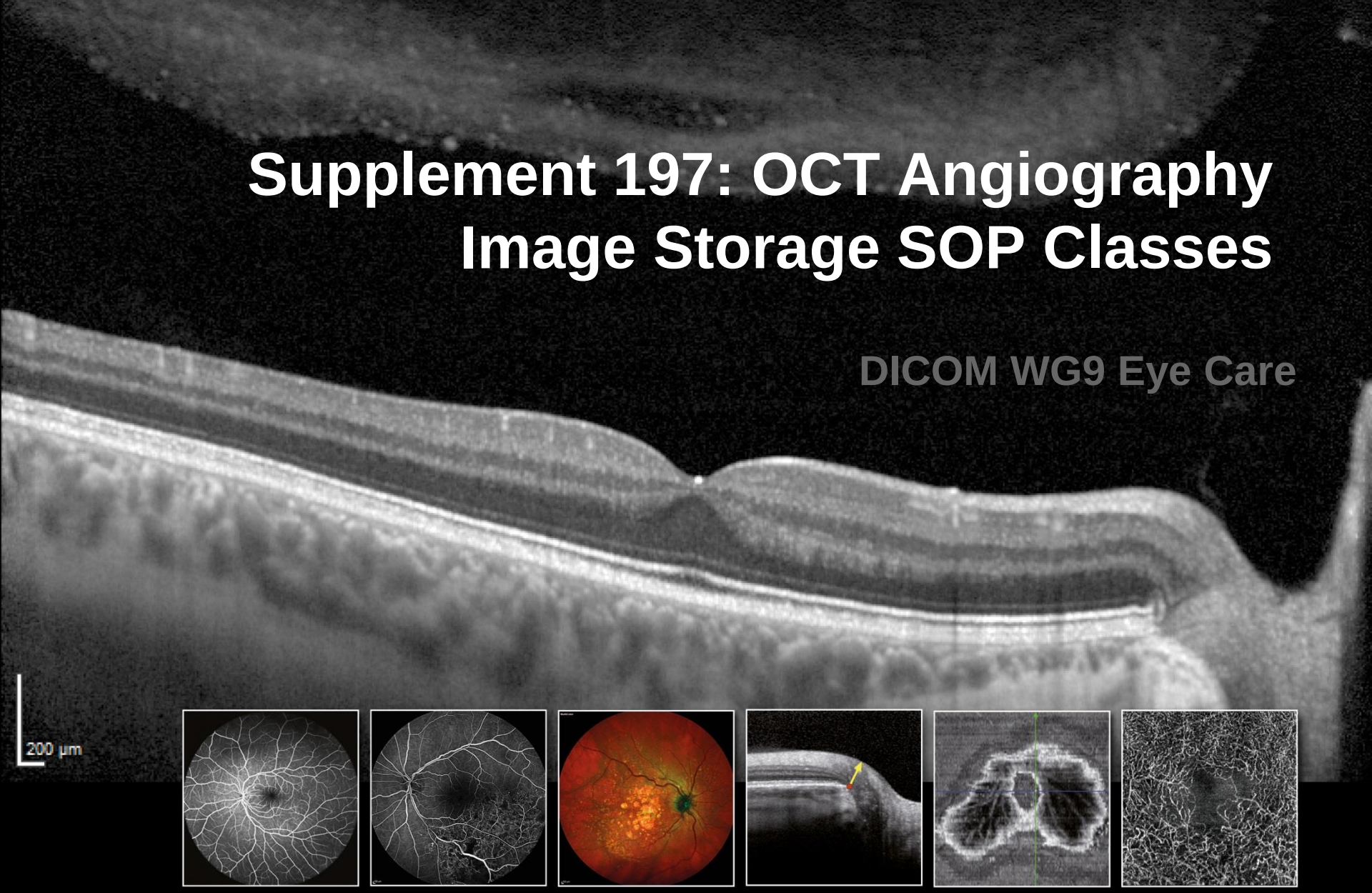
Supplement 197: OCT Angiography Image Storage SOP Classes

DICOM WG9 Eye Care

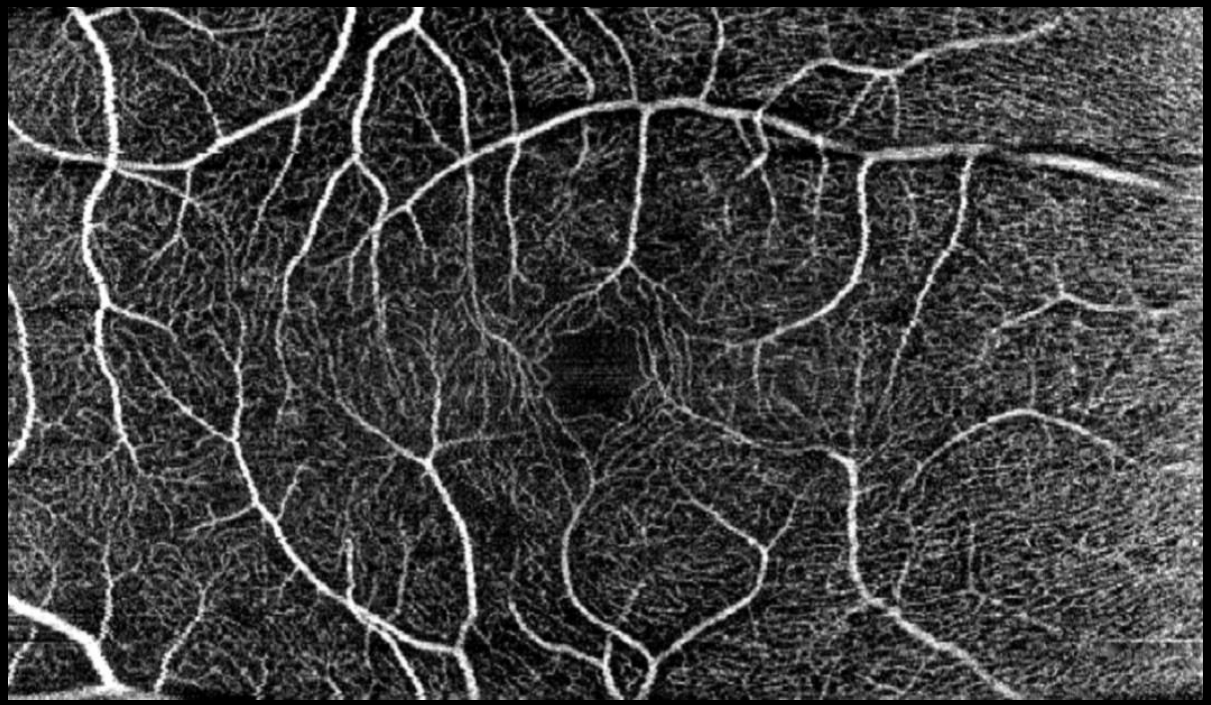


2016

OCT-A

Separating Vascular Networks

OCT-Angiography - Outcome



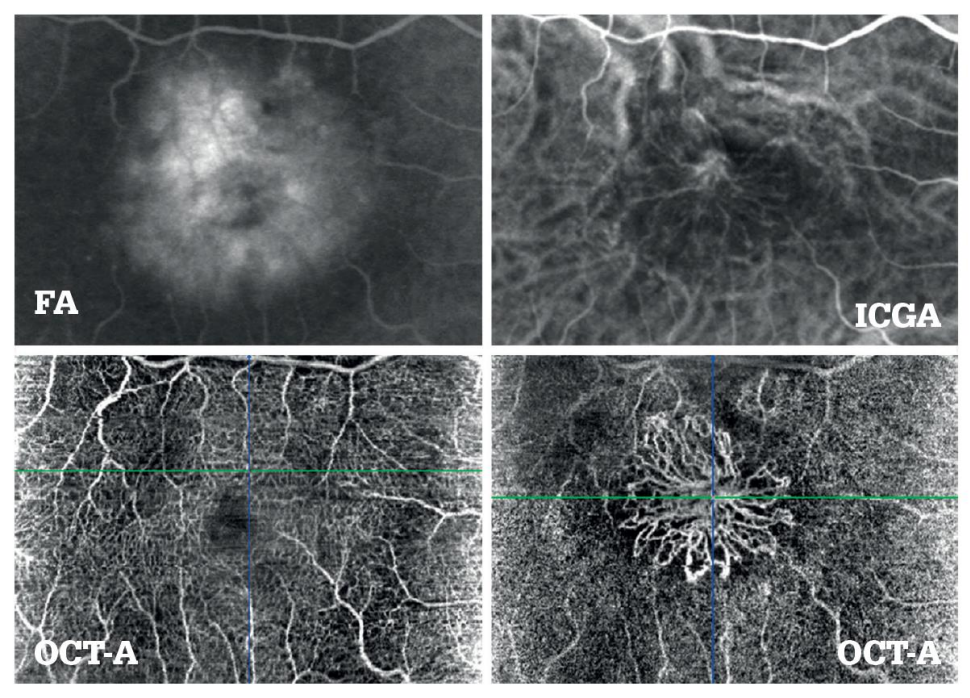
Clinicians typically make their assessment based on the OCT En face images derived from OCT structure and/or flow volumetric data.

