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Internal Medicine

BILATERAL INTERNUCLEAR OPHTHALMOPLEGIA IS A KEY DRIVER AND PRESENTING FIRST SIGN OF THE MULTIPLE SCLEROSIS

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ABSTRACT Multiple Sclerosis is an autoimmune, inflammatory demyelination disease of CNS with various neurological and ocular manifestations. Ocular involvement occurs in approximately 80% of patients sometime during the course of the illness and may be the first presenting signs in about 50% of the patients. Bilateral antinuclear Ophthalmoplegia (BINO) is a common presenting ocular complication of Multiple Sclerosis, occurring in up to one third of all MS patients. BINO is an ocular motility impairment.

KEYWORDS : Multiple sclerosis, Ocular movements, bilateral internuclear ophthalmoplegia (BINO)

Introduction

Multiple sclerosis (MS) is a common disorder of the central nervous system that is the main cause of non-traumatic disability of young adults. Although it was regarded as predominantly an autoimmune inflammatory disease in earlier reports, MS is now revealed as complex pathophysiology characterized by inflammatory demyelinating events and a significant component of neurodegeneration that manifests as neuronal and axonal loss since the early stages of the disease (1)

Multiple sclerosis, brainstem infarctions, tumors, hemorrhages, head trauma, Arnold-Chiari malformation, infection, hydrocephalus, lupus erythematosus, and nutritional or metabolic disorders are previously reported as the etiology of INO (Intra nuclear ophthalmia)(2)

Myasthenia gravis, Miller-Fisher syndrome, Grave's ophthalmoplegia, mitochondrial disorders and oculopharyngeal muscular dystrophies were previously reported to cause pseudo-INO in the literature (3)

Multiple sclerosis (MS) commonly causes eye movement abnormalities that may have a significant impact on patients' disability. Inflammatory demyelinating lesions, especially occurring in the posterior fossa, result in a wide range of disorders, spanning from acquired pendular nystagmus (APN) to internuclear ophthalmoplegia (INO), among the most common (4)

Disability in MS is quantified using standard scales such as the expanded disability status scale and the multiple sclerosis functional composite (5).

Such scales have limitations, especially when it comes to addressing disability arising from eye movement dysfunction, a common cause of transient or long-term impairment in MS. The presence of eye movement abnormalities correlates with greater levels of disability in affected patients and generally predicts a worse prognosis (6).

Poor scores at automated tests of saccadic performance, such as the King-Devick (K-D) test of rapid number naming, also correlate with higher levels of disability (7).

While some additional scales, such as the 25-Item National Eye Institute Visual Functioning Questionnaire and a 10-Item Neuro-Ophthalmic Supplement , can help track visual symptoms such as defects in binocular vision, blurred vision and diplopia, no standard evaluation includes a systematic approach for testing functional classes of eye movements in MS.(8)

Even without a formal standardized tool, an accurate bedside eye movement examination can aid or support the diagnosis of MS, for example, by providing evidence of disease dissemination in space (9).

As the physiology and underlying anatomical network of eye movement control is well known from animal models and studies in humans , eye movement abnormalities are highly localizing to CNS structural lesions. (10)

History

Patients with internuclear ophthalmoplegia report symptoms of varying severity. Some patients may report blurry vision or diplopia or dizziness on lateral gaze. Surprisingly, some patients may complain of vertical diplopia. Vertical diplopia in the primary position is due to skew deviation of eyes with the weak adducting eye being hypertrophic. Skew deviation is a vertical misalignment of eyes caused by asymmetrical disruption of supranuclear input from the otolithic organs of the inner ear.(11)

The hallmark of internuclear ophthalmoplegia is impaired adduction in the eye ipsilateral to the affected medial longitudinal fasciculus, which can range from mild limitation to severe restriction of adduction. There is nystagmus in the abducting eye associated with this, which usually lasts for a few beats. Some patients with internuclear ophthalmoplegia may converge to a near target. The dissociation of the medial rectus function during horizontal saccades and convergence helps to confirm a medial longitudinal fasciculus lesion, ruling out other causes of medial rectus weakness.

However, recent studies have disproved this theory, and retained convergence is thought to reflect the innate ability to converge to near targets(12)

What is Multiple Sclerosis?

Internuclear opthalmoplegia (INO) is a disorder of conjugate lateral gaze.

