OCT Workshop
Vision Expo East 2024
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This OCT workshop will be a great follow up to the March Madness series occurring at Vision Expo East (VEE) 2024.

- This workshop will include a brief introduction about OCT technology, different types of scan protocols, and image interpretation.
- Attendees will be able to gain experience with the various imaging devices including SD-OCT, SS-OCT, OCT-Angiography.
- Attendees will also be exposed to image management software during the hands on portion of the workshop
- The workshop also allows attendees to gain more knowledge and skills related to reviewing OCT images and various reports

Objectives

1) Discussion regarding the new technologies and features associated with OCT current imaging.
2) Provide an opportunity to work with and use the various SD OCT devices from Topcon, Zeiss, and Visionix
3) Provide an opportunity to learn about and to gain experience with OCT angiography (OCT-A)
4) Learn about the unique differences between the various OCT devices
5) Gain hands-on experience using the various imaging devices

Outline

Introduction of the various imaging technologies which will include SD-OCT, SS-OCT, OCT-Angiography, **45-60 minutes**

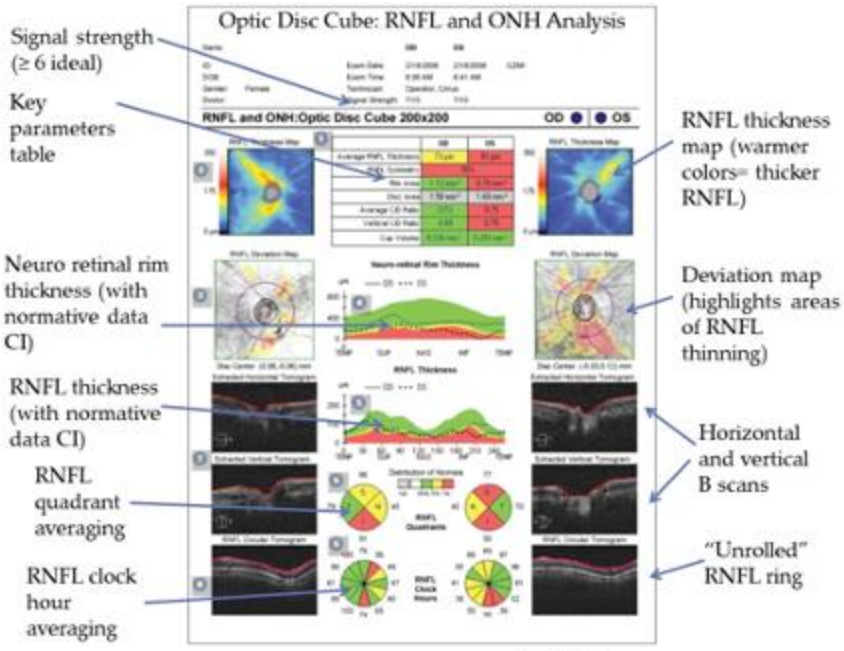
a. Introduction to OCT technology will include:
    i. Fundamentals of OCT imaging
    ii. Differences between SD-OCT and SS-OCT
    iii. Features associated with OCT devices from different manufacturers
    iv. Types of scans offered by devices
    v. Ocular diseases that can be more easily diagnosed through OCT
    vi. Cases highlighting the use of OCT imaging in diagnosis of ocular conditions

1) <u>Introduction</u>
    a. Non-contact, in vivo 3D imaging of the vitreous, retina, choroid, and sclera
    b. Basic principle is low coherence interferometry
2) <u>Different Instruments</u>

3) Scan options
    a) ONH Cube 200 x 200
        i) Once 3 scans are done Guided Progression Analysis (GPA)® can be done to look for progression
    b) Macular Cube 512 x 200
        i) Review on macular thickness
        ii) Review of ganglion cell layer (GCL+, GCL++)
        iii) How to display macular thickness ganglion cell layer thickness and conduct change analysis between visits
    c) 21 line raster
    d) 1 line raster
        i) Maximizes image averaging by overlay 100 B-scan images of the same retinal location
        ii) Cancels out random noise ("speckle", "static")
        iii) Good for imaging the vitreous or choroid (for choroid imaging also use EDI)

