OPTIC NEURITIS

SANDRA AZARELI GARCIA VELAZQUEZ
UNIVERSITY OF GUADALAJARA-LOS ALTOS UNIVERSITY CENTER
MEDICAL GRADUATE

INTRODUCTION

- Optic neuritis is an inflammatory, demyelinating condition that causes acute, usually monocular, visual loss.
- It is highly associated with multiple sclerosis (MS). Optic neuritis is the presenting feature of MS in 15 to 20% of patients and occurs in 50% at some time during the course of their illness.

EPIDEMIOLOGY

- Most cases of acute demyelinating optic neuritis occur in women (two-thirds) and typically develop in patients between the ages of 20 and 40.
- The incidence of optic neuritis is highest in populations located at higher latitudes, in the northern United States and western Europe, and is lowest in regions closer to the equator.
- **United States** → annual incidence of optic neuritis to be as high as 6.4 per 100,000, and it is more common in whites than blacks.

PATHOPHYSIOLOGY

Inflammatory demyelination of the optic nerve

The pathology is similar to that of acute multiple sclerosis (MS) plaques in the brain, with perivascular cuffing, edema in the myelinated nerve sheaths, and myelin breakdown.

Inflammation of the retinal vascular endothelium can precede demyelination and is sometimes visibly manifest as retinal vein sheathing. Myelin loss exceeds axonal loss.

Systemic T cell activation is identified at symptom onset and precedes changes in the cerebrospinal fluid (CSF)

ETIOLOGY

Table 1.

Aetiology of Optic Neuritis

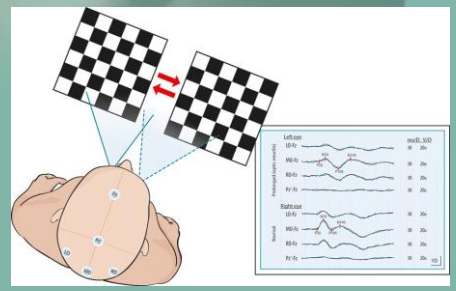
Demylinating lesions	Multiple Sclerosis (MS) [4,8-10], Neuromyelitis optica [4,8,9], Shilder's disease, Encephalitis periaxialis concentrica [4] (out of which MS is the most common cause [4])
Autoimmune Disease	Sarcoidosis [1,4,9], systemic lupus erythematosus (SLE) [4,9], Sjögren's syndrome (SS), Behchet's disease [9]
Infectious/para-infectious	Herpes zoster [9], lyme disease [1,4,9], syphilis [1,4,9,11], tuberculosis, dengue [11,13], mumps, varicella zoster [4,11], toxoplasmosis [4,9,11], measles [4,11,12], leptospirosis, chickungunya, west nile [11], adenovirus, brucellosis, coxsackievirus, cat scratch disease, β-hemolytic streptococcal infection, meningococcal infection, typhoid fever, whipple's disease [4]
Inflammatory/post vaccination	sinusitis [1], vaccinations against tuberculosis, hepatitis B, rabies, tetanus, meningitis, anthrax, measles, rubella & influenza [12]

CLINICAL FEATURES

Acute

- Usually monocular
- Bilateral more common in children
- Vision loss
- Decreased central visual acuity
- Eye pain
- Afferent pupillary defect
- Central scotoma
- Photopsias
- Loss of color vision

Chronic



- Persistent visual loss
- Relative APD (Marcus Gunn phenomenon)
- Color desaturation (dyschromatopsia)
- Exacerbation with increased body temperature (Uhthoff's phenomenon)
- Optic atrophy
- Pattern shift VER remains delayed (P100)

Table 3.

Features of Atypical ON in Adults

• Age > 50 or < 12 years [2,9]
• Simultaneous or sequential bilateral ON [2,4,9]
• light perception) which progress for > 2 weeks from onset [1,2,4,9]
• Painless/painful/persistent pain > 2 weeks [2,4,9]

• Abnormal ocular findings:
  • Noticeable anterior and/or posterior segment inflammation [2]
  • Significant uveitis [9] and retinal periphlebitis [2,9]
  • Intensely swollen optic nerve head [2,4,9]
  • Severe optic disc haemorrhages [1,2,5,9]
  • Retinal exudates [1,4,5]
  • Macular star [1]

• Absence of any visual recovery within 3-5 weeks [2,4,9] or continued exacerbation in visual function [2]
• Lower risk of developing MS [4]
• Manifestation of systemic diseases other than MS [2,9]
• Deterioration in vision after steroids discontinuation [2,9]
• Family history [2]
• Previous history of neoplasia [2,9]
• Optic atrophy lacking history of ON or MS [9]