OCT-A

- Separating Vascular Networks

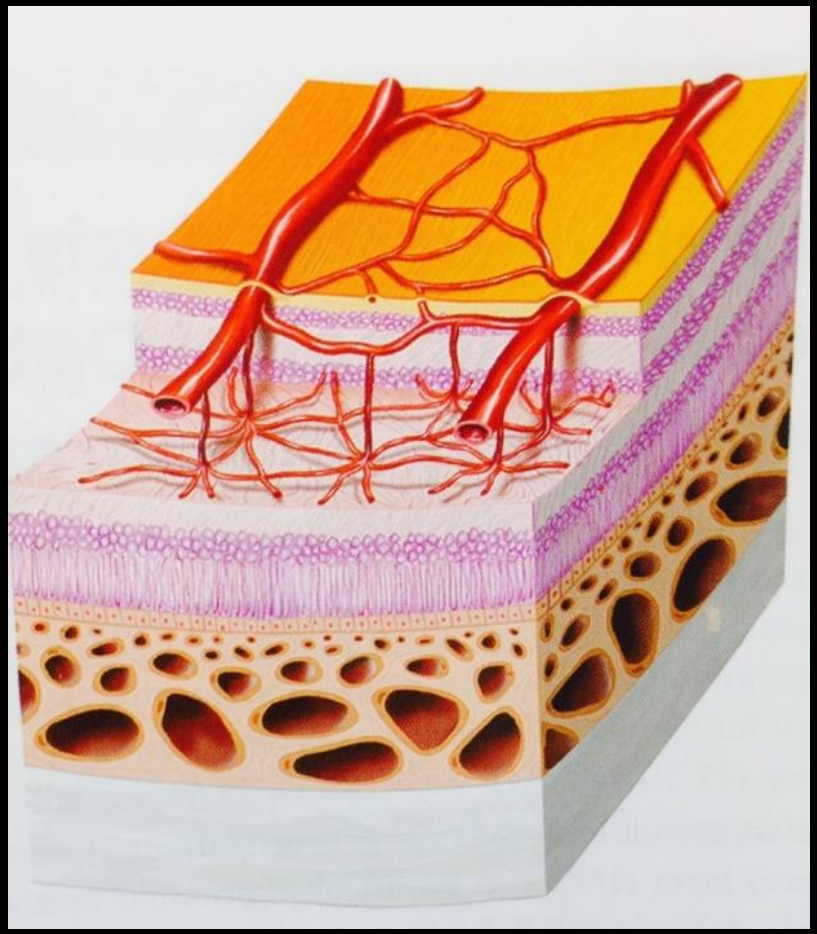
- Fluorescence angiography – typically using fluorescein (FA) or indocyanine green (ICG) as the fluorescent contrast agent – has been the standard method, but both have disadvantages:
  - nausea and allergic reactions
  - patients have to be prepared before the procedure, monitored afterwards, and the contrast agent isn't free of charge
- OCT-A will not replace the above for all cases – e.g. it's not able to capture leakages

OCT-A



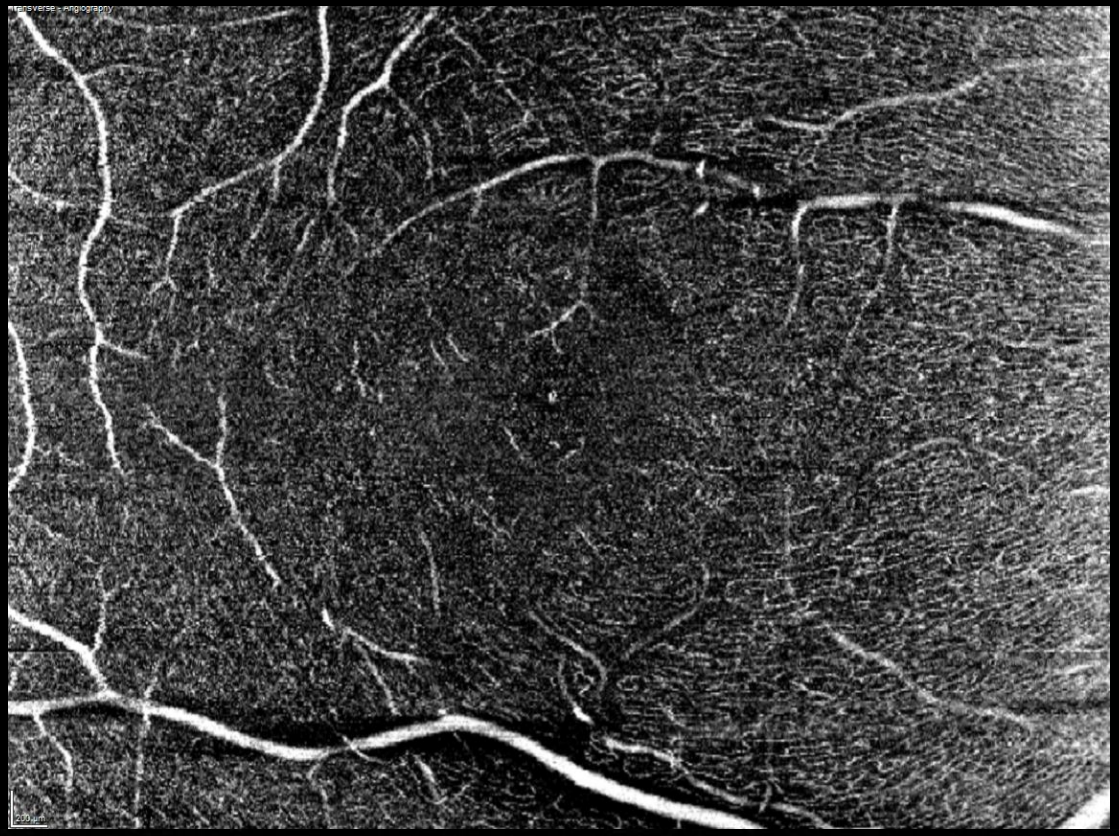
Patient with mCNV. FA/ICGA images (top) show capillary leakage; OCT-A (bottom) provides a superior visualization of the newly formed vessels and depth-resolved resolution of vascular perfusion –
neovascularization is clearly visible in deeper layers (right) than in superficial layers (left).