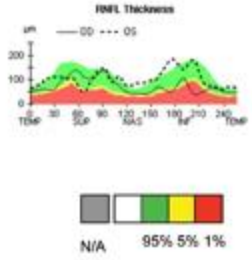
4) Display/Analysis
    a) Enface analysis
        i) An en face image represents a slab of data, typically including several retinal layers, that are compressed down into a 2D plane
        ii) Can be used to view both structural and angiography OCT data
        iii) Vitreoretinal interface (ERM), Mid-retina (CME), IS/OS Junction (hydroxychloroquine toxicity, geographic atrophy
        iii) How to improve depth imaging to acquire better images of the choroid, sclera, lamina cribrosa (pachychoroid disease, choroidal tumors)

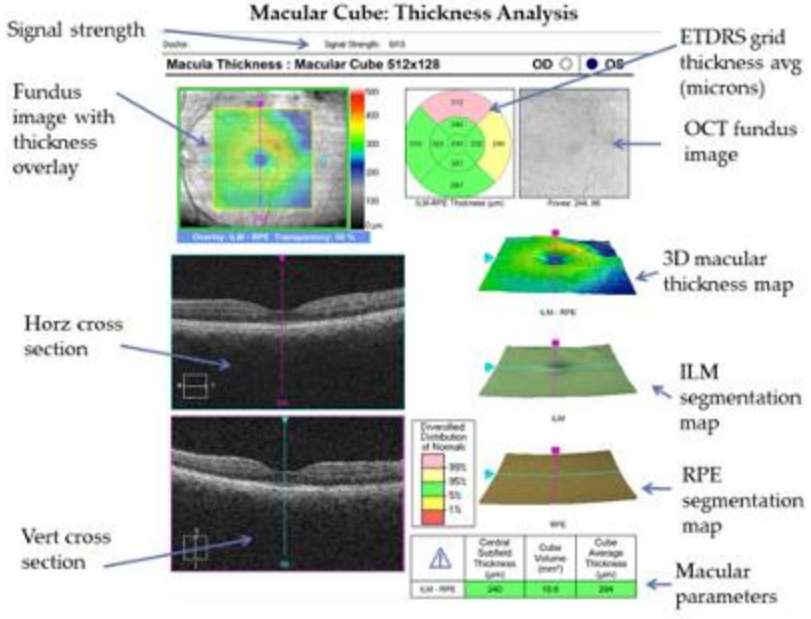
5) Printout/Interpretation

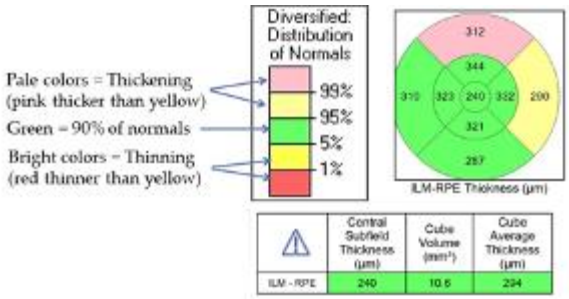


Normative data distribution

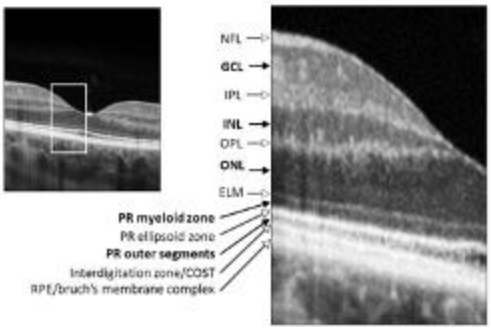
- White=thickest 5% of normals
- Green=90% of normals
- Yellow=thinnest 5% of normals
- Red= thinnest 1% of normals
- Gray= (no normative comparison available)

