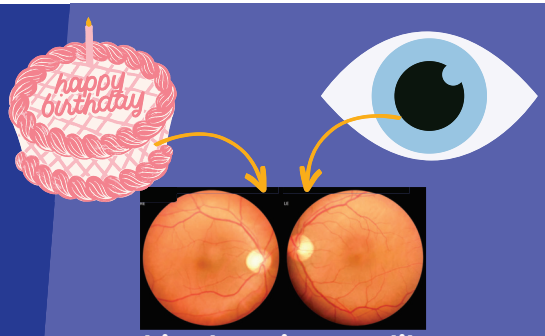
Imaging - Zeiss





What is Fundus Photography?

Fundus photography is a simple, non-invasive imaging test that takes two-dimensional photographs of the back inner wall of your eye, known as the Fundus.



This photo is more like looking at the top of a Birthday Cake.

It allows you to see changes in the anatomy on a more surface level.

Clarus / Optos

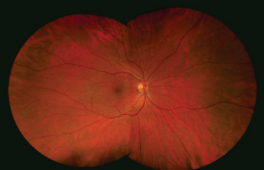
Clarus / Optos

What are the differences?

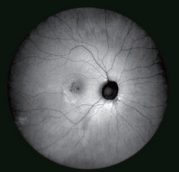
Technical Specs for Clarus:
- Resolution: 7.3 µm
- Field of View :
  - Widefield (one image) - 133˚
  - Ultra-widefield (two images) - 200˚
  - Montage (up to six images) - up to 267˚
- Wavelengths:
  - Red LED: 585 - 640 nm
  - Green LED: 500 - 585 nm
  - Blue LED: 435 - 500 nm
  - Infrared laser diode: 785 nm
- Capture Time: Less than 0.2 seconds

Technical Specs for Optos:
- Resolution: 20 µm
- Field of View :
  - Standard: 200° Single Shot
  - Auto-montage: Up to 220°
- Wavelengths:
  - Red laser: 635 nm
  - Green laser: 532 nm
  - Blue laser: 488 nm
  - Infrared laser: 802 nm
- Capture Time: Less than 0.4 seconds

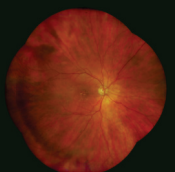
Image Modalities - Clarus



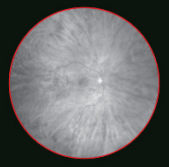
Ultra-wide True Color



Fundus Autofluorescence

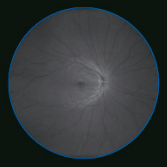


True Color Automontage



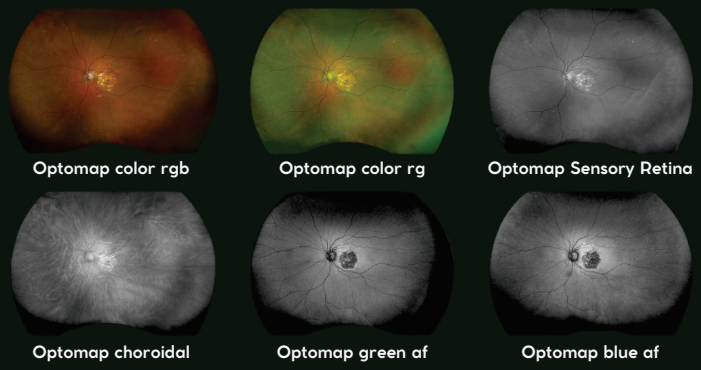
Red Channel

Green Channel

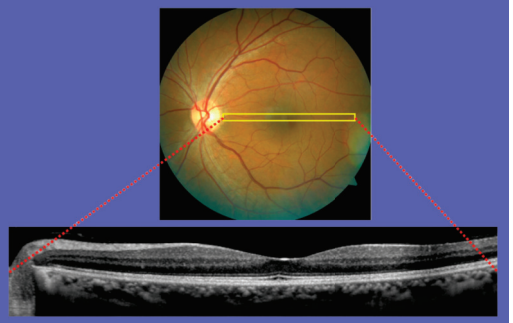


Blue Channel

Image Modalities - Optos

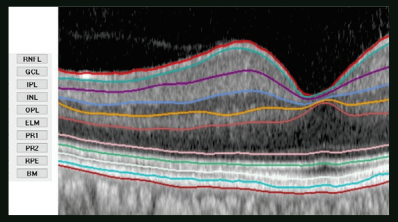


What posterior anatomy do these scans capture?



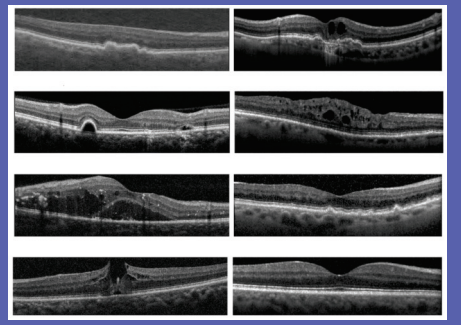
OCTs / Fundus Photography

- Posterior segment anatomy
  - 10 Retinal Layers
  - Macula
  - Optic Nerve



- Posterior segment anatomy
  - Retina
  - Macula
  - Retinal Blood Vessels
  - Optic Nerve Head
  - Choroid
  - Vitreous

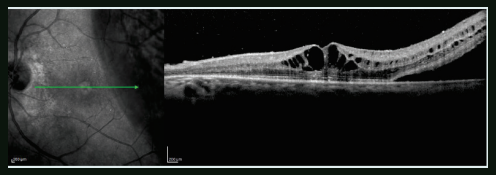
What ocular conditions might require an OCT or Fundus Photography?

