Title: Atypical Case of Multiple Sclerosis Presenting with Wall-Eyed Bilateral Internuclear Ophthalmoplegia, Nystagmus and Severe Optic Atrophy

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Abstract: A 31 year old Black Male with presumed weakness secondary to motor vehicle accident presents with severe vision loss, abnormal motilities, and nystagmus. Ophthalmologic imaging, MRI and clinical findings provide successful diagnosis of Multiple Sclerosis.

I. Case History: A 31-year-old Black Male presents with a chief complaint of decreased vision of both eyes after losing spectacles 1 year ago. The patient's last eye exam was 2 years ago. He reports a left eye turn outward "for at least 9 years," and denies headache, diplopia, oscillopsia, pain on eye movements, or transient vision loss. He reports no medical conditions or medications but does report a motor vehicle accident 5-6 years ago with no sustained head trauma. Weakness in his left leg and poor balance followed 6 months after the accident. The patient was under care of pain management, PCP, and rehabilitation for 2 years without conclusive diagnosis. He discontinued follow up about 1.5 years ago after losing insurance. The patient uses a cane to aide in mobility and admits to tingling in his hands greater in heat and hot showers and urinary incontinence. He denies history of smoking, substance abuse or vitamin deficiency.

II. Pertinent findings:

Best Corrected Visual Acuity: 20/25 OD, 20/400 OS PH NI
Pupils: Round and reactive OD, grade 2 APD OS
CVF: Full to finger counting OD+OS
Cover Test: Distance and Near: 35-40 pd CAXT (OD preference)
EOMS: Bilateral internuclear ophthalmoplegia (BINO), (-) convergence, upbeat nystagmus in primary gaze with increased amplitude in upgaze, downbeat nystagmus in downgaze OU.
Color Vision (Ishihara): No defects OD, Pt unable to perform OS.
DFE/Fundus Photography: OD:0.3 CD, mild temporal optic nerve head (ONH) pallor. OS: 0.3 CD, severe superior, temporal, and inferior ONH pallor with corresponding RNFL loss.
Cirrus OCT: Reduction of average RNFL OS>OD, superior and temporal RNFL loss OD, superior, temporal and inferior RNFL loss OS and 360 GCL loss OS>OD.
Laboratory Studies: CBC, ESR, ACE, RPR, ANA, chlamydia trachomatis/Neisseria gonorrhoeae, lipid, thyroid and metabolic panel, Hemoglobin A1C; all negative/unremarkable
Neuro Eval: Mild dysmetria of left extremities, wide gait, poor balance, spastic.
MRI with/without Contrast: Foci of increased T2 signal most consistent with demyelinating disease in cerebral white matter, midbrain, cerebellum and cervico-medullary junction.

III. Differential diagnosis: Primary Differential: Optic Atrophy OS>OD Secondary to Presumed Optic Neuritis by Multiple Sclerosis with Associated Wall-Eyed BINO and Gaze Evoked Nystagmus. Others: Connective tissue disease, SLE, Sjogren's, Behcet's, Infection, Sarcoid, Neoplasm, Neuromyelitis Optica, AION, hereditary optic neuropathies.

IV. Diagnosis and Discussion: Optic Atrophy OS>OD Secondary to Presumed Optic Neuritis by Multiple Sclerosis with Associated Wall-Eyed BINO and Gaze Evoked Nystagmus.

Multiple Sclerosis (MS) is an autoimmune disease against myelinated axons of the CNS characterized by episodes of inflammation followed by demyelination and axonal damage. It has
been widely accepted that the greatest prevalence occurs in women ages 20-50 and in Northern Europeans. However, African Americans are severely underrepresented in MS clinical studies and recent research shows a higher incidence rate in Africans Americans than Caucasians.\(^1\)

Diagnosis is based on clinical exam findings suggestive of brain and spinal cord disease and lesions with evidence of dissemination in space and time on MRI.\(^2\) Major ocular manifestations include typical optic neuritis, internuclear ophthalmoplegia (INO), and nystagmus, therefore diplopia, pain on eye movements, and sudden unilateral vision loss may be reported.\(^2,3\) Patients presenting with typical optic neuritis have a 50% risk of developing MS in 15 years. There is no long-term treatment benefit of corticosteroids for typical optic neuritis but diagnosed MS is treated with monoclonal antibodies, immunomodulators, or cytotoxic agents.\(^2\) As a result, quick and proper referral is critical to reduce relapses and lessen progression of physical and visual disability. Following optic neuritis, optic atrophy occurs and vision loss progresses with each episode. Optic atrophy can be observed by ONH pallor, and OCT allows for detection of subtle changes and careful monitoring of RNFL and GCL. Greatest RNFL loss on OCT is seen 3-6 months after an episode. In addition, studies show progressive neurodegeneration of the RNFL and GCL independent of optic neuritis.\(^4\) INO is found in 34-53% of MS patients. It is due to a MLF lesion and characterized by impaired adduction in the affected eye with nystagmus on abduction of the contralateral eye upon contralateral gaze. BINO is often much later in the disease course. Wall-eyed BINO presents with exotropia and loss of convergence. This finding is less common with far more extensive midbrain lesions, therefore MLF disruptions such as vertical gaze evoked nystagmus can be seen in conjunction.\(^3\)

V. Treatment/Management: The patient was thoroughly educated on his condition and importance of compliance in medications and follow up. The patient was prescribed oral dimethyl fumarate and referred to social services, urology and rehabilitation. Polycarbonate specs were prescribed and a low vision evaluation was recommended. MRI with neurology and next DFE, OCT and VF is scheduled for 6 months.

References:

VI. Conclusion: Putting the clinical picture together rather than treating findings as separate entities is critical for diagnosis of MS as the presentation can vary and patient history can obscure the diagnosis. Understanding typical eye movement disorders can expedite the diagnosis and provide insight to severity. In absence of acute optic neuritis, optic atrophy following previous optic neuritis must be ruled out in suspected MS. All cases of suspected MS require STAT neurology referral and MRI, and workup to rule out other etiology. The eyecare provider plays a critical role in diagnosis and management as changes in VF, color vision, acuity, and contrast sensitivity can impact daily life. Further, changes in optic nerve function and VF and OCT imaging should be communicated with neurology as they correlate strongly with clinical and radiological progression and should be monitored even without history of optic neuritis.