Role of Retinal Imaging in Neurodegenerative Disorders

I. Retinal Anatomy
   a. Histology

II. Clinical Retinal Imaging
   a. Adaptive Optics
   b. Optical Coherence Tomography
   c. Fundus Autofluorescence
   d. Macular Pigment Optical Density

III. Retinal Findings related to Neurodegenerative Disorders
   a. Parkinson's Disease
      i. Clinical Characteristics
      ii. Retinal Imaging Findings
   b. Huntington's Disease
      i. Clinical Characteristics
      ii. Retinal Imaging Findings
   c. Multiple Sclerosis
      i. Clinical Characteristics
      ii. Retinal Imaging Findings
   d. Cortical Infarction
      i. Clinical Characteristics
      ii. Retinal Imaging Findings
   e. Dementia with Lewy Bodies
      i. Clinical Characteristics
      ii. Retinal Imaging Findings
   f. Alzheimer's Disease and Cognitive Impairment
      i. Clinical Characteristics
      ii. Retinal Imaging Findings

IV. Oral Supplementation related to Neural Function and Cognitive Performance
   a. Dietary Modifications
   b. Supplementation
      i. Polyunsaturated Fatty Acids
      ii. Antioxidants
      iii. Trace Elements
      iv. AREDS2

V. Hypothesized Roles of Macular Pigment
   a. Optical Hypothesis
   b. Protection Hypothesis
   c. Neural Hypothesis

VI.   What's now?
      a. Amyloid beta accumulation
      b. Retinal Fundus Autofluorescence with Curcumin
      c. Early, Modest Risk Reduction
      d. Lutein and Zeaxanthin

VII.   What's next?
      a. Serum-based testing for:
          i.   CFH and ARMS2
          ii. StARD3 and GSTP1
          iii. APOE4
      b. Patient-tailored health plans for at-risk populations
          i.   Integrated biologic / vaccine / supplementation strategies
      c. Enhanced bioavailability
      d. Risk calculator to incorporate:
          i.   Clinical biomarkers + Genetic risk
          ii. Cognitive testing (MMSE and ADAS-Cog)

Course Description: Neurodegenerative conditions such as Alzheimer's disease affect over 50 million individuals worldwide and the most effective treatment strategies require early identification and intervention. Retinal imaging allows a non-invasive, population-level evaluation of the central nervous system that can be affected by these conditions. A review of existing retinal imaging capabilities paired with more recent developments in disease-specific screening will be presented along with an analysis of current medical and oral supplementation approaches to cognitive decline mitigation.

Cope Category: Neuro-optometry

Course Objectives (3/credit hour)-

Objective 1: Identify 3 retinal imaging modalities used in the early detection of neurodegenerative conditions

Objective 2: Define the 3 hypothesized roles of macular pigment

Objective 3: Describe the 4 mitigation strategies in the diagnosis and treatment of neurodegeneration