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CASE REPORT

Anti-MOG (Myelin Oligodendrocyte Glycoprotein)–Positive Severe Optic Neuritis with Optic Disc Ischaemia and Macular Star

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ABSTRACT

A 44-year-old man presented with severe right visual loss. The right fundus examination showed marked optic disc oedema associated with partial macular star. Serological blood tests for infectious agents were all negative. Serum aquaporin-4 antibody was negative but anti-MOG (myelin oligodendrocyte glycoprotein) was positive. Magnetic resonance revealed extensive lesion in right optic nerve. There was no visual improvement after intravenous therapy. Patient had no further attacks after follow-up. Optic disc oedema with macular star is found in several infectious and non-inflammatory disorders, but it has not been reported in optic neuritis (ON) associated with autoantibodies to myelin oligodendrocyte glycoprotein (anti-MOG).

Keywords: Devic's syndrome, macular star, multiple sclerosis, myelin oligodendrocyte glycoprotein antibody, optic neuritis

INTRODUCTION

Optic neuritis (ON) is a common manifestation of many inflammatory central nervous system disorders. Patients with atypical ON features with severe visual loss require an extensive evaluation.[1] Among other aetiologies, severe ON can be the first manifestation of neuromyelitis optica spectrum disorders (NMOs) associated with antibodies against aquaporin-4 (anti-AQP4), but a considerable proportion of atypical ON remains negative to anti-AQP4.[2] Recently, we reported patients with isolated ON with positivity to antibodies against myelin oligodendrocyte glycoprotein (anti-MOG). Orbital magnetic resonance imaging (MRI) and optical coherence tomography (OCT) findings suggest that anti-MOG+ cases usually have extensive optic nerve lesions on the MRI, but they usually have a better visual acuity recovery and less retinal loss than anti-AQP4+ ON cases.[3]

Optic disc oedema with macular star is found in several infectious (e.g., neuroretinitis) and non-infectious disorders (e.g., anterior ischaemic optic neuropathy), but macular star is usually absent in optic neuritis of patients with multiple sclerosis, and it has not been reported in anti-MOG+ ON cases. Herein, we present a patient with isolated unilateral severe ON with serum anti-MOG positivity associated with optic disc ischaemia and macular star.

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CASE REPORT

A previously healthy 44-year-old man developed severe visual loss evolving to no light perception (NLP) in 3 days in his right eye (OD) associated with pain on the same side. He had no recent infection or vaccination history and family history was unremarkable. The right fundus examination showed marked optic disc oedema associated with discrete cotton wool spots, flame-shaped haemorrhages, and retinal exudates temporal to the optic disc forming a partial macular star (Figure 1A). Serological blood tests for infectious agents were all negative (including *Bartonella*, Lyme, and syphilis) and orbital magnetic resonance imaging (MRI) revealed an extensive lesion in the right optic nerve compatible with ON (Figure 1C and D). Cerebrosponal fluid (CSF) analysis showed mild pleocytosis (21/mm^3) and normal protein (32 mg/dL; reference: <40 mg/dL). After 10 days of intravenous high-dose methylprednisolone (IVMP) treatment, the patient showed remarkable improvement of optic nerve oedema (Figure 1B), but no visual recovery. Serum anti-AQP4 was negative, but anti-MOG was positive (end point titre = 1:2048) using a cell-based assay with transfected cells.

There were no further episodes of visual loss during one year and a half of follow-up. Visual acuity remained NLP in OD and 1.0 in left eye (OS). Optical coherence tomography examination showed marked peripapillary retinal nerve fibre layer (RNFL) loss in OD (mean RNFL thickness = 30 μm) and was normal in OS (mean RNFL thickness = 107 μm).

DISCUSSION

Unilateral optic disc oedema with macular star may appear in several diseases, including neuroretinitis, hypertensive retinopathy, non-inflammatory papilloedema, and anterior ischaemic optic neuropathy. Different aetiologies may share a common pathway leading to axoplasmic flow stasis and axonal swelling, associated with disruption of glial organization in hypoxic/ischaemic retinal tissue.[4,5] In this case, severe inflammation and swelling of the optic nerve head may have promoted vascular changes of the optic disc leading to secondary ischaemic optic neuropathy and peripapillary retinal oedema, resulting in the formation of a macular star.