Vascular Network of the Posterior Segment



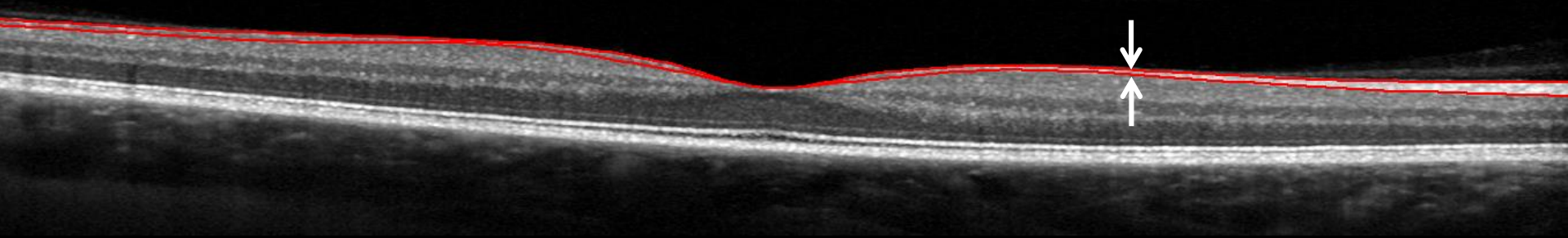
- Superficial Vascular Plexus (SP)
  - Large Vessels
  - Observable with ophthalmoscope
- Deep Vascular Plexus (DP)
  - Fine network of small sized capillaries
- Choroid
  - Choroiocapillaris