The affected eye shows impairment of adduction of the partner eye shows impairment of adduction. The partner eye diverges from the affected eye during abduction, resulting in compensatory nystagmus in the partner eye. (Saccadic movement).

INO occurs when Multiple Sclerosis affects a part of the brain stem

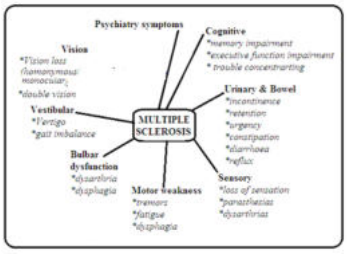
called the Medial Longitudinal Fasciculus, which is responsible for communication between the two eyes by connecting the abducens nucleus of one side to the Oculomotor of the opposite eye. This results in the failure of the Medial Rectus muscle to contracts appropriately, so that the eyes do not move equally (disconjugate gaze).

About Multiple Sclerosis:

Multiple Sclerosis is an autoimmune inflammatory disorder caused by an environmental factor mostly affecting women more aged 20 to 40 years. Multiple Sclerosis not defined as a genetic condition because there is no single gene that causes it, and hence it is termed as a multifactorial disorder.

Multiple Sclerosis more likely occur in countries far from equator as in UK, North America and Scandinavia, where the winter season is longer than the Southern hemisphere signifying the fact that MS occurrence more in peoples not exposed to sunlight and therefore less vitamin D in their bodies. Some studies have focused a link between lower levels of vitamin D and incidence of Multiple Sclerosis.

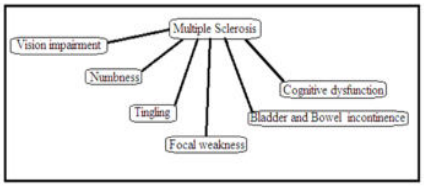
Some researchers have suggested that vitamin D supplementation may reduce the risk of Multiple Sclerosis. However, this has not been proven. Smoking is a risk factor, not clearly established, although one theory suggests that the chemicals in the cigarette smoke affect the immune system. Another theory is that common viruses such as Epstein Barr Virus (EBV) and Herpes Simplex Virus (HSV) which is a common virus that causes glandular have been the subject of mostly of the current studies. More research is needed to further to understand the risk.



Multiple Sclerosis Symptoms

The CNS (brain and Spinal cord) controls all of our brain actions. When MS damages the myelin sheath around the nerve fibers that carry messages to and from our brain, symptom can occur in any part of our body.

The symptoms are unpredictable, may develop and increase steadily over time, while for others, they come and go periodically. These periods when symptoms get worse are known as relapses. MS can cause various problems (Visual, bladder, bowel, speech and swallowing, abnormal sensation, cognitive, mental health issues and sexual issues).



Deeper understanding of multiple sclerosis needed'

MS is a disease of the central nervous system wherein the protective covering (myelin sheath) around nerves is damaged, resulting in neurological defects. The degree of disability should not be the only consideration in multiple sclerosis as patients face unpredictable symptoms. Medication can cut symptoms.

When the brain refuses to take the hint Multiple Sclerosis may be incurable but early diagnosis helps manage the disease's progress and assure the patient good quality of life. Multiple Sclerosis (MS) is a disease of the brain and spinal cord marked by loss of balance, vision loss, weakness of limbs, and bladder dysfunction among other symptoms.

However, it often goes undiagnosed, leading to delay in treatment. It affects women more than men. The disorder is commonly diagnosed between 20 and 40 years but can be seen at any age. MS is caused by damage to the myelin sheath, the protective covering that surrounds nerve cells. Due to damage in the nerve layer, transmission of signals from the brain and spinal cord is affected.(13)

BINO

BINO is caused by demyelinationary lesions within the Medial Longitudinal Fasciculous (MLF) in the region between the third and sixth nerve nuclei

The MLF consist of fibers that carry conjugate horizontal eye movement signal from the sixth nerve nucleus to the contralateral third nerve nucleus.. The MLF also consists of fibers for maintaining steady vertical position.