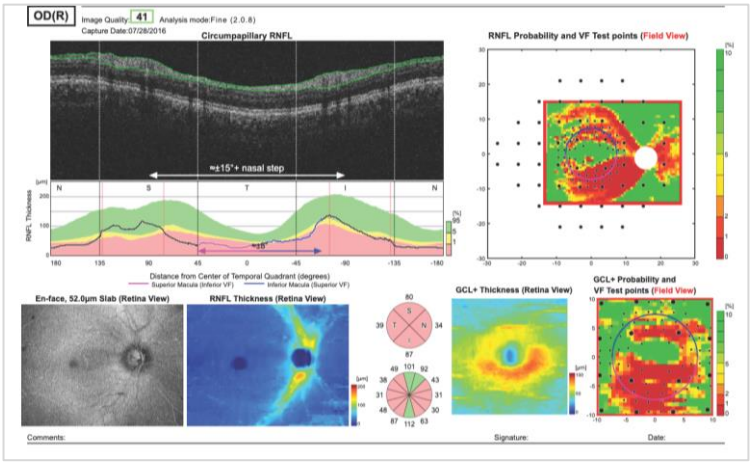






OCT NORMAL RETINAL ANATOMY

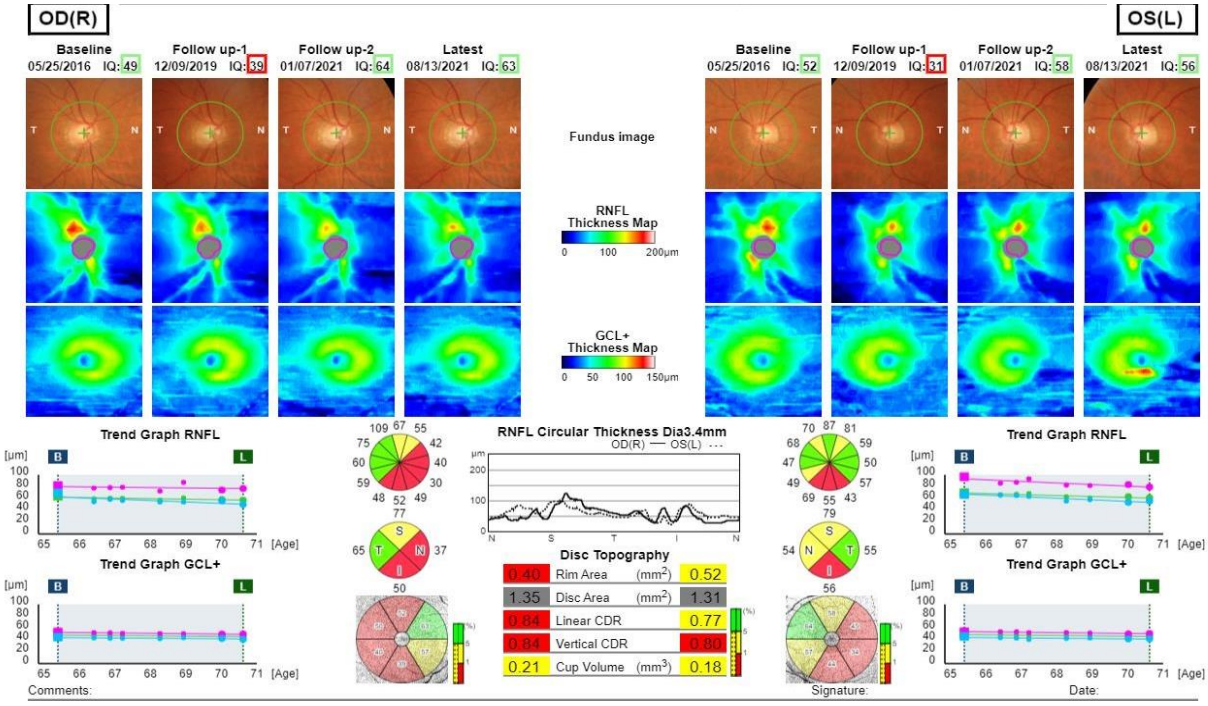




(Hood reports for glaucoma analysis will be reviewed)

7) <u>OCT Angiography</u>
   a) Non-invasive optical coherence tomography (OCT) technology that provides 3D volumetric data regarding retinal and choroidal vasculature and blood flow
   b) Co-registration of vascular and structural data allows for precise localization of vascular abnormalities
   c) Scan options for OCT-A technology with specific devices
      i) 3x3mm- provides greatest resolution but smallest FOV, use to look for macular ischemia and subclinical diabetic retinopathy
      ii) 6x6mm

iii) 8x8mm
iv) 12 x 12mm
v) 4.5mm ONH- use to detect NVD and radial peripapillary capillary dropout in glaucoma & other optic neuropathies
vi) Montage
vii) 6mm montage- knits together six 6mm scans to produce a 10x14mm viii) montage image
viii. 8mm montage- knits together five 8x8mm scans to produce a 14x14mm montage image