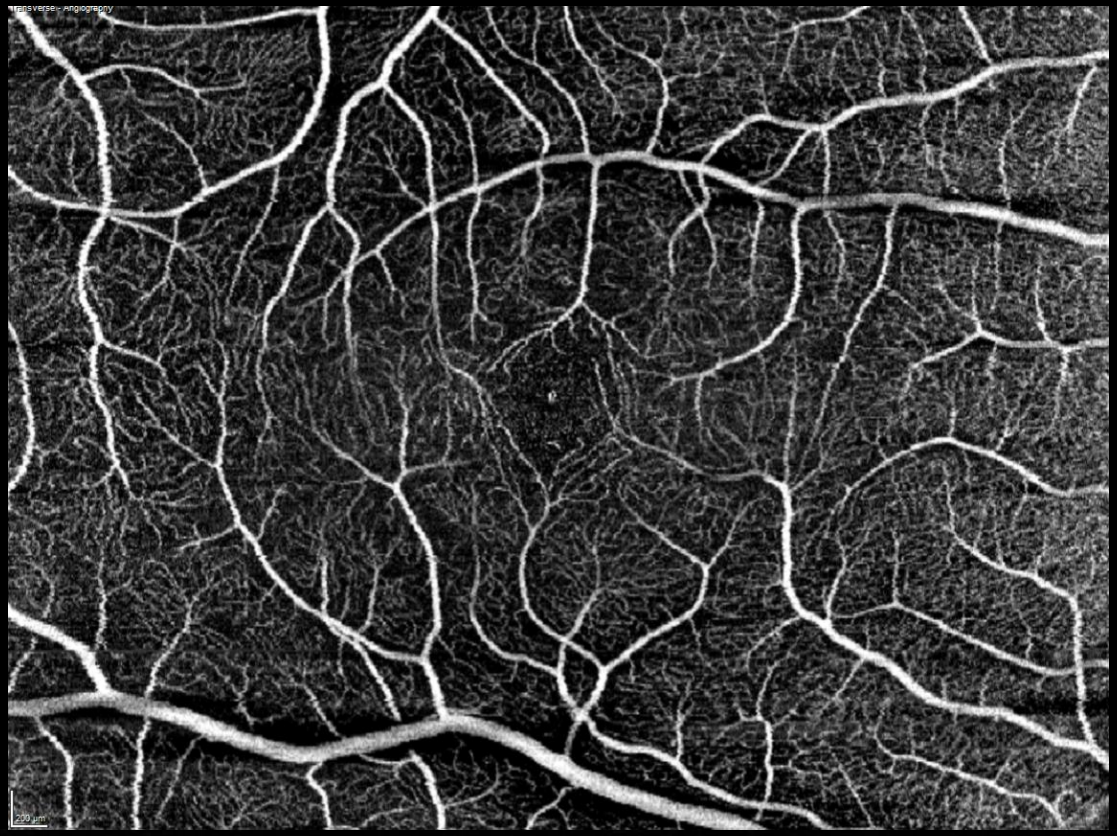
Layers of the Vascular Network



Perifoveal Arcade

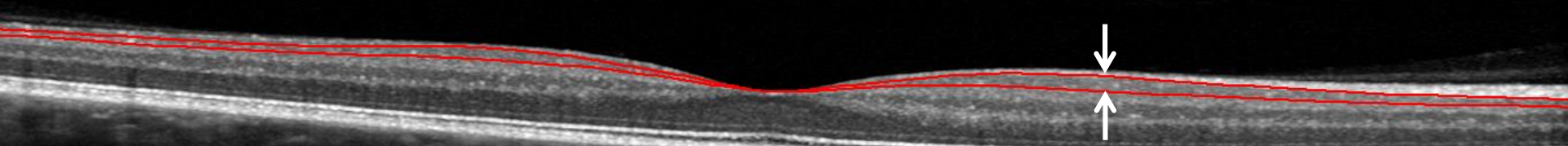
Retinal Nerve Fiber Layer

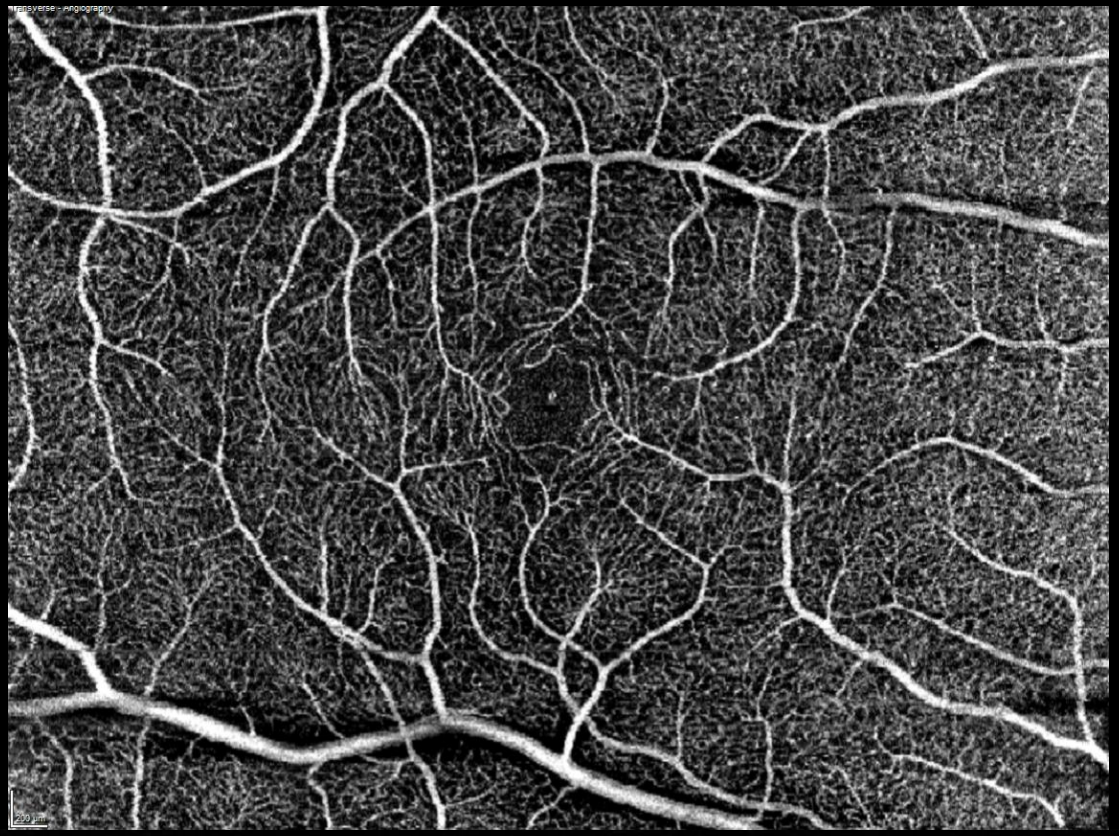




Superficial Capillary Plexus & Perifoveal Arcade

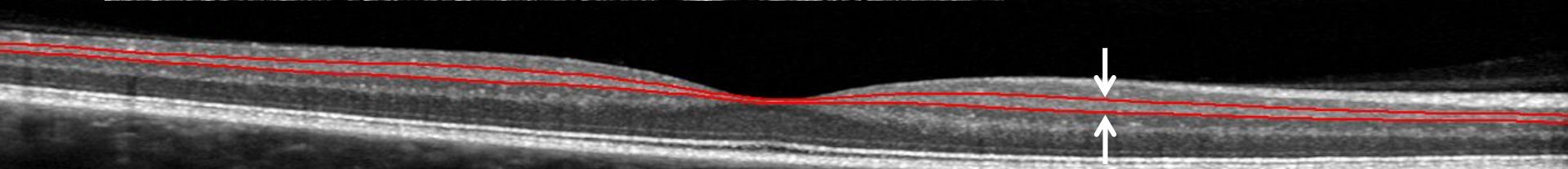
Ganglion Cell Layer

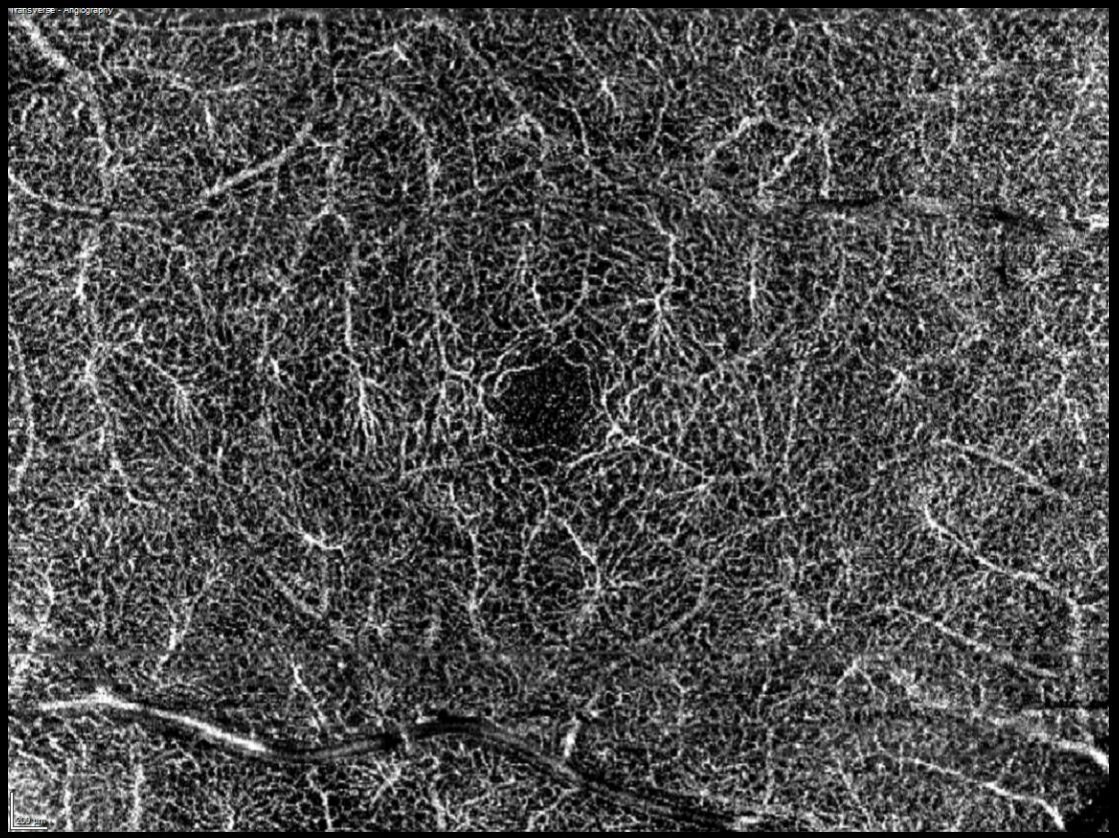




Superficial Capillary Plexus (& Perifoveal Arcade)

