Irish Medical Journal
Established 1867

Issue: Ir Med J; Vol 114; No. 6; P388

Myelin Oligodendrocyte Glycoprotein (MOG) Antibody Related Disease

N. Ennis[1],I. Hunt[2] ,L. Rice[3], C. Bannan[4,5] , D. Bradley[2], S. O'Callaghan[1]

1. Acute Medical Assessment Unit, St. James's Hospital, Dublin.
2. Department of Neurology, St. James's Hospital, Dublin.
3. Radiology Department, St. James's Hospital, Dublin.
4. Department of Genitourinary Medicine and Infectious Diseases (GUIDe), St. James's Hospital, Dublin.
5. School of Medicine, Trinity College Dublin.

Abstract

Presentation

A 20 year old male presented with bilateral leg weakness and urinary retention.

Diagnosis

Routine bloods and imaging were normal. MRI spine showed myelitis. CSF analysis showed elevated protein and significant leukocytosis. Microbiological, autoimmune and paraneoplastic tests were negative. Autoimmune antibody testing was positive for Anti MOG antibodies.

Treatment

Initially he was treated for a broad differential with empiric CNS bacterial and viral coverage, as well as steroids. In addition to his steroid treatment, he required plasma exchange.

Discussion

MOG antibody related disease is a rare neuro-inflammatory condition. Acute treatment consists of high dose steroids, and potentially plasma exchange. There is a moderate relapse risk. Patients can be left with significant disability.

Introduction

Myelin oligodendrocyte glycoprotein (MOG) antibody related disease is a rare neuro-inflammatory condition, emerging from neuromyelitis optica spectrum disorder (NMOSD). [1] Acute treatment consists of high dose steroids, and if improvement is not seen, plasma exchange (PLEX) is used. [2]

Case Report

A 20 year old male presented to the emergency department with a three day history of bilateral leg weakness, hypoesthesia and urinary retention requiring catheterisation. He had no past medical conditions, nor regular medications. Examination revealed grade 3/5 pyramidal weakness in the lower limbs, pinprick and cold temperature sensory loss to level T5/6. Deep tendon reflexes were depressed. There was no ankle clonus. Babinskis sign was negative. Cranial nerves, cerebellar and upper limb examinations were normal.

Routine blood tests, CXR and MRI brain were normal. MRI spine revealed a longitudinally extensive T2 hyperintense anterior cord lesion from the level of C6-7 to the conus. There was no cord expansion nor abnormal enhancement on postcontrast sequences. Initial cerebrospinal fluid (CSF) analysis showed a significant leukocytosis c. 300 WBCs per mm^3 (20% polymorphs / 80% monocytes) and elevated protein (86mg/dl). CSF glucose was normal. Oligoclonal bands were negative. He underwent extensive CSF and serum testing, see table 1.

Table 1: *Tests and results.*

	Tests	**Result**
CSF Microbiology testing	Gram stain and culture, Cryptococcal Antigen Assay, Acid Fast Bacilli direct microscopy, GeneXpert MTB/RIF Ultra assay, TB cultures, PCR Meningococcal DNA, PCR Pneumococcal DNA, and PCR H. Influenza DNA	Negative
Serum microbiology tests	Borrelia Burgdorferi IgG Syphilis TP assay, Cryptococcal antigen, Lyme IgG serology, Mycoplasma pneumonia IgM, Mycobacterium tuberculosis complex DNA, Hepatitis B Surface Antigen, Hepatitis C Antibody, and HIV Ag/Ab Combo.	Negative
Serum autoimmune tests	Immunofluorescence screen, Serum ACE, MAG antibodies, Anti-Hu antibodies, Anti-Ri antibodies, Anti-YO antibodies and Aquaporin 4 antibodies.	Negative
	anti-MOG antibodies	Positive

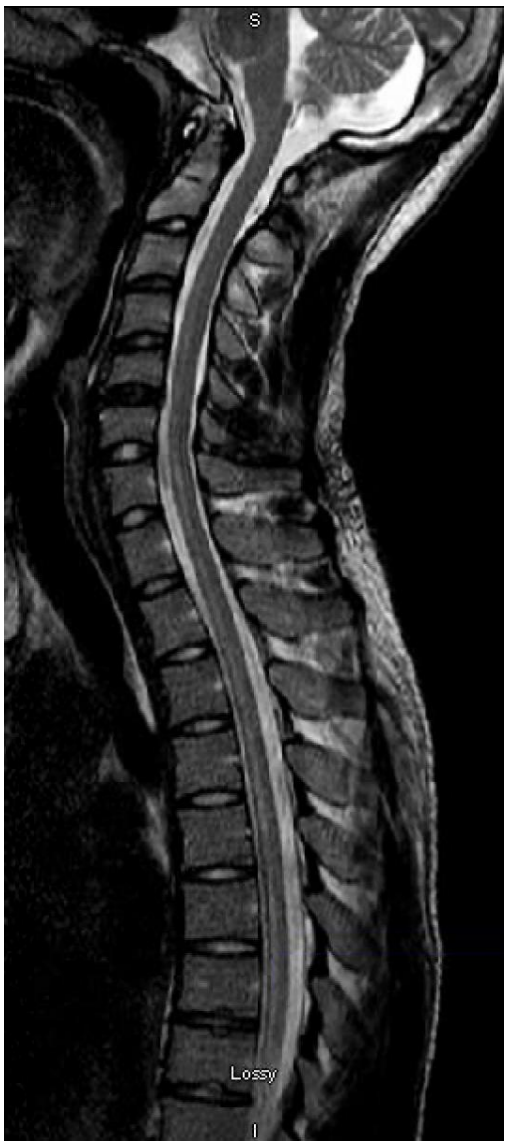

Figure 1: Sagittal T2-weighted image of the spine demonstrating irregular T2 hyperintensity in the spinal cord from the level of C6-7 to the conus.