DIFFERENTIAL DIAGNOSES

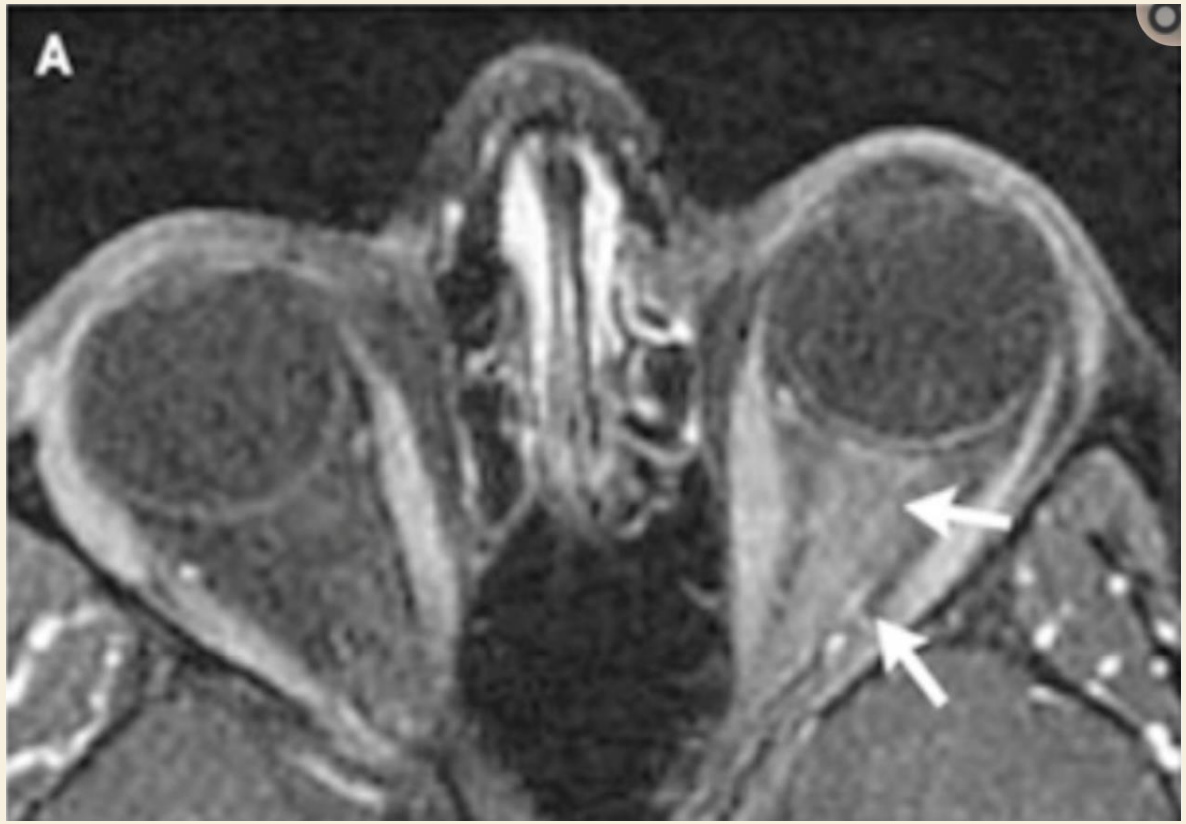
- **Anterior ischemic optic neuropathy** (AION)
- **Leber's hereditary optic neuropathy** (LHON)
- **Toxins** (carbon monoxide, ethylene glycol, methanol, tobacco, etc.)
- **Drugs** (ethambutol, clioquinol, isoniazid, methotrexate, etc.)
- **Nutritional deficiencies**
- **Compressive optic neuropathies** (arterial aneurysm, tumor, mass lesions, thyroid eye disease, etc.)

Differential Diagnosis of NMO *vs* MS

Features		Neuromyelitis Optica	Multiple Sclerosis
Attacks are bilateral		Usually [8,9]	Rarely [8]
Visual loss severity		More, with less improvement [8,10,14,22]	Less, with more improvement [9,22]
White matter lesions on brain MRI		Rarely and usually resolving [8,9]	Usually [8,22]
Transverse myelitis		TM in spinal MRI often spanning ≥3 spinal cord segments (in 20%) [2,8,9,22]	Rarely [8]
Clinical involvement beyond spinal cord and optic nerve		Rarely [8]	Usually [8]
Tissue destruction and cavitations		More than MS [8]	Less than NMO [8]
CSF Analysis	Oligoclonal bands	Rarely [2,8,9]	Frequently [8,22]
	Protein contents	Higher than MS [8]	Lower than NMO [8]
Treatment	DMDs	Ineffective even worsening [8,9]	Effective [8,9,23]
	Immunosuppressive (corticosteroids)	First line of treatment [8,9]	First line of treatment [24]

DIAGNOSIS

- Clinical
- MRI
- Lumbar puncture
- Other testing
  - Fluorescein angiography
  - Visual evoked response
  - Optical coherence tomography
  - Antibody testing



TREATMENT

- Acute treatment
  - Corticosteroids (IV methylprednisolone)
  - Alternative acute immunomodulatory therapy (IVIG, plasma exchange)
- Disease modifying agents for optic neuritis due to MS (Interferon B1a, Interferon B1b, glatiramer acetate)
- Investigational treatments (dalfampridine, erythropoietin, phenytoin, amiloride…)

PROGNOSIS

- **Recovery of vision**: 90% have 20/40 or better vision at one year
- **Recurrence**: In the Optic Neuritis Treatment Trial (ONTT), there was a 35% recurrence of optic neuritis at 10 years: 14% in the original eye, 12% in the other eye, and 9% in both eyes
- **Risk of MS**: the 5-year incidence of clinically definite MS was 30% following a first episode of idiopathic demyelinating optic neuritis

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