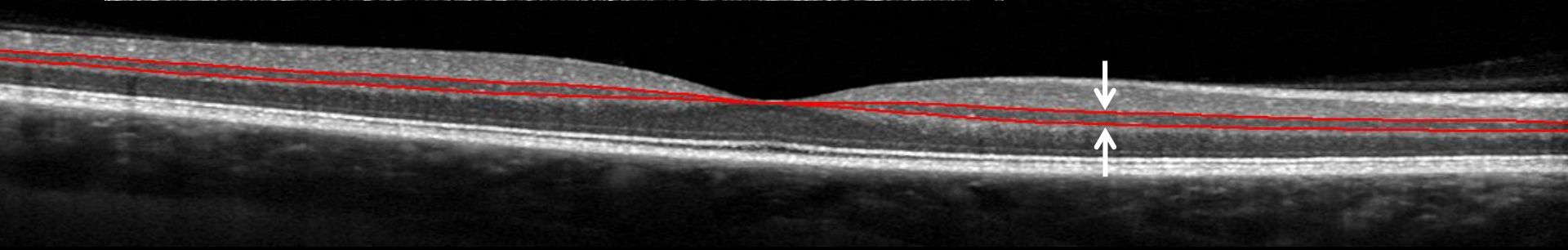
Inner Plexiform Layer

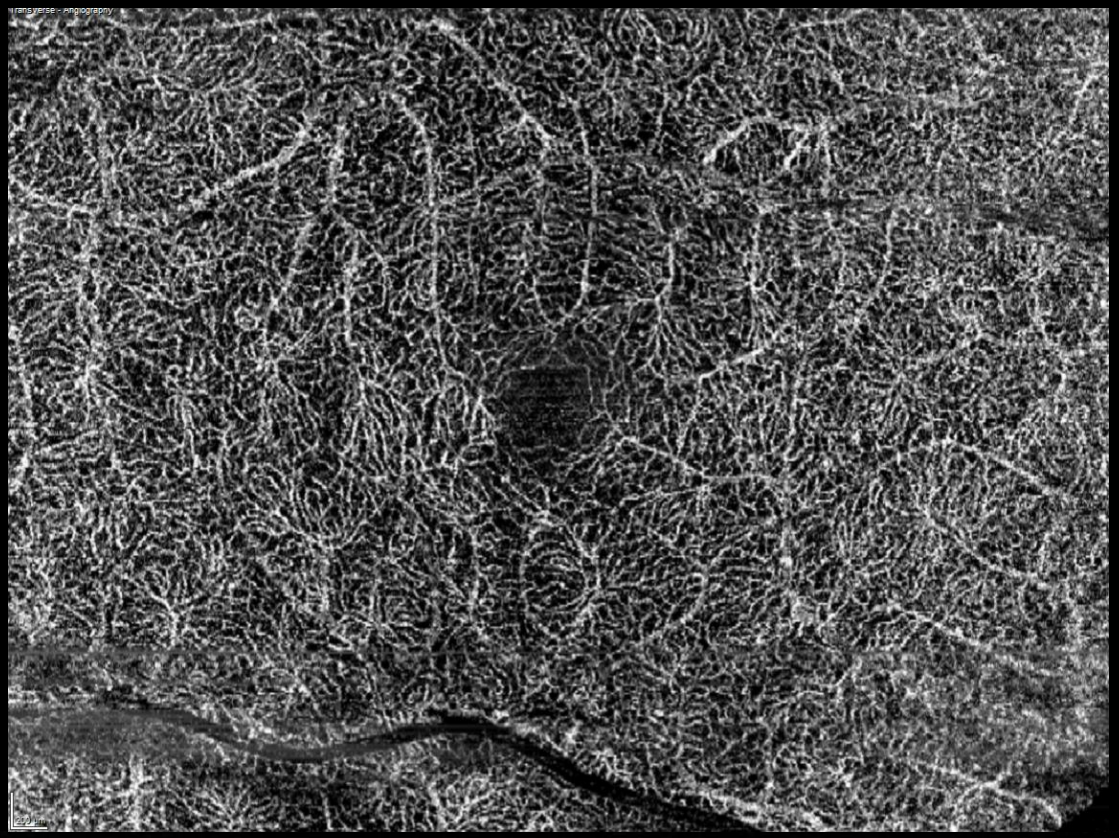




Deep Capillary Plexus

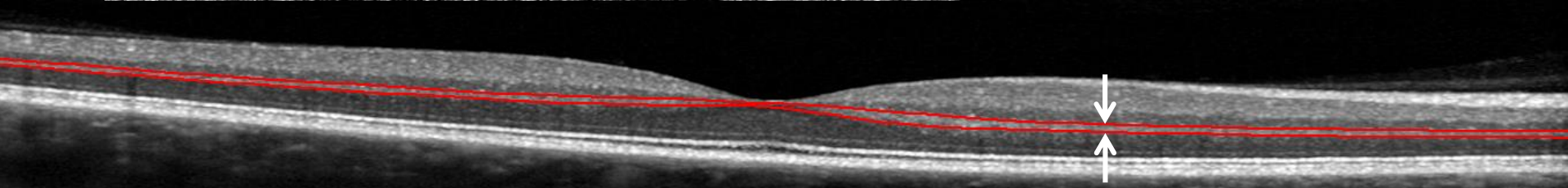
Inner Nuclear Layer

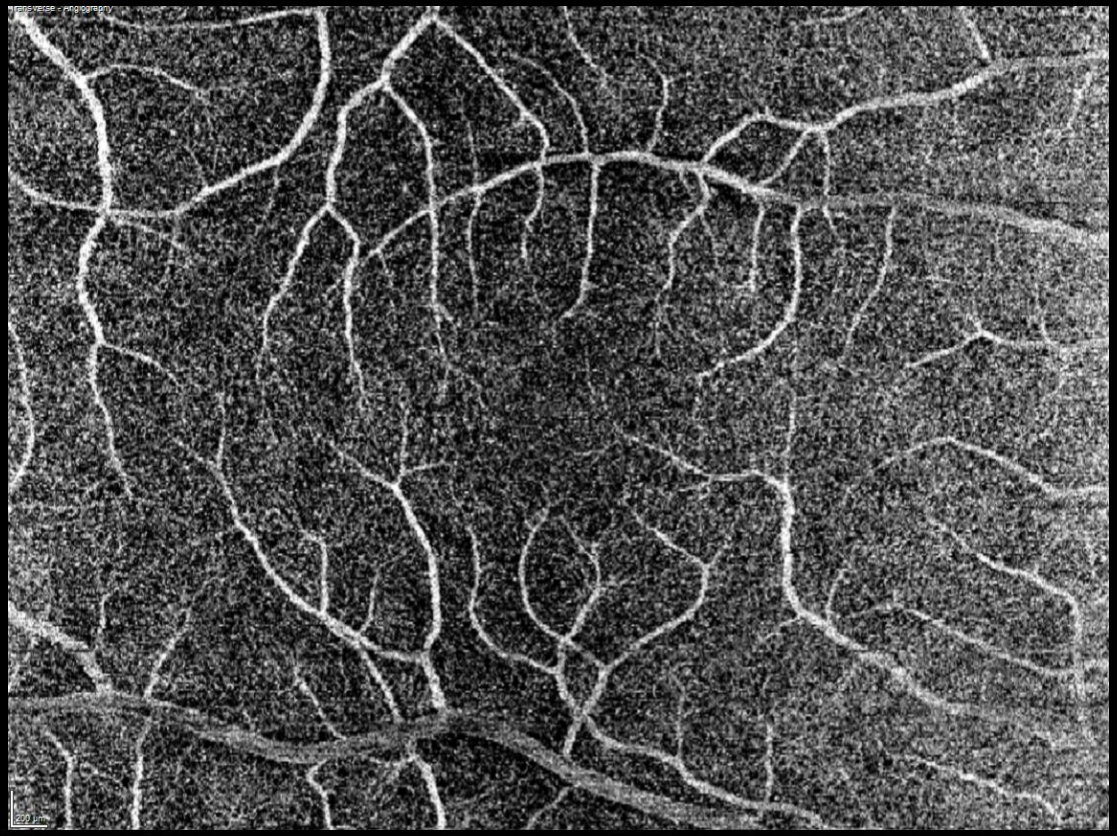




Deep Capillary Plexus

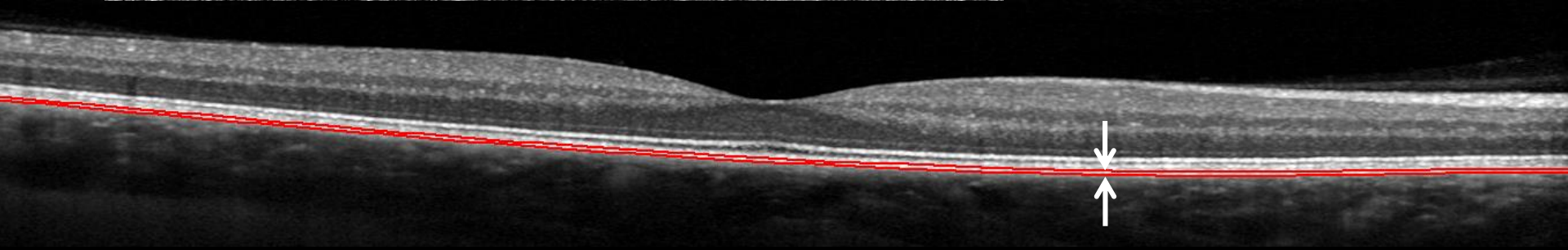
Outer Plexiform Layer





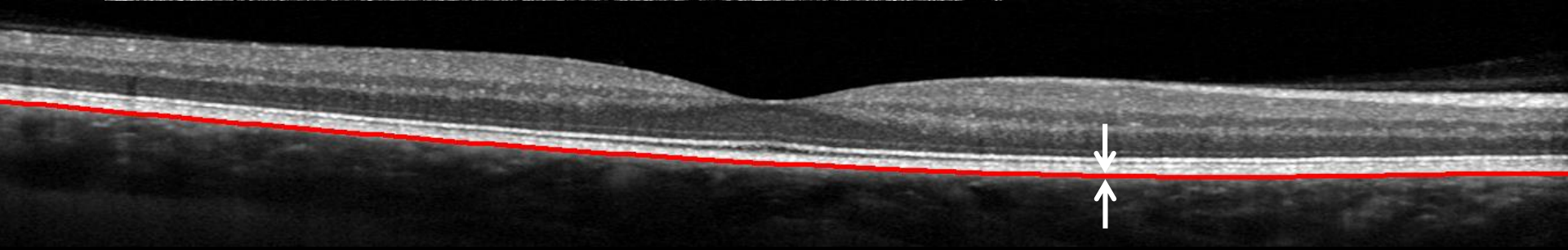
Avascular Layer & copy of superficial vascular plexus