Initially he was treated for both infective and inflammatory causes with empiric CNS bacterial and viral coverage, as well as daily 1g intravenous (IV) Methylprednisolone. Antibiotics were rationalised with microbiology results. He completed 5 days of IV Methylprednisolone, with subsequent oral steroid taper. Recovery was slow and significant residual symptoms remained; therefore, he underwent five cycles of PLEX. After this he made significant clinical improvements. He was discharged independently mobile on maintenance steroids.

The results of specialised tests sent to Oxford, England, became available after discharge. He was positive for anti-MOG antibodies. The reference range for the Oxford test was negative at 1:20 titre. The patient was informed of these results during the COVID-19 pandemic. He returned to his home country to be with his family and attends a neurologist and urologist there. He is currently well on maintenance steroids of 20mg. He has not commenced long term steroid sparing immunotherapy to date. He has ongoing neurogenic bladder issues.

Discussion

MOG antibody disease has emerged from neuromyelitis optica spectrum disorder (NMOSD).[3] NMOSD, once considered a variant of multiple sclerosis (MS), was reclassified as its own entity after the discovery of AQP4 antibody (Ab) in the pathogenesis process. NMOSD is classified on AQP4 Ab negativity or positivity.[3] There are six core clinical characteristics: longitudinally extensive transverse myelitis (LETM), optic neuritis, area postrema syndrome, symptomatic brainstem, diencephalic, or cerebral syndromes.[3] LETM is the most specific presentation. LETM is characterised by longitudinally extensive transverse myelitis lesions and spinal cord atrophy. This occurs across more than three contiguous segments of cord and is usually centrally located, with conus involement.[4,6] MRI findings help differentiate it from MS. In comparison, MS spinal cord MRI findings show lesions that are predominately in the peripheral cord and span less than three complete vertebral segments. There is also diffuse, indistinct signal change on T2-weighted sequences with MS. [6] A sensory level and bladder involvement help distinguish it from other causes of rapidly evolving weakness e.g. Guillain–Barré syndrome. In comparison to MS, NMOSD is negative for oligoclonal bands on CSF analysis.

In 2012, another antibody target, MOG, was identified in approximately 40% of AQP4 Ab negative NMOSD patients.[3] MOG is expressed on the surface of oligodendrocytes and myelin. [2] MOG helps repair the myelin sheath. Compared to AQP4 Ab disease, MOG Ab disease has some distinctive characteristics.[3] More patients may have monophasic disease with a transient presence of antibodies. The more frequent presentation in adults is bilateral simultaneous optic neuritis. [1,4,5] The most frequent presentation in under 7 years is acute disseminated encephalomyelitis (ADEM).[5]

Acute treatment involves high dose steroids; 1g of IV methylprednisolone daily for 5 days, with oral prednisolone continued for 3-12 months.[2,3] If improvement is not seen within days of acute treatment, 5 cycles of PLEX should be carried out. PLEX therapy increases remission rates. If MOG antibodies become undetectable at 6months, long-term immunosuppression is not always required.

MOG antibody disease has a risk of relapse risk; 20-74%.[1,6] Immunosuppression longer than 3 months has a lower risk of a second relapse.[7] PLEX is first line treatment for relapses.[2] Azathioprine, mycophenolate mofetil and rituximab have all been used in relapse attacks.[7]

Transverse myelitis is a predictor of long-term disability.[1] Motor outcomes after myelitis are better, however patients can be left with significant dysfunction, e.g. permanent bladder issues, bowel dysfunction, and erectile dysfunction.[1,3]

Declaration of Conflicts of Interest:
The authors have no conflicts of interest to declare.

Corresponding Author:
Dr Niamh Ennis,
St. James's Hospital,
Dublin,
Ireland.
E-mail: ennisnm@tcd.ie.

References:

1. Jurynczyk M, Messina S, Woodhall MR, et al. Clinical presentation and prognosis in MOG-antibody disease: A UK study. *Brain*. 2017;140(12):3128-3138. doi:10.1093/brain/awx276
2. Palace J, Everett R. *MOG Antibody Demylination Information for Patients*. Oxford: Oxford University Hospital NHS; 2019. Accessed May 28, 2020.
3. Huda S, Whittam D, Bhojak M, Chamberlain J, Noonan C, Jacob A. Neuromyelitis optica spectrum disorders. *Clin Med J R Coll Physicians London*. 2019;19(2):169-176. doi:10.7861/CLINMEDICINE.19-2-169
4. Dubey D, Pittock SJ, Krecke KN, et al. Clinical, Radiologic, and Prognostic Features of Myelitis Associated With Myelin Oligodendrocyte Glycoprotein Autoantibody. *JAMA Neurol*. 2019;76(3):301-309. doi:10.1001/jamaneurol.2018.4053
5. Massachusetts General Hospital. About MOG Antibody Disease. https://www.massgeneral.org/neurology/treatments-and-services/about-mog-antibody-disease. Accessed May 28, 2020.
6. Chen JJ, Flanagan EP, Bhatti MT, et al. Steroid-sparing maintenance immunotherapy for MOG-IgG associated disorder. *Neurology*. 2020;95(2):111-120. doi:10.1212/WNL.0000000000009758
7. Lana-Peixoto MA, Talim N. Neuromyelitis optica spectrum disorder and anti-MOG syndromes. *Biomedicines*. 2019;7(2). doi:10.3390/BIOMEDICINES7020042