**OCT and OCT Angiography in Retinal Disease**

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2 hour course

CEE

**Course Description:**

Optical Coherence Tomography (OCT) has established itself as a must have imaging technique in any optometric practice setting due to its exceptional anatomical and structural information. The evolution of OCT technology has resulted in the development of non-invasive OCT Angiography (OCT-A) which provides high-resolution three-dimensional visualization of the ocular microvasculature. This course will discuss OCT and OCT-A for retinal disease by reviewing anatomy and structure then emphasizing the numerous clinical applications via case-based presentations.

**Course Objectives:**

1. Discuss principles behind OCT and OCT Angiography imaging
2. Recognize OCT and OCT-A patterns of retina and macular diseases and how to use this information to guide clinical decision making
3. Emphasize clinical diagnosis of posterior segment disease
4. Strengthen clinical treatment of posterior segment disease
5. Gain confidence in interpreting diagnostic to allow accurate and earlier diagnosis and treatment

**Outline:**

1. Disclosures- Greg Caldwell, OD, FAAO
2. Resources
3. Optical Coherence Tomography  
   Course Design
4. OCT and OCT Angiography
   1. Both are Becoming Equally Important in Diagnosis, Management, and Treatment
5. Optical Coherence Tomography
   1. OCT is an optical signal acquisition and processing method
   2. Time domain OCT
      1. 15-16 microns of resolution
      2. Stratus (Zeiss)
   3. Spectral domain (SD-OCT) or Fourier domain OCT
      1. Spatially encoded frequency domain OCT (SEFD-OCT)
      2. 5-6 microns of resolution
         1. Able to see photoreceptor morphology (inner/outer segments)
      3. 50 times faster than time domain
   4. Swept source OCT
      1. Time encoded frequency domain OCT
      2. 1 micron of resolution
   5. Future of OCT- intraoperative imaging, blood flow and oxygenation measurements
6. 4 Basic Categories: Diseases of the….
   1. Vitreous
   2. Neurosensory retina
   3. RPE
   4. Choroid
7. Normal Retinal Vasculaturel
   1. 25-year-old man
   2. 60-year-old man
   3. 60-Year-Old Montage OU
8. Green, Red, Yellow, and Blue Disease
   1. Hints to this Disease
   2. If the disease is a bilateral disease
      1. Glaucoma
         1. It is usually asymmetric
   3. If the scans are symmetric
      1. Then it most likely not disease
      2. Anatomical variation
         1. Normal for that patient
   4. Another hint is the GCC
      1. 85-100 microns
      2. 92-95 microns
   5. 28 yo woman with yellow disease
      1. OD -6.25-0.75 x 005 20/20
      2. OS -6.50 -0.75 x 170 20/20
      3. No medications
      4. Systemic hx: unremarkable
      5. IOPs 17-20 mm Hg OU 2011-2016
   6. 46 yo woman with red-yellow disease
      1. OD -0.75 20/20
      2. OS -1.25 20/20
      3. Systemic hx: thyroid dysfunction, high cholesterol
         1. Medications for the above
      4. IOPs 15 mm Hg OU 8:30 am
   7. 63 yo woman with red, yellow, blue, and green disease
      1. OD plano/ +2.00 20/20
      2. OS -0.50/ +2.00 20/20
      3. IOPs 15-18 mm Hg OU 2011-2015
   8. 58 yo with yellow disease
      1. OD +1.00 20/20
      2. OS +1.25 20/20
      3. IOPs: 13/15 mm Hg at 11:24 am
      4. Pay attention to FLV and GLV)
   9. 40 yo man with red, blue, green disease
   10. OD -7.50 – 0.75 x 110 20/20
   11. OS -7.50 – 0.75 x 105 20/20
   12. IOPs: 15/13 mm Hg at 6:30 pm
   13. March 16, 2015
9. OCT of Vitreoretinal Interface Disorders
   1. Early PVD
   2. Epiretinal membrane
   3. Vitreomacular traction syndrome
   4. Pseudohole
   5. Lamellar hole
   6. Macular hole
10. Epiretinal Membrane
    1. Other names: premacular fibroplasia, preretinal glosis, macular pucker, surface wrinkling retinopathy
    2. Believed to be the result of proliferation of retinal glial cells on the internal limiting membrane that escaped through breaks in the internal limiting membrane
    3. May create macular edema
    4. Amsler grid may elicit metamorphosia from surface wrinkling or macular edema
    5. Treatment: Monitor until severe then retinal consult, possible vitrectomy with membrane peeling
11. OCT Epiretinal Membrane (ERM)
12. OCT Vitreomacular Traction Syndrome
13. OCT Peripheral posterior vitreous detachment (PVD)
14. OCT Persistent adherence with traction to macula and/or disc
15. OCT of Vitreoretinal Interface Disorders
16. Full Thickness Macular Hole
    1. More on Macula Holes…
    2. Stage 3 Macular Hole