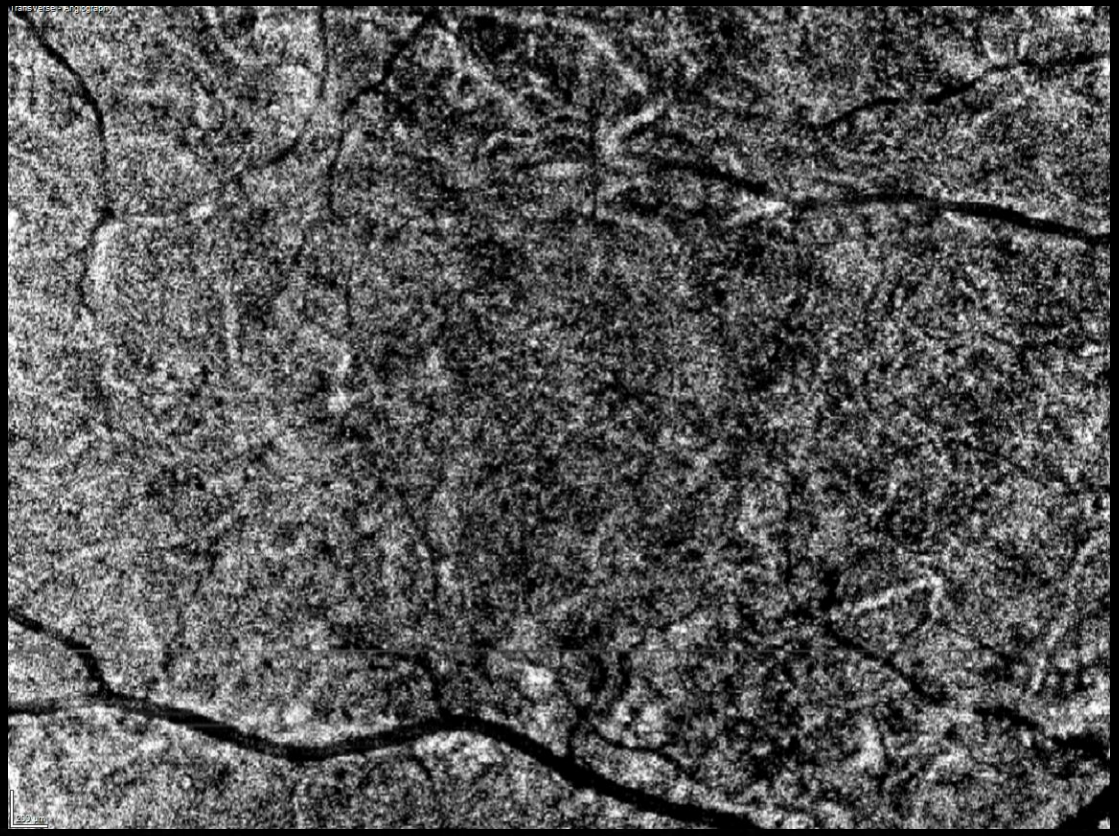
Bruch’s Membrane - RPE



Choriocapillaris

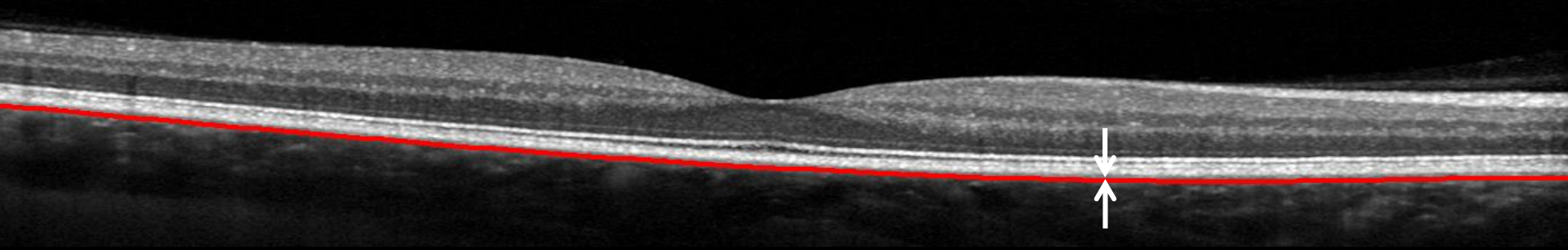
5µm distance (BM)
5µm thickness

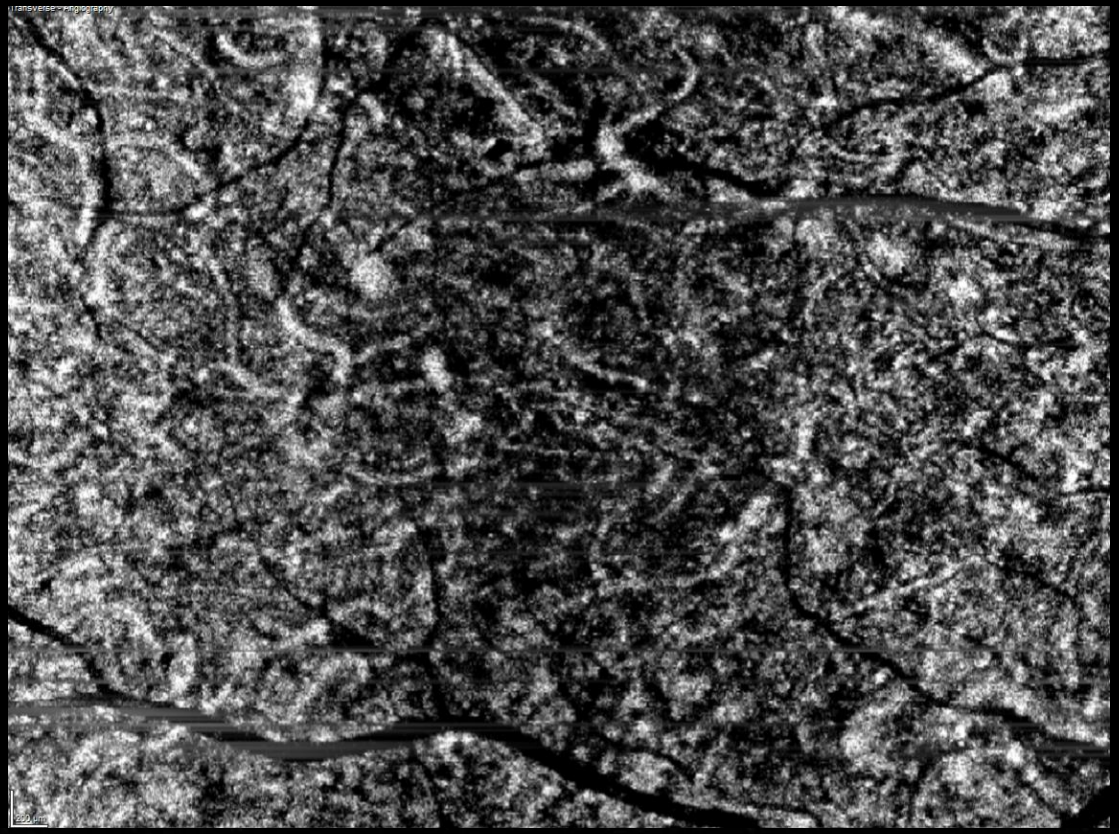




Sattler's Layer

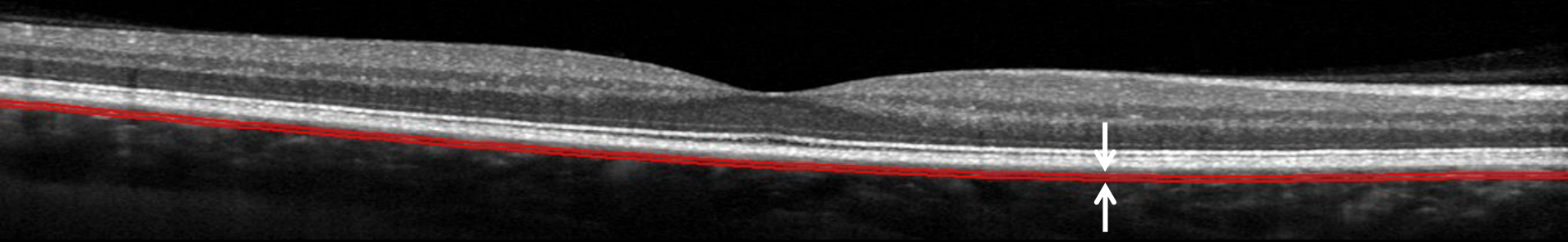
20µm distance (BM)
10µm thickness





Haller's Layer

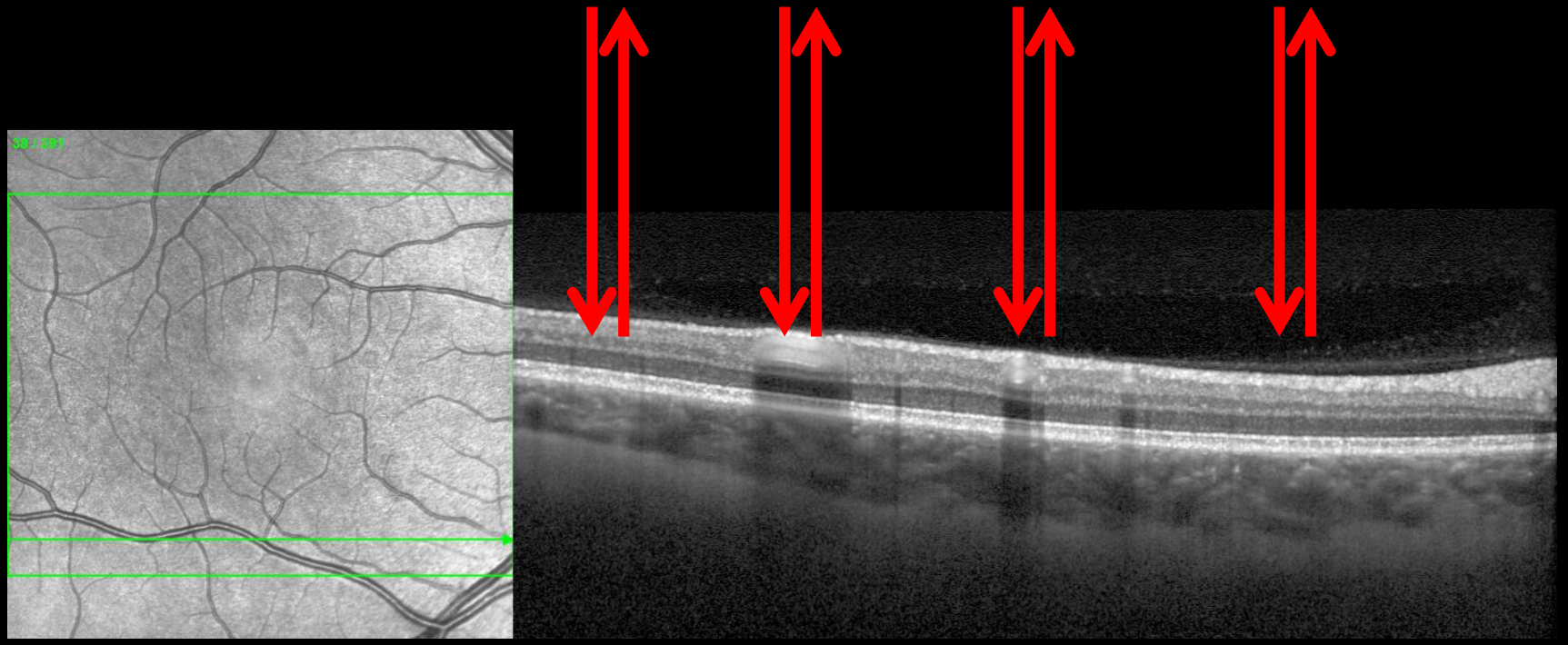
