

Bilateral optic neuritis in a boy – More than the eyes

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SUMMARY

Neuromyelitis optica (NMO) is a rare disorder in children with variable presentation. We report a 7-year-old boy who presented with bilateral retrobulbar optic neuritis and responded very well to treatment. He was also positive for aquaporin 4 (AQP4) antibodies, which is part of an emerging endophenotype within autoimmune neurological disorders in childhood.

KEY WORDS:

Neuromyelitis optica, Aquaporin 4, optic neuritis

INTRODUCTION

Optic neuritis is an inflammatory process involving the optic nerve. In children, most cases of optic neuritis are due to an immune-mediated process, which is associated with infection or immunization. However, it can be the first manifestation of a demyelination disease. Therefore, a high suspicion of the possibility of neuromyelitis optica (NMO) should be in place especially in the case of bilateral severe retrobulbar optic neuritis, which requires more thorough assessment and investigations.

The exact pathomechanism of NMO is unknown, but there is emerging evidence that molecular mimicry and genetic susceptibility may be a key factor. Aquaporin 4 (AQP4)-IgG is a sensitive and highly specific serum biomarker for NMO.¹ It is an antibody that targets the central nervous system (CNS) - predominant water channel, aquaporin-4. Aquaporin-4 is the most abundant water channel in the central nervous system and is widely distributed throughout the brain, spinal cord and optic nerves. It is highly expressed by the astrocyte endfeet processes and is critical for normal regulation of water flux at the blood-brain barrier. NMO-IgG induces an increase in the blood brain barrier permeability, complement cascade activation, inflammation and astrocytic cytotoxicity.¹

CASE REPORT

This 7-year-old Malay boy who was previously well with no co-morbidities presented with bilateral acute painless visual loss for two days, which was associated with vomiting. He also had low-grade fever, headache and generalised body weakness for one week. However, he had neither recent history of vaccination nor infection. He was born to non-consanguineous parents of Malay origin and has one younger brother who is healthy.

Ocular examination revealed bilateral retrobulbar optic neuritis with severe impaired vision to only perception of light. Both pupils were mid-dilated and sluggish to light. Anterior segment and fundoscopic examination of both eyes were normal. There was no optic disc swelling noted. He had no feature suggestive of connective tissue disease.

T2 and FLAIR Magnetic Resonance Imaging (MRI) of brain showed extensive hyperintense lesions involving all the lobes of both cerebral hemispheres with periventricular sparing. (Figure 1)

He was initially treated as acute disseminated encephalomyelitis (ADEM) with intravenous methylprednisolone followed by a course of oral prednisolone. A month later, the natural history of the disorder evolved further to involve his spine with symptoms of weakness and numbness over both his upper and lower limbs as well as loss of bladder control. MRI spine showed long segment of hyperintensity lesions within the spinal cord (Figure 2). Anti-Aquaporin 4 (AQP 4) antibody and antinuclear antibody were positive.

A course of high dose intravenous methylprednisolone (30mg/kg/day) for five days was given again followed by two weeks oral prednisolone (1mg/kg/day) and tapered over one month. The child regained his normal motor function and achieved 6/9 visual acuity in both eyes a few days after the treatment. Repeated anti-Aquaporin 4 antibody after he completed the course of treatment was negative. He was not started on long-term immunotherapy and has remained well during his latest review at one-year post treatment.

Table 1: Proposed diagnostic criteria for neuromyelitis optica³

Absolute criteria:

1. Optic neuritis
2. Acute myelitis

Supportive criteria: (At least two of three)

1. Contiguous spinal cord MRI lesion extending over 3 vertebral segments
2. Brain MRI not meeting diagnostic criteria for multiple sclerosis
3. NMO-IgG seropositive status

This article was accepted: 23 November 2015

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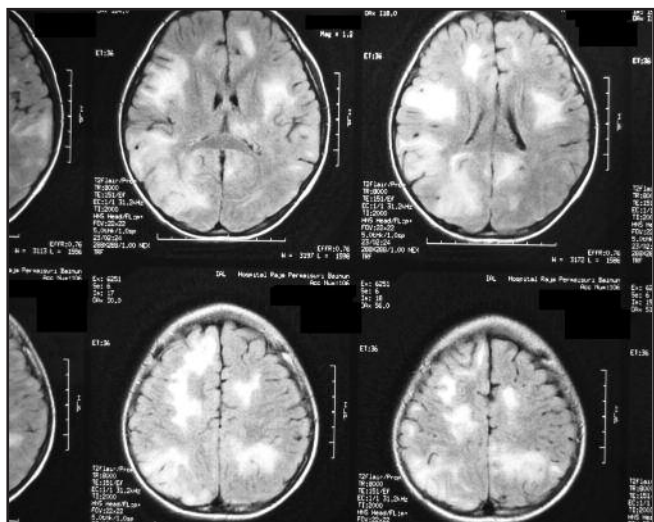


Fig. 1: Coronal T1 (FLAIR) - Weighted brain MRI showed extensive hyperintense lesions involving all the lobes of both cerebral hemispheres with periventricular sparing.



