Optical Coherence Tomography and Optic Neuritis

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Financial Disclosure

I have no actual or potential conflicts of interest in relation to the material in this presentation.

I will not be discussing the “off-label” use of any medications during this presentation.
TIME FOR REVIEW!
Multiple Sclerosis (MS) Review

- Characterized by inflammation of the myelin sheaths surrounding nerve fibers
- Prevalence: 400,000 individual in United States
- Predilection for women > men by two to three fold
- Relapsing and remitting MS (RRMS) is the most common and least progressive form
MS Review (cont.)

- Most common in 2nd to 4th decades\textsuperscript{1,3,6}
- Total annual cost of MS in the United States is $13 billion annual\textsuperscript{5}
- Mean lifetime cost per patient: $3.4 million\textsuperscript{5}
Optic Neuritis Review

- Inflammatory and demyelination of the optic nerve\textsuperscript{4,7,8}

- One quarter of all MS patients will present with optic neuritis as the first symptom of the disease\textsuperscript{3}
Left retrobulbar optic nerve with enhancement and high T2 signal

Case courtesy of Dr. Roberto Schubert. radiopaedia.org. Rid:14295
Optic Neuritis (cont.)

- Majority of eyes recover vision to 20/40 or better\textsuperscript{3,4}

- 3\% with Best Corrected Visual Acuity (BCVA) of worse than 20/200\textsuperscript{3,4}

- In utility value studies -
  - BCVA 20/40 equivalent to moderate chest pain or having HIV\textsuperscript{10}
  - BCVA 20/200 to 20/800 decreased quality of life more than end stage renal disease on hemodialysis\textsuperscript{10}
  - BCVA worse than 20/800 BCVA is equivalent to end stage prostate cancer or a severely debilitating stroke\textsuperscript{10}
The Role of Imaging in Optic Neuritis
Spectral Domain Optical Coherence Tomography (SD- OCT)

- Light based, non-invasive imaging modality\(^3\)
- Produces cross-sectional images of retina\(^3\)
SD- OCT Retinal Layer Segmentation
Macular Cube

Standard from ETDRS
Ganglion Cell Layer
Macular Cube
Retinal Nerve Fiber Layer
Macular Cube
Optic Neuritis and Retinal OCT Segmentation
Previous Studies

- OCTs of patients with optic neuritis demonstrated significant thinning of GCL and IPL at multiple locations in the inner and outer retina\(^8\)

- Previously difficult to separate some of the layers from each other to evaluate individual thicknesses
• Objective: To measure GCL and RNFL with SD-OCT of patients with and without vision loss from optic neuritis

• Design: Retrospective case-control study. Chart review from 2013-2015.

• Statistical Analysis: ANOVA testing
• Inclusion Criteria:
  • 18+ yo
  • Dx of RRMS and bilateral optic neuritis with unilateral recovery
  • No co-morbid ocular conditions
  • Pt seen within last two years
Study Results

- 11 unique individuals were studied
  - Female >> Male, 35-68 yo
- BCVA range for “recovered eyes”: 20/20 to 20/40
- BCVA range for “unrecovered eyes”: 20/50 to CF
- Mean GCL thickness was significantly thinner in patients with non-recovered eye
- Mean RNFL thickness was near normal (mildly thickened)
- No statistically significant difference in thickness of GCL or RNFL between treatment and non-treatment groups for high dose IV steroids
Best Corrected Visual Acuity: Non-Recovered Eyes (At Baseline and Final Follow Up)

- % of Non-recovered Eyes at Baseline
- % of Non-recovered Eyes at Follow Up

20/50, 20/60, 20/70, 20/100, 20/200, 20/400 Count Fingers
OCT RNFL Findings

Baseline Measurement (in micrometers)
- Non-recovered Eye: 6.3
- Eye Without History of Optic Neuritis: 11.5
- Control Eye: 12.9

Follow Up Measurement (in micrometers)
- Non-recovered Eye: 6.8
- Eye Without History of Optic Neuritis: 11.5
- Control Eye: 12.9
OCT GCL Findings

Baseline Measurement (in micrometers)
- Non-recovered Eye: 7.0
- Eye Without History of Optic Neuritis: 13.6
- Control Eye: 15.9

Follow Up Measurement (in micrometers)
- Non-recovered Eye: 8.2
- Eye Without History of Optic Neuritis: 13.6
- Control Eye: 15.9
Research Significance

- May be beneficial to identify GCL loss in disease processes with optic nerve edema
- Allows separation of individual layers and not be confounded with the generalized increased thickness seen in edema
- Identification of optic neuritis with GCL loss may provide opportunity for alternative treatment therapies
- Provide GCL support and minimize damage
Research Significance (cont.)

- Able to follow OCTs more closely to elucidate which layers may have higher correlation with visual function
- Allow better understanding of disease course.
- Contribution to visual acuity, vision loss, and re-acquisition of sight of various retinal layers
- Ultimately, cumulative results may assist in predicting disease severity and prognosis
References


9. Case courtesy of Dr. Roberto Schubert. radiopaedia.org, Rid:14295


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Thank you!

Questions??