40µm distance (BM)
15µm thickness



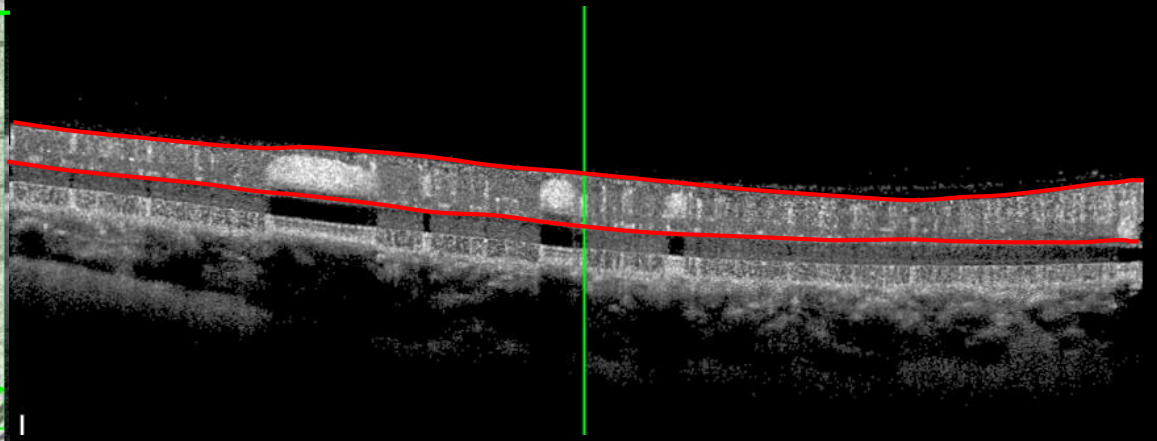
HOW DOES OCT-A WORK IN PRINCIPLE?

OCT-Angiography

A sequence of B-scans is acquired at a fixed retinal location.
Changes in OCT images reflect blood flow.



OCT-Angiography

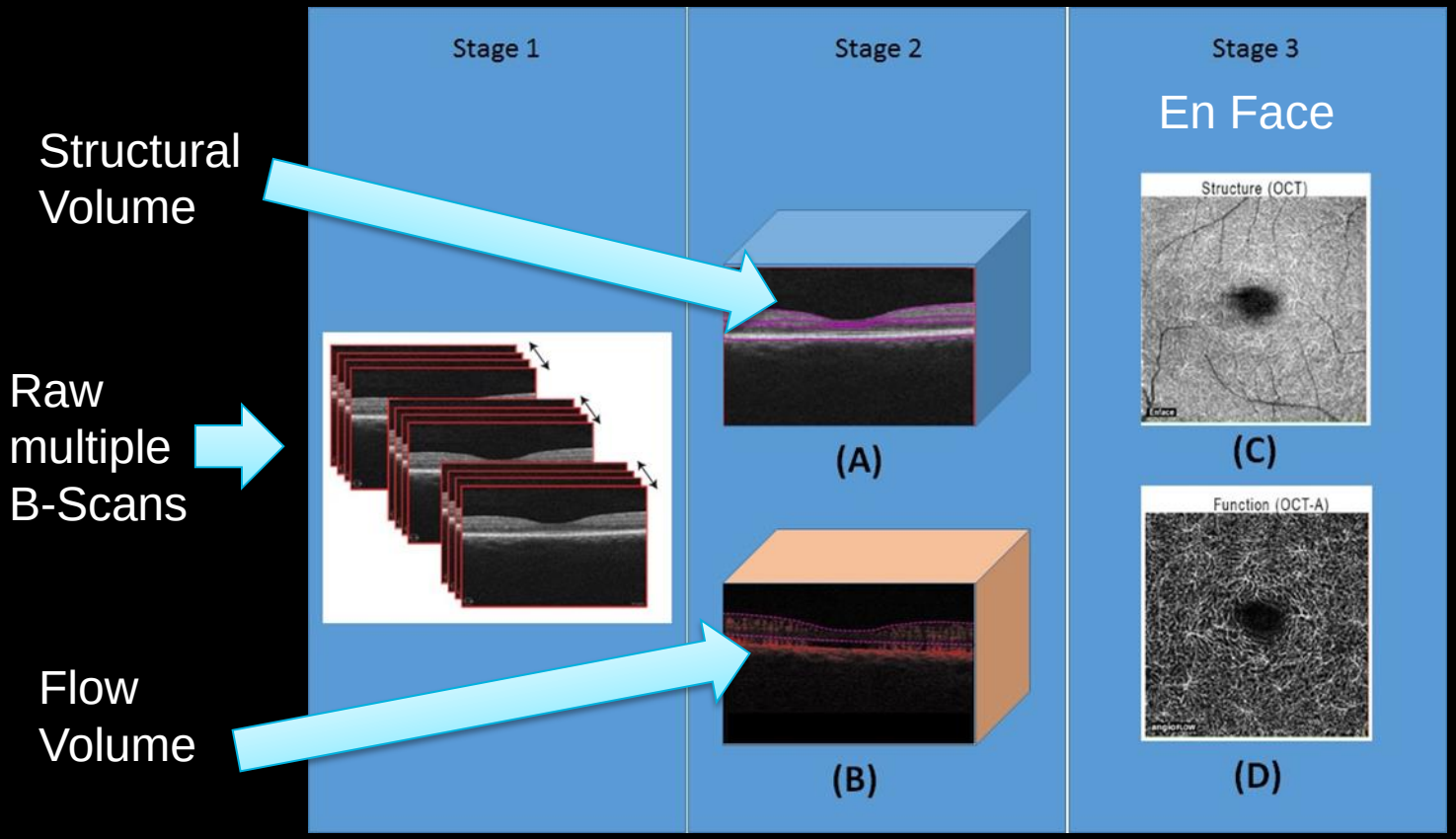


OCT angiography B-scan

Segmentation of retinal layers to define OCT slab.

