Myasthenia Gravis as Pseudo-INO

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Introduction

Internuclear Ophthalmoplegia (INO)

- INO is an important cause of diplopia
- Most common causes include multiple sclerosis and stroke
- Pathophysiology involves damage to an internuclear connection in the brainstem called the medial longitudinal fasciculus (MLF) [1]
- During normal lateral gaze, CN VI on the side of the abducting eye sends an impulse to the lateral rectus of that same eye (resulting in abduction) and an impulse through the MLF to opposite CN III nucleus which stimulates an impulse to the opposite medial rectus (resulting in adduction) [2]
- INO occurs when the MLF is damaged, causing an adduction deficit ipsilateral to the damaged MLF [2]
- Horizontal nystagmus also commonly occurs in the contralateral abducting eye, due to Herring's Law [2]
- Convergence remains intact, as CN III and the medial rectus are unaffected
- Several disorders exist that may cause a similar presentation to INO, but are not due to a damaged MLF; this is termed pseudo-INO

<u>Pseudo-INOs and their distinguishing features</u>:

Myasthenia Gravis (MG)

- Autoimmune disease targeting acetylcholine receptors (AChR) in neuromuscular junction
- Symptoms are fatigable and fluctuate
- Often associated ptosis and muscle weakness in other parts of the body
- Nystagmus is absent (in contrast to INO) [3]
- Diagnose with ice pack test, autoantibodies, single-fiber electromyography (SF-EMG). See figure 1 for further details on ice pack test vs SF-EMG

Lambert-Eaton Myasthenic Syndrome (LEMS)

- Autoimmune disease against voltage-gated calcium channels in neuromuscular junction
- Symptoms improve with repeated use

Graves' Ophthalmopathy

- Inflammation and fibrosis of extraocular muscles leading to restrictive strabismus
- Passive forced duction testing is positive

Miller Fisher Syndrome

- Rare variant of Guillain-Barré Syndrome
- Classic triad of ophthalmoplegia, ataxia, and areflexia
- Usually triggered by recent infection

Case Presentation

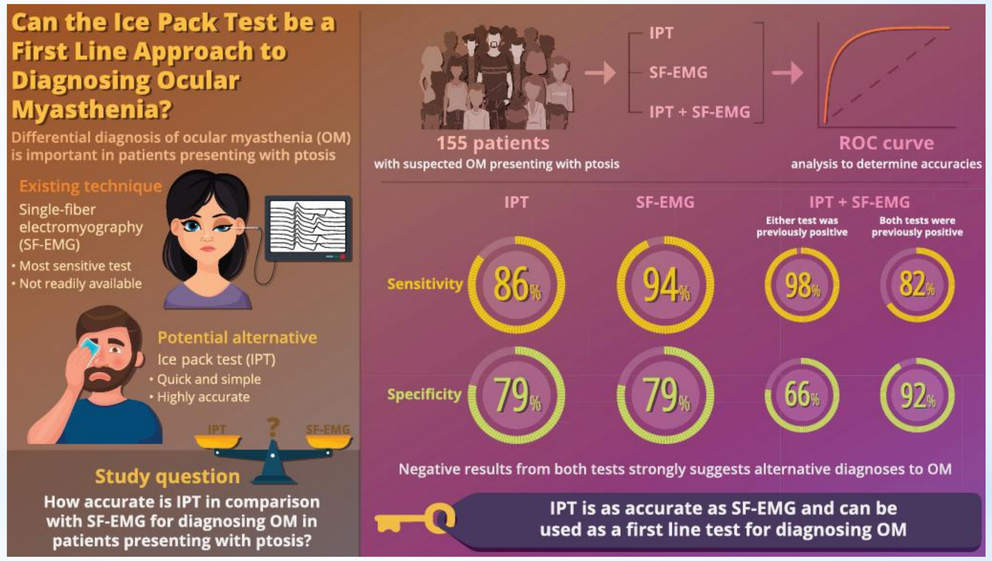
- 54-year-old-male presents with intermittent blurry vision & difficulty focusing
- Adduction deficits were noted OU raising concern for bilateral INO
- MRI brain without contrast showed no demyelinating plaques in the brain
- CT Head and CTA head and neck were also negative

Case Presentation (Continued)

- On further questioning, pt reports that symptoms fluctuate throughout the day, worsening as the day progresses
- Ptosis and Cogan sign present OU
- Positive ice test OD; Positive AChR binding and blocking antibodies
- CT chest showed no evidence of thymoma
- Pyridostigmine 60mg QID & Prednisone 20mg daily led to improvement of symptoms

Figures

Figure 1. Comparison of Ice pack test vs SF-EMG for diagnosing ocular myasthenia. Both have high levels of accuracy, however ice pack test is much more readily accessible than SF-EMG and can be performed in less than 5 minutes in the clinic. Schematic from Giannoccaro et al. [4]



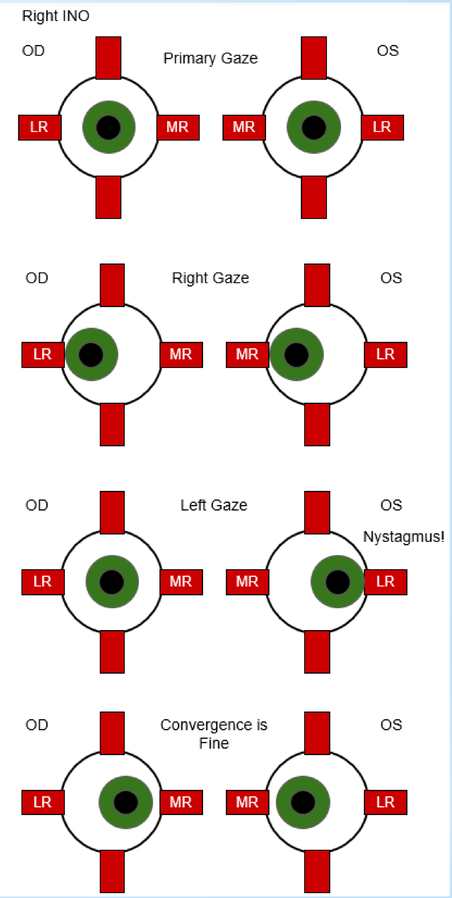


Figure 2. Schematic of right-sided INO showing ipsilateral adduction deficit and nystagmus in abducting eye in left gaze.

Conclusion

- INO occurs after damage to the MLF, which is most commonly due to multiple sclerosis or stroke
- Differential diagnosis for INO includes causes of pseudo-INO, such as MG, LEMS, Graves' Disease, and Miller Fisher Syndrome
- Distinguishing features of pseudo-INO due to MG are fatigable and fluctuating symptoms, ptosis, and lack of nystagmus in abducing eye
- Ice pack test is easy to perform and has sensitivity and specificity comparable to SF-EMG for the diagnosis of ocular MG with ptosis
- Ice pack test is much more readily accessible than SF-EMG
- Ocular MG is usually treated with pyridostigmine and/or steroids
- It is important to obtain a CT chest in the cases of MG to rule out a thymoma (which can be a treatable cause of MG)

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