    3. Make Sure You Carefully Review the Other Eye  
       Why?
    4. Looking for a Stage 0 macular hole (need an OCT to detect it)
    5. Some studies say that finding a Stage 0 has a 42% risk of going to a full thickness macular hole
    6. If no Stage 0 then 0-3% risk
       1. Need an OCT to detect and see a Stage 0 macular hole
17. OCT in AMD
    1. Need spectral domain to follow intermediate or worse AMD
    2. Able to identify OCT predictors of progression
18. Especially in identifying OCT predictors of progression
    1. Hyper-reflective foci
    2. Reticular pseudodrusen
    3. Nascent geographic atrophy
    4. Sub-RPE hyper-reflective columns
    5. Drusen substructures
    6. Drusen load and regression
19. Hypo versus Hyper Reflectance
20. OCT cases in AMD
    1. Case 1 - OCT Predictors of Progression
    2. Case 2 - OCT Predictors of Progression
    3. Case 3 - OCT Predictors of Progression
    4. Case 4 - OCT Predictors of Progression
    5. Case 5 - OCT Predictors of Progression
21. OCT Angiography   
    A New Approach to Protecting Vision
    1. Non-invasive visualization of individual layers of retinal vasculature
    2. Pathology not obscured by fluorescein staining or pooling
    3. Image acquisition requires less time than a dye-based procedure
    4. Reduced patient burden allows more frequent imaging to better follow disease progression and treatment response
    5. Enface OCT-A Slabs Based on Retinal Anatomy
    6. Normal Retinal Vasculature
22. Type 1 “Occult” CNV
    1. New vessels develop in the choroid
    2. New vessels located below RPE and above Bruch’s membrane
    3. New vessels located BELOW RPE and ABOVE Bruch’s membrane
23. Case example: 70 y/o WM, AMD
24. Diabetes
    1. Foveal avascular zone (FAZ) changes and expanding is considered one of the earliest signs of diabetic retinopathy
    2. AngioWellness Report- Comprehensive Eye Exam - Healthy
    3. AngioWellness Report-Patient 1 with Diabetes
    4. AngioWellness Report-Patient 2 with Diabetes
    5. AngioWellness Report-Patient 3 with Diabetes
    6. 29 year old man with diabetes
       1. Yearly diabetic exam, reports no changes to vision
       2. Type 1 DM
       3. BS: 190 this AM, last HbA1c 8.6
       4. Vision 20/20
       5. Anterior segment: normal
       6. Posterior segment:
          1. Non-proliferative DR
             1. Hemes and exudates
          2. No CSME
       7. Optomap, OCT-Wellness, and OCT-A (Angiography)
25. OCT and OCT Angiography-Solve the Case
    1. 63-year-old man
    2. Complicated ERM surgery OD
       1. Increased IOP
       2. Vitreous hemorrhage
    3. ERM peel 8-16-2018
       1. My visit 11-20-18
          1. IOP 18/13
    4. Vision 20/20
       1. But “cannot see top part of vision in right eye”
    5. Patient returned to me because the surgeon said it will take time for vision to return
    6. OCT and OCT-A reveals the diagnosis and prognosis
       1. Superficial
       2. Deep
       3. Diagnosis?
26. 69-year-old woman
    1. In for 6 month diabetic check
       1. History of idiopathic juxtafoveal telangiectasia
    2. BVA OD 20/80 OS 20/40
    3. Thoughts are the macula changes DM and IJT?
    4. OCT and OCT-A
27. Central Serous Retinopathy (Neurosensory Retinal Detachment)
    1. 46 year old man
    2. Complains of a perfect yellow circle in the center of his OS
    3. The circle stays in the center of his vision even when he moves his eye
    4. VA 20/20 OU
    5. Refraction OD Plano OS +1.00 D
       1. Prior visit Plano OU
    6. Photos
    7. RPE Detachment With Clear Fluid
28. Central Serous Chorioretinopathy
29. Plaquenil Toxicity
    1. Revised Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy
    2. Last recommendations were 2002 by the American Academy of Ophthalmology
    3. Improved screening tools and new knowledge about prevalence of toxicity have prompt the change
       1. 1% after 5-7 years of use or a cumulative dose of 1000 grams (Plaquenil)
    4. There is no treatment for this condition
       1. Therefore must be caught early
    5. Screening for the earliest hints of functional or anatomic change
    6. Plaquenil toxicity is not well understood
30. 71 yo woman
    1. With Lupus and hypertension
    2. Medications:
       1. Colazapam
       2. Plaquenil 200 mg BID, 15 years
       3. 81 mg ASA
       4. Prednisone
       5. Losartin
    3. VA 20/25 OD/OS (mild cataracts)
    4. Patient was told to see an ophthalmologist in 2013
    5. 2016
    6. 2016
31. Hope You Enjoyed- Thank You!