Clinical Biomarkers of Retinal Laser Lesions

I. Purpose and Partners
   a. Retinal Imaging Collection
      i. St. Mary's University
   b. Blood-plasma Biomarkers
      i. Duke University
      ii. University of Texas Medical Branch
      iii. United States Air Force Academy
   c. Retinal Imaging Database
      i. 711 Human Performance Wing

II. Imaging
   a. Color Fundus Photography
      i. Advantages / Limitations
   b. Optical Coherence Tomography
      i. Advantages / Limitations
   c. Autofluorescence
      i. Advantages / Limitations
   d. Confocal Scanning Laser Ophthalmoscopy
      i. Advantages / Limitations
   e. Multi-spectral / Hyper-spectral
      i. Advantages / Limitations
   f. Laser Speckle
      i. Advantages / Limitations

III. Methods
   a. Distribution by Group and Time Point
      i. Plasma Collection
      ii. Retinal Image Collection
   b. Lesion Placement
      i. Photothermal
      ii. Photomechanical
   c. Results
      i. Fundus Photography
      ii. Optical Coherence Tomography
      iii. Autofluorescence

IV. Retinal Lesion Diagnosis Gap
   a. Proteomic Analysis
      i. Denaturation and Fractionation
   b. Photothermal vs. Photomechanical
      i. Protein and Peptide Pooling
   c. Algorithm Teaming
      i. Tissue
      ii. Laser Type
      iii. Time from Exposure
      iv. Imaging Modality

V. Informational Bioeffects Atlas of Laser Lesions (IBALL)
   a. Capabilities vs Limitations
      i. Available Modalities
      ii. Austere Environments
      iii. Image Quality
   b. Applications
      i. Paired with Plasma Biomarkers
      ii. Central Repository
   c. Future Directions
      i. Machine Learning
      ii. Image Reconstruction

Course Description: Recent advances in serum-based identification of retinal lesions correlated to laser injury will be presented. Clinical applications of proteomic analysis may hold promise in the identification of complex retinal injuries when paired with multi-modal retinal imaging to include SD_OCT and fundus autofluorescence. Use of advanced, predictive modeling may increase both the sensitivity and specificity of retinal lesion diagnosis.

Cope Category: Treatment and Management of Ocular Disease (PS)

Course Objectives (3/credit hour)-

Objective 1: Identify 3 retinal imaging modalities used in the detection of suspected retinal laser injury

Objective 2: Define the 4 parameters used in classification of suspected retinal laser injury

Objective 3: Describe the 2 future directions of the Informational Bioeffects Atlas of Laser Lesions