Anti-MOG is predominantly of immunoglobulin G1 (IgG1) subtype, and it has been reported to have ability to promote complement dependent

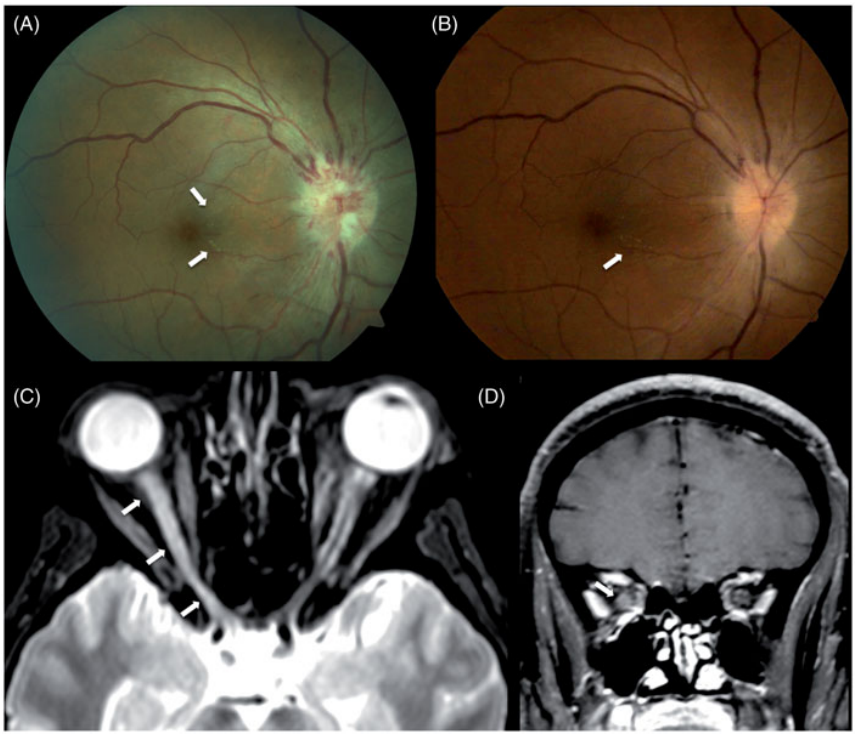

FIGURE 1 (Upper panels) Colour fundus view of right eye at admission (A) shows optic disc oedema with macular star (arrows) and (B) remarkable improvement of the optic disc oedema and macular star (arrow) 10 days after treatment. (Lower panels) Orbital magnetic resonance imaging shows a (C) T2-weighted hyperintense extensive lesion (arrows) in the right optic nerve with T1-weighted sequence contrast enhancement (D; arrow).

cytotoxicity in vitro[6] and induces significant changes in the cytoskeleton of cultured oligodendrocytes.[7] We recently reported a remarkable elevation of myelin basic protein without glial fibrillary acidic protein detectable in the CSF of a patient with anti-MOG+ definitive NMO, suggesting myelin damage without astrocyte injury.[8] In common, both cases had anti-MOG positivity at the first event without any previous manifestation to induce exposition of central nervous system (CNS) antigens promoting a bystander phenomenon to produce autoantibodies. Taken together, it is possible that glial alterations and release of inflammatory factors associated with anti-MOG might have contributed to optic nerve inflammation, but further experimental studies are required to confirm this hypothesis.

Although anti-MOG+ patients with ON usually have a good visual recovery after IVMP, it is known that not all patients recover well.[9] Our patient received IVMP and oral prednisone after ruling out other possible aetiologies and detection of an extensive optic nerve lesion on the MRI. Unfortunately, there was no visual recovery, suggesting that in patients with extensive ON, severe optic disc oedema associated with retinal swelling and macular star formation as seen in non-retrobulbar ON may be signs of poor prognosis. Furthermore, this case emphasizes that the presence of severe disc oedema with macular star formation should not exclude severe ON, and prompt diagnosis and aggressive treatment during the acute phase might increase the chances of visual recovery.

Declaration of interest: The authors have the right to publish any and all data separate and apart from any sponsor. Drs. Moura, Apostolos-Pereira, de Oliveira, Leite, and Callegaro report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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