COURSE TITLE

Retina Grand Rounds

Carlo J. Pelino, OD, FAAO
Joseph J. Pizzimenti, OD, FAAO

GOAL

The goal of this presentation is to provide the participant with useful clinical information about the current standards in the diagnosis of posterior segment disease.

OBJECTIVES

At the conclusion of this course, the participant should be able to:

1. Understand the functional anatomy of posterior segment tissues.
2. Describe the clinical application of optical coherence tomography.
3. Describe the clinical application of ophthalmic ultrasonogrpahy.
4. Describe the clinical application of retinal angiography.
5. Describe the clinical application of fundus autofluorescence (FAF).
6. Perform at least three tests of macular function and properly analyze the results.
7. Apply new knowledge about pathogenesis and diagnostic workup of various vitreoretinal diseases.

ABSTRACT

This course uses clinical cases and topical discussion to present current standards of care in the diagnosis of posterior segment disease. After a brief review of relevant functional anatomy, the lecturers describe various high and low-tech measures of retinal structure and function, within the context of clinical case scenarios. Audience participation is encouraged.

Course Outline

Introduction: Anatomy and Physiology of the Posterior Segment

The Vitreous

- Composition of the vitreous humor
  - Water
  - Hyaluronic acid
  - Protein
- Functional Anatomy of the Anterior Vitreous
  - Anterior Vitreous Base
    - Pars Plana
  - Posterior Vitreous Base
    - Ora Serrata
  - Vitreous-lens interface
- The Vitreoretinal Interface

The Retina

- The Pigment Epithelium
  - Monolayer
  - Cuboidal cells
  - Function of RPE
  - Tight junctions form outer blood-retina barrier
- The Neurosensory Retina
  - The Photoreceptors
    - Structure and function of cones and rods
  - Inner and outer segment junction
    - Importance of structural integrity to visual function
  - Outer limiting membrane
  - Outer nuclei
  - Synaptic layers (plexiform)
  - Inner nuclei
  - Ganglion cells
  - Nerve fiber layer
  - Internal limiting membrane
  - Pericytes and the inner blood-retina barrier
- Photransduction: conversion of light into an electrical impulse
- Normal Retinal Metabolism
- Autoregulation of blood flow

The Choroid

- Vascular layers
- Melanocytes
- Bruch's membrane

- Sympathetic regulation of blood flow
- Function of choriocapillaris
    - Supply of nutrients
    - Absorption of light

Visual Function and Performance: Current Concepts of Evaluation

- Symptoms and Signs of Poor Performance: Quality of life
    - Glare discomfort and disability
    - Visual fatigue
    - Chromatic aberrations
    - Photophobia
- Functional Testing
    - Visual Acuity
        - Snellen
        - LogMAR charts
    - Contrast Sensitivity
        - Purpose
        - The normal Contrast Sensitivity Function (CSF)
        - CSF in AMD
        - Use of CSF in Low Vision Rehabilitation
    - Visual Field Testing
        - Amsler Grid
        - Preferential Hyperacuity Perimetry (PHP)
        - Microperimetry
    - Photostress Testing
    - Glare recovery
- Structural Testing
    - Stereoscopic fundus examination
    - Macular Pigment Optical Density (MPOD)
        - Heterochromatic Flicker Photometry
    - Fundus autofluorescence (FAF)
    - Optical Coherence Tomography (OCT)
    - Microperimetry
    - Angiography
        - Fluorescein (FA)
        - Indocyanine Green (ICGA)
- Nutritional factors and visual function
- The importance of macular pigments in visual function and performance

Genomics and Genetic Testing for Retinal Disease

All people are 99.9% identical in genetic makeup, but differences in the remaining 0.1% hold important clues about health and disease.