Summation of flow signal within an OCT slab, multiple frames are acquired at each B-scan location

Image Process Performed to Generate *En face* Images



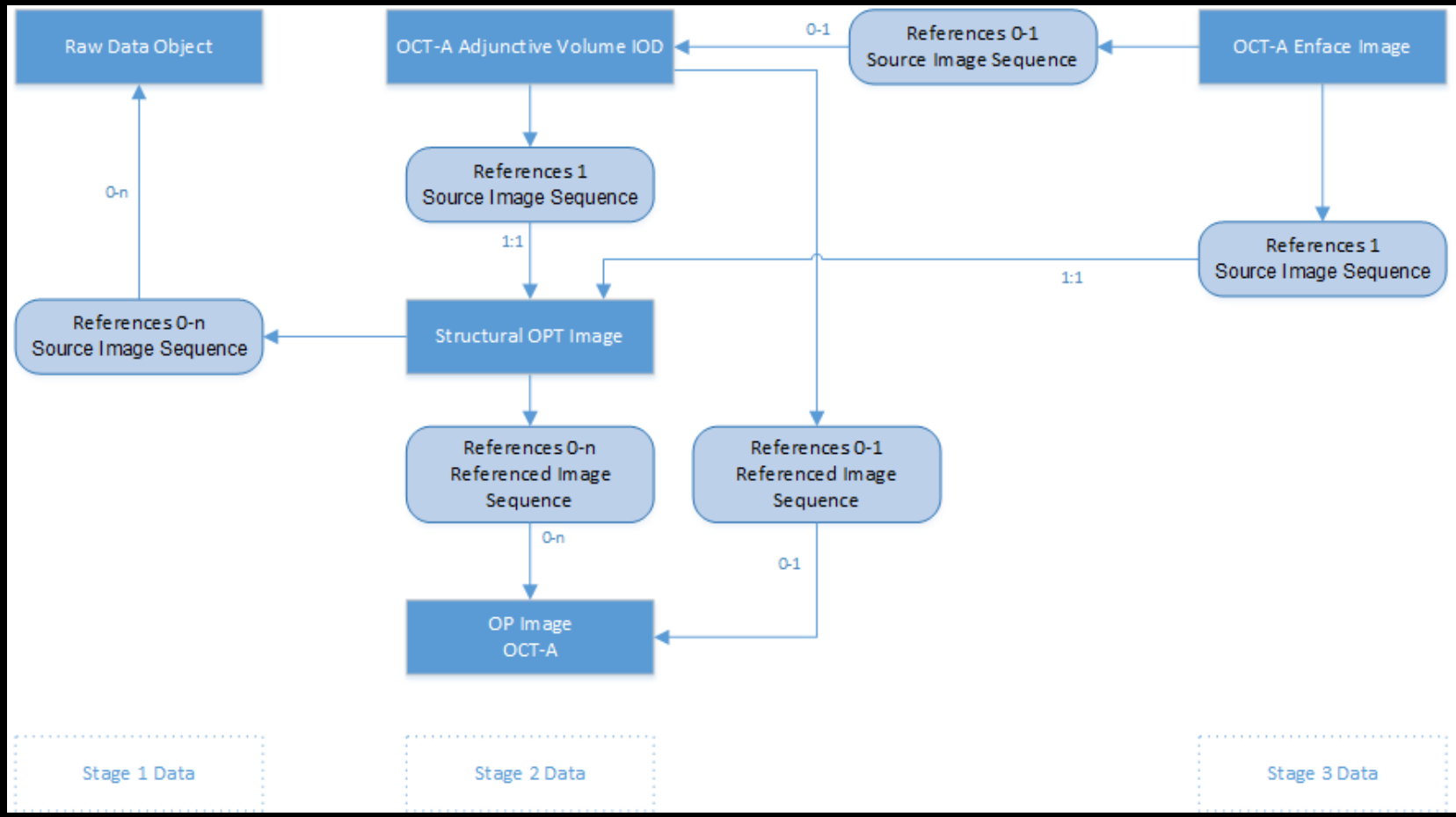
OCT-A

- ***Stage 1*** – OCT “raw data” acquires volumetric data set of mulitple B-scans in a proprietary format
(may be stored using DICOM Raw Data SOP Class)

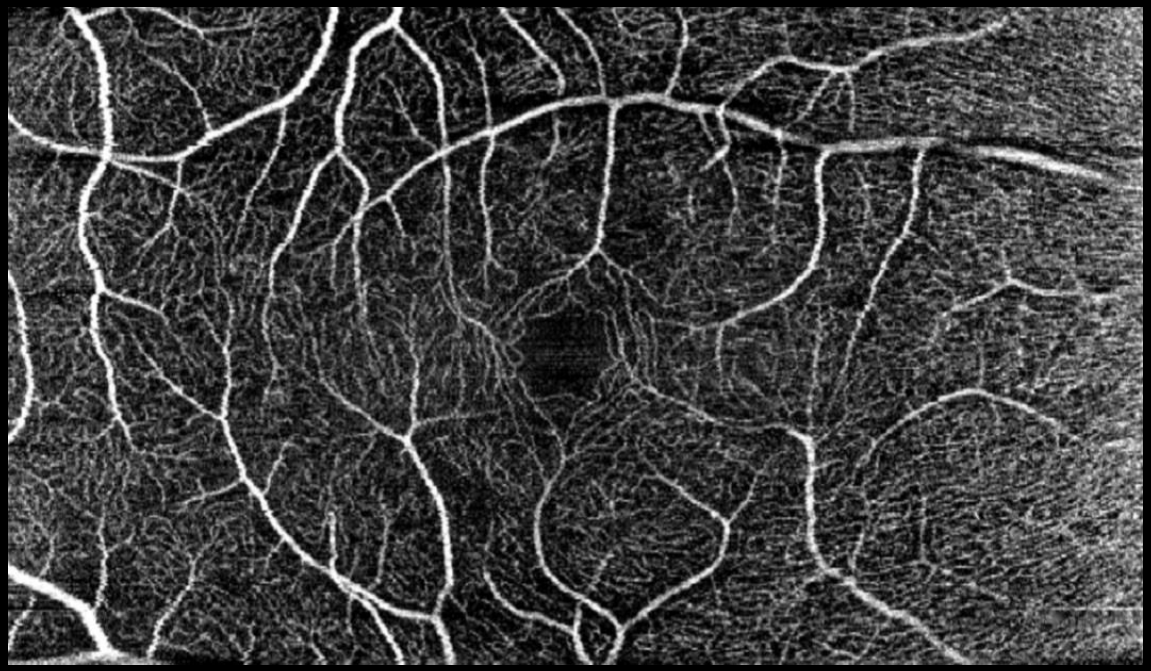
- ***Stage 2*** – OCT “raw data” analyzed to derive two DICOM standard volumetric SOP Instances
  - Structural OCT image stored in the OPT SOP Class
(OCT surface segmentation included)
  - Differences in signal between B-scans produces OCT angiographic flow volume information
(stored in the newly defined Ophthalmic Tomography Angiographic Adjunctive Image Storage SOP Class)

- ***Stage 3*** – Analysis of the above two SOP Instances enables generation of multiple *en face* images showing structural and/or angiographic flow images
(stored in the newly defined En face Image Storage SOP Class)

Relationships Between DICOM OCT-A Based SOP Instances



En Face Image



- OCT angiography provides information about the vascular flow
- Layers of the vascular architecture can be separated

THANKS FOR LISTENING