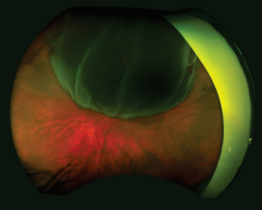


OCTs / Fundus Photography

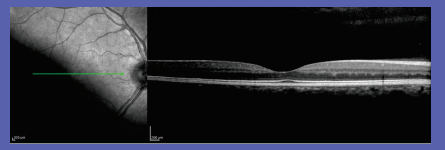
Almost all pathology of the posterior segment of the eye can be detected with a fundus camera or an OCT. A few of the most common conditions are:

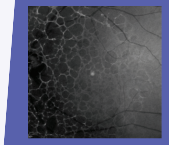
- macular holes
- Epiretinal Membrane (ERM)
- macular edema
- age-related macular degeneration (AMD)
- geographic atrophy
- central serous retinopathy
- diabetic retinopathy
- vitreous traction
- abnormal blood vessels
- blood vessel blockage
- drusen
- retinal tears
- retinal detachments
- schisis
- lesions and nevi

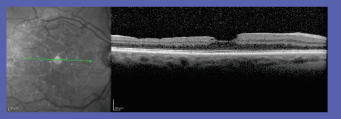


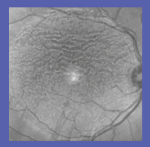


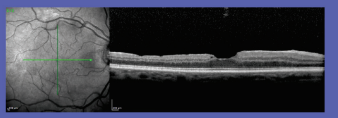
Why might it be difficult to capture a quality scan?







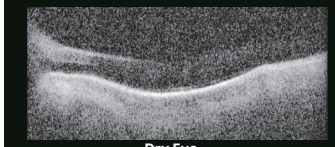




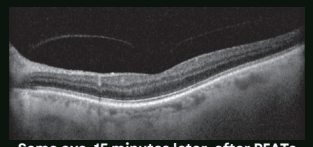
OCTs / Fundus Photography

OCTs and Fundus Photography rely on light waves to acquire images, therefore they aren't as effective when capturing through conditions that interfere with light passing through the eye; including:

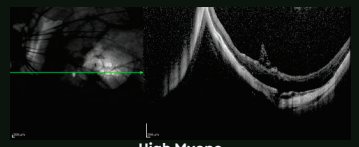
- Poorly dilated pupils
- Clouding or scarring of the cornea
- Dry eyes
- Dense cataracts
- Myopia
- Dense vitreous floaters
- Significant bleeding in the vitreous



Dry Eye



Same eye, 15 minutes later, after PFATs



High Myope

OCTs / Fundus Photography

Additional causes for artifacts or poor images include:

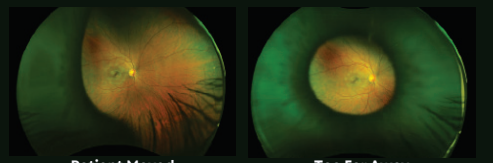
- Poor patient positioning
  - Being too close or too far away
  - Eyelids or Eyelashes in the way
  - The patient's nose casting a shadow
  - Poor pupil alignment
  - Patient movement
- Mask fogging the lens of the instrument
- Dust, smudges, or debris on the camera lens

Mask causing the lens to fog

OCTs / Fundus Photography

How to minimize artifacts

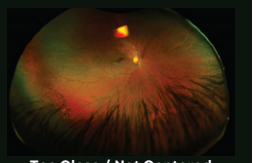
- Ensure proper patient positioning, including sitting straight and aligning the canthus mark with the center of the pupil.
- Instruct the patient to fixate on the target and minimize blinking during the scan, utilizing BSS if necessary.
- Turn the patient's head slightly so their nose is out of the picture.
- Adjust the table height to reduce patient fatigue and movement.
- If needed, hold or tape lids/lashes up and out of the way.
- Properly care for your instrument by keeping it clean and dust free.



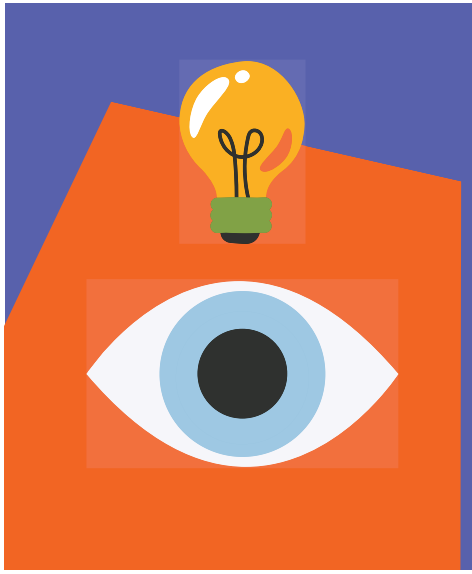
Patient Moved

Too Far Away

Lid Obscuring Image



Too Close / Not Centered



Your Turn!

Summing Up

Anatomy

OCT vs. Fundus Photography

- Retinal Layers
- Macula
- Optic Nerve
- Vitreous

Conditions

- AMD
- ERM
- NPDR
- Drusen
- Macular Holes & Edema

How to Troubleshoot

- Hold/Tape Lids
- Adjust positioning
- Are you too close?
- Are you too far away?
- Are the eyes dry?

How to Capture

OCTs:

- Heidelberg & Zeiss

Fundus Photography:

- Optos & Clarus

Any Questions?

Sources

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