- Genomics Defined
    - Genomics is the study of all the genes in a person, as well as the interactions of those genes with each other and a person's environment.
    - A discipline in genetics concerned with the study of the genomes of organisms.
        - A genome is the sum total of all an individual organism's genes.
- Pharmacogenomics defined
    - Pharmacogenomics is a science that examines the inherited variations in genes that dictate drug response.
        - It explores ways these variations can be used to predict whether a patient will have a good response (to a drug), a bad response, or no response at all.
    - Examples of pharmacogenomics in ophthalmic pharmacotherapy: Wet AMD
    - Genetic Testing
        - Genetic predisposition
        - Should we offer genetic testing to our early AMD patients?
        - Role for genetic testing in AMD prevention/treatment?
- Nutrigenomics defined
    - Nutrigenomics refers to the application of genomics in nutrition research.
    - It enables associations to be made between specific nutrients and genetic factors
        - e.g. the way in which food ingredients influence gene expression.
    - Basic tenets of nutrigenomics

Can nutritional therapy reduce the genetic risk of early AMD?

- The Rotterdam Study
    - 2167 subjects 55 and over
    - Genetic variants CFH and LOC
    - Dietary intake assessment
    - Exam for early AMD
        - Baseline
        - 3 follow-up visits; mean follow-up 8.6 years
    - Results
        - 517 developed early AMD
        - Biological interaction between CFH and Zn, B-carotene, Lutein/Zeaxanthin, EPA/DHA
        - Interaction between LOC and DHA
        - Risk reductions
    - Conclusions
        - High antioxidant intake reduces risk of early AMD in those with high genetic risk

A Nutrigenomic Approach to Retinal Wellness and Visual Performance

- Consider offering genetic testing for those with early dry AMD, especially those with other high risk factors (i.e. smoking, first-degree family history of advanced disease, over 65, low baseline MPOD)
- Increase the MPOD through healthy diet, supplementation
- Provide dietary advice to those susceptible to AMD to postpone or prevent sight-threatening consequences

Choroidal Neovascularization (CNV)

- Subjective symptoms
- Objective data
- Diagnostic Workup
- Making the diagnosis
- Common Causes of CNV
    - Exudative AMD
    - Ocular Histoplasmosis
    - High Myopia
    - Angioid Streaks
- Variations of CNV
    - Polypoidal Choroidal Vasculopathy (PCV)
    - Retinal Angiomatous Proliferation (RAP)
- Masqueraders of CNV, other considerations
    - Choroidal Neoplastic Disease
    - Primary Tumors of the Choroid
        - Nevus vs. melanoma
    - Metastatic Tumors to the Choroid
        - Common primary sites
            - Breast
            - Lung

Case Studies in Vitreo-retinal Interface Disorders

- Vitreo-macular Traction Syndrome
    - Vitreo-papillary traction
- Epiretinal Membrane
- Macular Hole
- Lamellar Macular Defects
- Cystic Tuft
- Peripheral vitreo-retinal degenerations
- Schisis
- Retinal Breaks
    - Holes
    - Tears

        - Dialysis
- Retinal Detachment
    - Rhegmatogenous
    - Tractional
    - Exudative

Clinical Testing and Evaluation of the Vitreous/Vitreoretinal Interface

- Evaluation of the Patient
    - History Taking
    - Visual Acuity
    - Visual Field
    - Color Vision
    - Pupillary Testing
    - Photostress Recovery Test
    - Contrast Sensitivity
    - Biomicroscopy
    - Watzke Test
    - Ophthalmoscopy
        - Direct
        - Slit lamp funduscopy
            - Contact
            - Non-contact
            - Binocular indirect
                - Scleral indentation
    - Imaging Studies
    - Scanning lasers
        - OCT
    - Echography/Ophthalmic Ultrasound

        - Pars Plana
    - Posterior Vitreous Base
        - Ora Serrata
    - Vitreous-lens interface

Summary and Conclusions

- Evaluating posterior segment function and structure are equally important
- Nutritional factors may act synergistically with genetic tendencies to allow/enhance expression of disease
- Modifying one's diet may decrease the risk of disease
- Increased MPOD correlates with improvements in visual performance