Inflammatory Optic Neuropathies

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Disclosure:
The speaker has no financial interest in the subject matter of this presentation.
Objective:

- Develop an organized, localization-based approach to the differential diagnosis, treatment strategy and prognosis of common inflammatory optic neuropathies, with an emphasis on proper utilization of laboratory, neuroimaging and therapeutic modalities.
12 year-old girl

“blurry vision” OS; pain with EOM

09/2010

- 3-day IVMP

- VA OD 20/15, OS 20/400
- HRR OD 10/10, OS 1/10
- APD + OS
- Disc mild edema

10/2010

- VA OD 20/15, OS 20/25
- HRR OD 10/10, OS 8.5/10
- APD trace OS
- Disc edema resolved
• MRI brain normal
• ANA, ACE, antiphospholipid antibodies, B henselae, ESR, CRP, Lyme, rheumatoid panel and NMO negative.

• F/U 11/1/10, 12/6/10, 6/6/2011 stable-improving examination w f/u MRI normal

• 09/08/2014 OD “foggy and hazy,” decreased color with pain at EOM
• OD 20/25, OS 20/15, 1/10 OD, 10/10 OS with subtle APD
• Normal appearing nerve
• Repeat MRI
12-year-old girl:

- 09/25 “blured vision” OS
- Pain with EOM
- Initial examination
- 20/15 OD, 20/400 OS
- Dyschromatopsia, APD OS
- Mild disc edema OS

- 3-day IVMP with oral taper

- 10/15: VA 20/15, 20/25+ HRR 10/10, 8.5/10 (slower)
- Resolving edema
Optic Neuritis

- Most common acute optic neuropathy
- Idiopathic or associated with MS
- ~1 to 5/100,000
- White: 85%
- Female: 77%
- Age 20-50 (mean 32)
- Children (1st, 2nd decade)
ON: Clinical Profile

• Rapid onset (~ 5 days) central vision loss
• Visual acuity
  – 20/40 or >: 35%
  – 29/50-20/190: 29%
  – 20/200 or <: 36%
• Optic disc swelling 35%
• Variable visual field defect

• Ocular pain 92%
  – 87% worse with eye movement
KEEP CALM
We'll Be Back
In 5 Minutes

ON: Diagnosis
The Optic Neuritis Treatment Trial

Probability of Recurrent Optic Neuritis


- **ORAL PRED**
- **ORAL PLACEBO**
- **IVMP**

P=0.004 Prednisone vs. Placebo
P=0.003 Prednisone vs Intravenous
Optic neuritis (ON) is an inflammatory disorder of the optic nerve. Most cases are idiopathic or associated with MS. ON can be associated with a variety of systemic or ocular disorders and is the most common acute optic neuropathy in adults.

- Oral prednisone (1mg/kg/day) = no value in treating ON
- IVMP (1g/day x 3):
  - significantly faster visual recovery over 1st 30 days
  - reduced 2-yr risk of CDMS if abnormal MRI
- Higher-dose oral prednisone speeds recovery
- No evidence of long-term benefit

Neurology 2000
MRI and Risk of MS

5 years\textsuperscript{1} 10 years\textsuperscript{2}

0 lesions $\rightarrow$ 16\% $\rightarrow$ 22\%

1-2 lesions $\rightarrow$ 35\% $\rightarrow$ 56\%

$>$2 lesions $\rightarrow$ 51\% $\rightarrow$ 56\%

\textsuperscript{1}Optic Neuritis Study Group. Neurology 1997
LONS: 15-year follow-up

Cumulative Probability of MS

Years After Randomization

≥ 3 MRI Lesions, N=91
0 MRI Lesions, N=191
1-2 MRI Lesions, N=70

5 10

78% 65%

32%
Our Patient Revisited: 16-years-old

- 09/08/2014:
  - OD “foggy and hazy,” decreased color, pain with EOM
- VA OD 20/25, OS 20/15
- HRR 1/10 OD, 10/10 OS
- < 0.3 log APD OS
- Disc normal
Demyelination vs Axon Loss
Spectral-Domain OCT

- Vitreous
- Fovea
- Choroid
- RNFL
- Optic Disc
- Sclera

250 µm

log reflection
Active MS is associated with accelerated retinal ganglion cell/inner plexiform layer thinning

ABSTRACT

Objective: To determine the effect of clinical and radiologic disease activity on the rate of thinning of the ganglion cell/inner plexiform (GCIP) layer and the retinal nerve fiber layer in patients with multiple sclerosis (MS) using optical coherence tomography (OCT).

Methods: One hundred sixty-four patients with MS and 59 healthy controls underwent spectral-domain OCT scans every 6 months for a mean follow-up period of 21.1 months. Baseline and annual contrast-enhanced brain MRIs were performed. Patients who developed optic neuritis during follow-up were excluded from analysis.

Results: Patients with the following features of disease activity during follow-up had faster rates of annualized GCIP thinning: relapses (42% faster, p 5 0.007), new gadolinium-enhancing lesions (54% faster, p , 0.001), and new T2 lesions (36% faster, p 5 0.02). Annual GCIP thinning was 37% faster in those with disability progression during follow-up, and 43% faster in those with disease duration , 5 years vs. 5 years (p 5 0.003). Annual rates of GCIP thinning were highest in patients exhibiting combinations of new gadolinium-enhancing lesions, new T2 lesions, and disease duration , 5 years (70% faster in patients with vs without all 3 characteristics, p , 0.001).

Conclusions: MS patients with clinical and/or radiologic nonocular disease activity, particularly early in the disease course, exhibit accelerated GCIP thinning. Our findings suggest that retinal changes in MS reflect global CNS processes, and that OCT-derived GCIP thickness measures may have utility as an outcome measure for assessing neuroprotective agents, particularly in early, active MS. Neurology® 2013;80:47–54
SD-OCT in Optic Neuritis/MS

- 164 MS patients, 59 controls
- SD-OCT scans every 6 months
- MRI scans at baseline and 1 year

**Ganglion Cell/Inner Plexiform Layer:**
- MS relapse: 42% faster thinning
- Gd-enhancing lesions: 54% faster thinning
- new T2 lesions: 36% faster thinning
- worsening disability: 37% faster thinning

Ratchford et al, Neurology 2013
Table 1 Features considered atypical for demyelinating optic neuritis

- Painless

Features considered atypical for optic neuritis

- Aged <15 years or >50 years
- No relative afferent pupillary defect
- Aquaporin-4 (neuromyelitis optica) antibody positivity
- Immediate and dramatic response to steroids
- Bilateral or chariot involvement
- Severity – no light perception or hand motion vision
- Progressive vision loss after several weeks
- Painless
- Presence of a macular star (inferring neuroretinitis)
- Lack of recovery over time
- Steroid dependence (worsening of vision with steroid tapering)
- Optic atrophy at presentation
- Anterior or posterior uveitis

Pula J, MacDonald CJ. Clin Ophthal 2012