Areas of demyelination compromise the neurological signals in the MLF, which leads to the clinical features of BINO, bilateral palsy of adduction on the attempted horizontal gaze, bilateral horizontal nystagmus of the adducting eye, and a vertical gaze-evoked nystagmus

Figure 1: Left eye adduction palsy with Right eye abduction nystagmus on right lateral gaze

The impaired adduction of horizontal gaze may be complete, where the eye does not move pass the mid-point, or partial, where the eye either incompletely adducts or adducts slower than normal in speed.

BINO is considered pathognomonic for Multiple Sclerosis, become there is a strong prediction for the demyelinating lesion of MS affect the MLF . However, it remains unsatisfactorily explained in the literature why this prediliction for the MLF occurs.While BINO is considered pathognomonic for MS, other etiologies are possible and should be considered in cases not consistent with a diagnosis BINO (Wide page 2B).

Common cause of BINO are listed (Table 1 & 2)

Table 1. Causes of BINO

Multiple Sclerosis.
Arnold Chiari malformation.
Wernicke's encephalopathy.
Syphilis
Tumors
Head trauma.
Occlusive vascular disease.
Myasthenia gravis.

Table 2. Ocular Manifestation of Multiplesclerosis

Bilateral Internuclear Opthalmoplegia (BINO)
Optic neuritis
Optic Atrphy (Pallor).
Cranial Nerve Palsy.
Nyastagmus
Retinal lesions
Afferent Pupillary Defect
Homonymous visual field defect Posterior uveitis

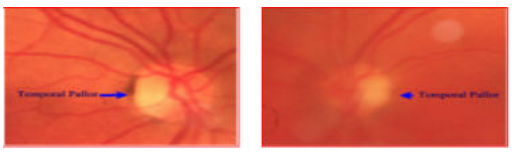


Figure 2A: Right Eye Optic Nerve
Figure 2B: Left Eye Optic Nerve

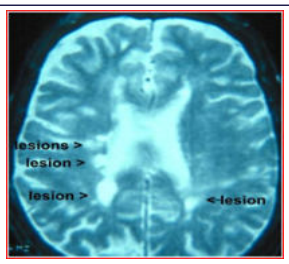


Figure 3: Axaial T2-Weighted MRI Showing High-Signal Lesions in the Periventricular White Matter Region.

Diagnosis

Blood tests, to help rule out other diseases with symptoms similar to MS. Tests to check for specific biomarkers associated with MS are currently under development and may also help in diagnosing the disease.lumbar puncture, in which a small sample of cerebrospinal fluid is removed from your spinal canal for laboratory analysis. It can also help rule out infections MRI, which can reveal areas of MS (lesions) brain and spinal cord. Potential tests, which record the electrical signals produced by your nervous system in response to stimuli. MS, the diagnosis is fairly straightforward inmost cases and the disease confirmed by brain imaging scans, such as MRI.Diagnosing MS can be more difficult in people with unusual symptoms or progressive disease.

Treatment and management

Treatment depends on the hidden cause. Acute strokes require hospitalization and neurological assessment. Other pathologies require management by a physician (e.g., MS, infections, SLE). Most patients with demyelination, infectious, and traumatic etiologies show complete recovery. Patients with cerebrovascular disorders had a less favorable recovery. Recovery is said to be more likely if internuclear ophthalmoplegia is isolated than if other neurological signs accompany it. According to some studies, recovery is also said to be less likely if there was a visible lesion causing internuclear ophthalmoplegia.

The majority of patients with persistent internuclear ophthalmoplegia have minimal symptoms. Those with diplopia may benefit from botulinum toxin injections.Surgical correction of strabismus may be used for patients with wall-eyed bilateral internuclear ophthalmoplegia.(14)

Summary

INO (Intra nuclear ophthalmic),as the displaying indication of infantile-onset multiple sclerosis who also had concurrent Lyme disease. INO is an uncommon ophthalmic finding of infants and identification may be difficult in the pediatric population. Early recognition of the basic cause can lead to better outcomes for patients.

Conclusion

INO in the adult population is frequently the result of a demyelinating disease such as multiple sclerosis (MS) or an ischemic cerebrovascular accident. Less common causes include trauma, tentorial herniation, intracerebral hemorrhage, vasculitis, and infection (15)

MS is most commonly diagnosed in young adults and presents much less frequently in children before age 16 years. There have been few reports of pediatric INO secondary to a demyelinating disease such as MS, and it remains a rare ophthalmic finding in the pediatric population (16)

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