(Trend analysis report review for glaucoma management)

8) Image Management Review Software
   a) Data management solution that enables a fully electronic workflow
   b) Glaucoma & retinal image review
      i) Retina and Glaucoma Workplace on Zeiss Forum
   c) Event based versus tend based analysis

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Workshop: **60-75 minutes**

a. Attendees will be broken up into small groups evenly to utilize the various OCT devices and their image review software
   i. They will rotate through various instruments from different manufacturers, while having an opportunity to better understand features associated with each particular device.

b. Each attendee receives instruction on hands-on opportunities to use the various technologies which include:
    a. Noninvasive, noncontact transpupillary imaging technology
    b. Analogous to ultrasound B-wave imaging or radar except light is used instead of acoustic or radio waves
    c. Can image retinal structures in vivo with a resolution of 10 µ
    d. The retinal detail provided is consistent with an "optical biopsy" providing a 2- and 3-dimensional cross-sectional images of tissue microstructure. This is done by collecting backscattering of light reflected from the fundus and related structures
    e. Provides cross-sectional images of retinal structures
        i. Allows for clinical correlation
        ii. Better anatomic perspective
        iii. Diagnosis of ocular conditions
        iv. Supplements other diagnostic testing
    f. OCT has changed how clinicians look at the retina
        i. The assessment of retinal abnormalities based on OCT imaging has advanced eye care
        ii. OCT in Optometry practices ~ 40-70%
        iii. As the technology has evolved -> price points for the devices continue to come down
    g. Provides better understanding of vitreomacular interactions and related diseases
        i. This has redefined our understanding of the pathogenesis of full thickness macular holes.
    h. SS-OCT has improved our understanding of the retinal-choroidal interface
    i. Glaucoma Management
        i. RNFL analysis & print outs
        ii. Ganglion Cell analysis & print outs
    j. Retinal disease management
        i. Review of all the scans that can be applied
        ii. Macular cube vs. Raster lines
    k. Current SD-OCT Available
        i. Cirrus SD-OCT
        ii. Heidelberg Spectralis
        iii. Optovue Avantis
        iv. Optovue iVue
    l. Hardware is relatively similar between devices. The main differences revolved around software
        i. Software will be demonstrated as a part of the workshop
        ii. Some OCT's are combination units that Include fundus camera

m. All have normative data base - More important in glaucoma management

ii. OCT Angiography (OCT-A)

a. Faster scanning speed so able to capture motion
    i. Scans at 68,000 to 100,000 A-scans per second
    ii. Traditional SD OCT scan at 28,000 to 40,000 A- scans per second
    iii.. Compares repeat scans acquired at the same position in the retina to look for changes

b. Able capture movement of the RBC's as it moves through the blood vessels
    i. Capillaries are clearly delineated from another
    ii. Branching points are more visible
    iii. Even small loops are revealed

c. OCT-A is beneficial for the diagnosis of CNV and retinal vascular disease
    i. Case examples of CNV
    ii. Case examples of OCTA in DR
    iii. Motion artifacts

vii. Swept Source OCT (SS-OCT)

a. Utilizes a swept cavity laser

b. Swept-source light source has a wavelength centered at ~1 µm that sweeps across a narrow band of wavelengths, while spectral-domain devices utilize a broadband light source

c. Scanning speeds up to a million A-scans per second achieved

d. Faster speeds yield a high-density scan with high resolution en face OCT images, but at the expense of worse signal-to-noise ratio.

e. Current commercially available SS-OCT devices operating at a speed of 100,000 A-scans/second

f. Disadvantages of Swept Source OCT
    i. Lower axial resolution
    ii. Image averaging (noise reduction) is higher
    iii. Worse signal-to-noise ratio
    iv. Worse motion artifact
    v. No normative databases
    vi. Higher cost