Fig. 2: Sagittal T2-weighted cervical spinal cord MRI showed a long hyperintensity (5 vertebral body lengths) within the spinal cord (white arrow).

DISCUSSION

Neuromyelitis optica (NMO) is an inflammatory disease that often presents with optic neuritis and transverse myelitis. The incidence of acquired demyelinating diseases in the paediatric population is approximately 1 in 100,000. Out of this, NMO patients consist of only 3% to 4% and are more predominant in females.² This case report describes a rare case of NMO in a young boy who was initially diagnosed as ADEM based on the clinical features and the MRI brain findings.

Since the clinical syndrome of encephalopathic variants of NMO can mimic acute disseminated encephalomyelitis (ADEM),¹ making a diagnosis can be challenging during the early presentation. Furthermore, distinguishing between NMO and multiple sclerosis is crucial for successful management. Many clinical, neuroimaging and laboratory studies have provided useful means to differentiate NMO from multiple sclerosis (MS). Currently, the diagnosis of NMO can be supported by the identification of AQP4-IgG.

The emerging spectrum of the AQP 4 antibodies positive children can range from asymptomatic to severe. In severe cases, the attacks of optic neuritis can lead to blindness. Moreover, transverse myelitis can result in paraparesis or tetraparesis, a symmetric sensory loss below the lesion and sphincter dysfunction. Myelitis may expand towards the brain stem and lead to hiccups, intractable vomiting or death secondary to respiratory failure.¹ Autoimmune diseases and autoantibodies are more common in NMO disorders and requires further investigation.¹

A revised diagnostic criterion for NMO has been proposed in 2006 to include AQP4 antibody status.³ The diagnosis of NMO requires two absolute criteria and at least two of three supportive criteria (Table I). The absolute criteria include optic neuritis and acute myelitis. Lately, an expanded

spectrum of NMO disorders was proposed to include recurrent brainstem, hypothalamic and encephalopathy symptoms as alternate supportive evidence for the diagnosis of NMO.⁴

The first-line therapy for acute attacks of NMO is intravenous corticosteroids (30mg/kg/d of methylprednisolone for five consecutive days, maximum of 1g daily). For relapse cases, plasma exchanges or intravenous immune globulin has shown benefit.⁵ For long term management, a conservative observational approach is advised in seronegative and likely monophasic cases. However, in seropositive patients or in cases of recurrent NMO, maintenance immunotherapy is needed to prevent relapse. This patient responded very well to the steroid without relapse. Early treatment has converted his seropositive status to seronegative without long-term immunotherapy.

CONCLUSION

Bilateral severe retrobulbar optic neuritis should raise the suspicion of neuromyelitis optica, which requires further investigations. Early treatment can reverse the natural history of neuromyelitis optica as shown in this case.

REFERENCES

1. Lucchinetti CF, Mandler RN, McGavern D, Bruck W, Gleich G, Ransohoff RM, *et al.* A role for humoral mechanisms in the pathogenesis of Devic's neuromyelitis optica. *Brain* 2002; 125(Pt 7): 1450-61.
2. Tillema JM, McKeon A. The spectrum of neuromyelitis optica (NMO) in childhood. *J Child Neurol* 2012; 27(11): 1437-47
3. Wingerchuk DM, Lennon VA, Pittock SJ, Lucchinetti CF, Weinshenker BG. Revised diagnostic criteria for neuromyelitis optica. *Neurology* 2006; 66(10): 1485-9.
4. Lana-Peixoto MA, Callegaro D. The expanded spectrum of neuromyelitis optica – evidences for a new definition. *Arq Neuropsiquiatr* 2012; 70(10): 807-13
5. Wingerchuk DM, Weinshenker BG. Neuromyelitis optica. *Curr Treat Options Neurol* 2005; 7(3): 173-82.