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Case Report

Acute Myelin Oligodendrocyte Glycoprotein-IgG Optic Neuritis without Optic Nerve Enhancement

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Keywords
Myelin oligodendrocyte glycoprotein-IgG-associated disease · Optic neuritis · MRI · Myelin oligodendrocyte glycoprotein-IgG · Case report

Abstract
Introduction: Optic neuritis (ON) is a common neuro-ophthalmological condition and remains a significant indicator of inflammatory conditions affecting the central nervous system. Varying etiologies exist for ON including multiple sclerosis, NMOSD, and MOGAD. Differential diagnosis is achieved using both radiological and serological testing. MRI characteristics of MOG-ON include T2 hypersensitive lesions, nerve swelling, and gadolinium enhancement of the affected optic nerve. While acute MOG-ON usually presents with optic nerve enhancement, recognizing atypical presentations is critical in accurate diagnosis and effective management. ***Case Presentation:*** We herein present a case of a 67-year-old woman presenting with sudden decrease in vision in the right eye. The patient underwent a 3T MRI of the orbits and brain 5 days post vision loss which returned normal right optic nerve appearance at presentation (no edema, enhancement or increased T2 signal). Further serological testing of the MOG antibody returned positive (1:100) while APQ4 antibodies were negative. This yielded a diagnosis of MOG-IgG-ON. Subsequently, the patient was treated with IV methylprednisolone 1 g daily for 5 days followed by prednisone 1 mg/kg, resulting in marked improvement in vision. ***Conclusion:*** This case highlights the complexity involved in diagnosing ON, especially in the context of MOGAD. Absence of optic nerve enhancement in this patient calls attention to the possibility of subclinical inflammation and/or detectable enhancement later in clinical course. Our findings, along with existing literature, highlight the need for clinicians to

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consider atypical MRI presentations in MOG-ON cases. Recognizing that normal MRI does not exclude MOG-ON is important for optimizing diagnostic accuracy and effective treatment interventions.

Introduction

Optic neuritis (ON) is among one of the most common neuro-ophthalmological conditions and is one of the leading manifestations of inflammatory conditions of the central nervous system [1, 2]. Underlying etiologies of ON include multiple sclerosis, aquaporin-4 (AQP4)-IgG antibody-associated neuromyelitis optica spectrum disorder (NMOSD) and myelin oligodendrocyte glycoprotein (MOG)-IgG-associated disease (MOGAD) [1].

Common MRI characteristics in MOG-ON may include T2 hypersensitive lesions, nerve swelling, and gadolinium enhancement of the affected optic nerve on T1-weighted imaging with contrast [3–6]. Atypical optic nerve signals are usually found in the anterior segment of the optic nerve and retrobulbar region [7]. In acute MOG-ON, MRI findings frequently show longitudinal enhancement or optic nerve sheath enhancement. Notably, a study by Chen et al. [4] founds that all the patients in their case series had optic nerve enhancement, illustrating the consistent nature of this specific imaging feature in MOGAD. Similarly, another study analyzing 24 MRIs found that gadolinium enhancement was present in all images (100%), with frequent enhancement of the orbital segment in 20 MRIs (83.3%) [8]. Bilateral optic nerve involvement (29–73%) and optic nerve swelling (70–80%) were common during the first episode of MOG-ON [9–11]. Considering these characteristic imaging findings of MOG-ON, it is important to consider a specific case that deviates from the expected optic nerve enhancement pattern. Here, we present a case of acute unilateral retrobulbar MOG-IgG ON that underwent a high-quality MRI of the orbits with contrast and showed no optic nerve enhancement.

Case Report

A 67-year-old woman presented to hospital with sudden vision loss in her right eye upon awakening. She reported mild retro-orbital and periorbital pain 2 days prior. There was no pain with eye movements. Her past medical history included Sjogren's disease, gastroesophageal reflux disease, idiopathic thrombocytopenic purpura, thyroid, and renal cancer, both in remission. Her medications included amlodipine, famotidine, irbesartan, levothyroxine. Ophthalmology examination revealed a visual acuity of hand motions in the right eye and 20/50 in the left eye. There is a brisk right relative afferent pupillary defect. Intraocular pressure was 17 OD and 16 OS. Anterior segment was normal. Dilated fundus examination showed normal-appearing optic nerves with normal color. Ocular motility was normal. The patient vision loss was due to a right retrobulbar optic neuropathy, and the differential diagnosis included ON or a posterior ischemic optic neuropathy. She denied any symptoms of giant cell arteritis and her sedimentation rate and C-reactive protein were normal. She underwent a 3T MRI of the orbits and brain with contrast which was normal (shown in Fig. 1). This was performed 5 days after vision loss. The MRI was reviewed by multiple neuroradiologists and no enhancement or increased T2 signal of the right optic nerve was seen. The remainder of the brain was normal. The patient also underwent an MRI of the spine, which

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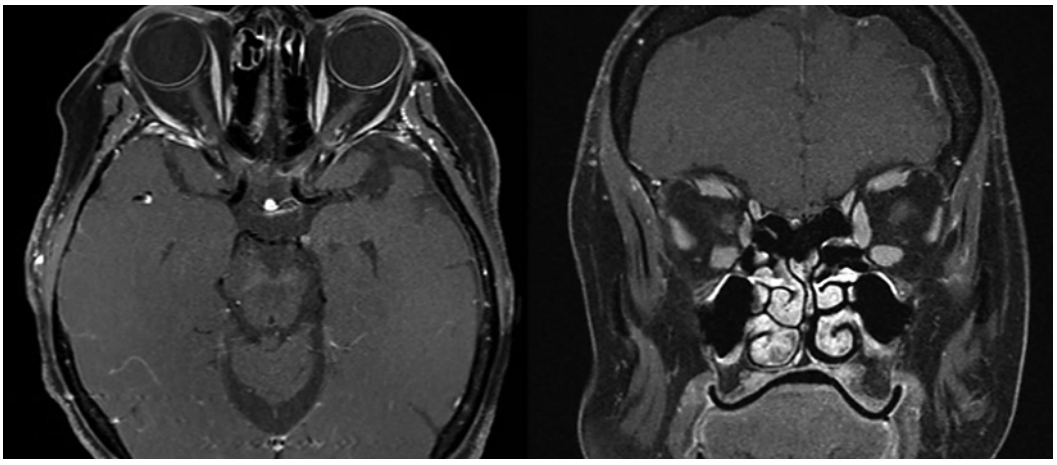

Fig. 1. 3T orbital MRI with contrast of a 67-year-old woman 5 days after vision loss from right MOG-IgG-ON which showed no optic nerve enhancement.

was normal. Blood testing for myelin oligodendrocyte glycoprotein returned positive (live cell-based assay and titer of 1:100) and aquaporin-4 antibodies were negative. The patient was treated with intravenous methylprednisolone 1 g daily for 5 days followed by prednisone 1 mg/kg gradually improved. At the 6-month follow-up, her visual acuity was 20/25 in the right eye and the Humphrey visual field testing was normal. There was mild right optic disc pallor at that time.

Discussion

In this report, we present a case of acute ON with high positive titers to MOG-IgG that responded well to steroids. She had a high-quality 3T MRI of the orbits with thin slices that did not show any enhancement of increased T2 signal of the optic nerve. This was reviewed by multiple neuroradiologists who agreed on the report. The absence of optic nerve enhancement on MRI in the context of confirmed serological positivity raises questions about the mechanisms underlying MOG-IgG in relation to symptom onset.

The discrepancy between clinical presentation and imaging findings is not commonly reported in literature. Interestingly, this parallels a recent case reported by Zaini et al., 2023 [12], where a 36-year-old patient with acute onset of MOG-ON exhibited similar MRI findings. The patient had received a COVID-19 booster vaccine 1 month before disease onset. There were abnormal optic nerve tests with positive RAPD on the right eye and bilateral optic disc swelling on fundus examination. The MRI of the orbits revealed normal optic nerves with no enhancement despite significant positive titers (>1:10) serum MOG-IgG. The significance of these findings is further highlighted in additional literature. In a MOG-ON case series, a 37-year-old woman who had three episodes of ON also presented with normal brain and orbit MRI, although fundoscopy revealed bilateral optic disc swelling. Positive serological analysis of anti-MOG antibody was ultimately used to make the final diagnosis [13]. In a retrospective study of 9 patients diagnosed with MOG+ ON, 3 patients presented with normal optic nerves on their first MRIs, although the time at which the MRI was completed during clinical presentation was not reported [14]. Moreover, Handzic et al. [15] explored the association between MRI biomarkers and visual prognosis in a cohort of 92 (129 eyes) MOG-ON patients and found that 5 patients had no optic nerve enhancement with the median time of symptom

onset to MRI of 7 days (IQR 4.0–11.0). Lack of optic nerve enhancement was also associated with incomplete VA recovery compared with eyes with any optic nerve enhancement [15].

Considering the complexity of MOG-IgG ON and the unique presentation of our patient, we hypothesize that the lack of optic nerve enhancement in this patient may include subclinical/mild inflammation of the optic nerve. Typically, during acute ON, contrast enhancement of the optic nerve found on MRIs is indicative of blood-brain barrier (BBB) breakdown [16]. In cases where inflammation of the optic nerve may have been present, but too mild to cause detectable disruption of the BBB, optic nerve enhancement may not be visible on the MRI. A study conducted by Hickman et al., 2004 [17] describes the variability in MRI results, indicating that milder cases of acute ON may not result in detectable BBB disruption, leading to the absence of optic nerve enhancement. This patient also has multiple autoimmune conditions including a history of Sjogren's syndrome, which is known to be associated with various neurological manifestations and may influence the pathophysiology of ON. This underlying condition may contribute to atypical manifestations of MOG-IgG-related ON by influencing the immune system's response and the degree of inflammation in the optic nerve. This patient's MRI was completed 5 days post-symptom onset. It is possible that the MRI enhancement was previously present but resolved or was not visible on the day 5 MRI. It is also possible that the enhancement may have been detectable later in the clinical course, but no repeat MRI was performed.

Although literature infrequently reports the timing of MRI from symptom onset, our case, alongside with existing literature, emphasizes the need for clinicians to consider atypical MRI features in MOG-ON despite the presence of clinical symptoms and serological positivity. It underscores the importance of maintaining a high index of suspicion for MOG-ON even when MRI findings are inconclusive or do not align with clinical expectations. Recognizing that normal MRI findings do not necessarily exclude MOG-IgG ON is crucial in optimizing diagnostic accuracy and guiding effective management strategies and timely therapeutic interventions.

Statement of Ethics

Ethical approval is not required for this study in accordance with local guidelines. The authors have no ethical conflicts to disclose. Written informed consent was obtained from the patient for publication of this case report and any accompanying images. The CARE checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000542889).

Conflict of Interest Statement

The authors have no conflict of interests to disclose.

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Author Contributions

Design, conception, and final approval and editing: B.J. and J.M.; data acquisition: J.M.; drafting of manuscript: B.J.

Data Availability Statement

All data generated or analyzed during this study are included in this article and its online supplementary material files. Further inquiries can be directed to the corresponding author.

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