Sakarya Tıp Dergisi
Sakarya Med J

E-ISSN: 4146-409X
Yayıncı / Publisher: Sakarya Üniversitesi

Cilt/Vol. 14, Sayı/No. 2, 164-171, 2024
DOI: http://doi.org/10.31832/smj.1438799

Research Article/ Araştırma Makalesi

Clinical Characteristics and Treatment Outcomes of MOGAD: A Detailed Analysis from a Single-Center Four-Year Retrospective Cohort

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Geliş Tarihi/Received:
23.02.2024
Kabul Tarihi/Accepted:
08.05.2024
Çevrimiçi Yayınlanma Tarihi/Available Online Date:
07.06.2024

Introduction: This study aims to delineate the prevalence, clinical characteristics, diagnostic findings, and treatment outcomes of Myelin Oligodendrocyte Glycoprotein Associated Disease (MOGAD) in a cohort over four years, providing a basis for improved diagnostic criteria and therapeutic strategies.

Materials and Methods: In a retrospective cohort study at a tertiary care center, we analyzed medical records of 90 patients presenting with CNS demyelinating symptoms, focusing on those diagnosed with MOGAD based on the International MOGAD Panel criteria. Data on clinical presentation, serum Anti-MOG antibody testing, MRI, VEP scans, CSF analysis, and treatment outcomes were evaluated.

Results: Among the cohort of 90 patients, 7 patients were identified with positive Anti-MOG antibodies, indicating a prevalence of 7.8%. Clinical manifestations varied widely, including optic neuritis, myelitis, and cerebral cortical encephalitis. Diagnostic findings highlighted the absence of oligoclonal bands in CSF analysis and diverse MRI lesions. Most patients responded well to immunosuppressive treatments, though relapses occurred in two cases. The study underscores the heterogeneity of MOGAD presentations and the importance of personalized treatment approaches.

Conclusion: Our findings contribute to the growing understanding of MOGAD, emphasizing its distinct clinical and diagnostic features compared to other CNS demyelinating disorders. The study advocates for the integration of MOG antibody testing in clinical practice to enhance diagnostic accuracy and patient outcomes. Future research should aim at longitudinal and multicentric studies to validate our findings and further refine MOGAD management strategies.

Keywords: Myelin-Oligodendrocyte Glycoprotein, Demyelinating Diseases, Optic Neuritis, Autoantibodies, Magnetic Resonance Imaging

1.INTRODUCTION

Myelin Oligodendrocyte Glycoprotein Associated Disease (MOGAD) has emerged as a distinct entity within the spectrum of central nervous system (CNS) inflammatory demyelinating disorders, separate from Multiple Sclerosis (MS) and Aquaporin-4-seropositive Neuromyelitis Optica Spectrum Disorders (NMOSD)[1,2]. The advent of cell-based assays for anti-MOG antibodies has been pivotal in identifying MOGAD, providing insights into its unique pathophysiological mechanisms, clinical features, and implications for management [3,4]. MOGAD's clinical manifestations are diverse, ranging from acute disseminated encephalomyelitis (ADEM), optic neuritis, and transverse myelitis to less common presentations such as cerebral cortical encephalitis and brainstem syndromes, reflecting the broad immunopathogenic spectrum of the disease [5,6].

Cite this article/Atıf: Akbaş A.A., Elçi Ö., Bozkurt B., Sezer V., Tunç A. Clinical Characteristics and Treatment Outcomes of MOGAD: A Detailed Analysis from a Single-Center Four-Year Retrospective Cohort. Sakarya Med J 2024; 14(2): 164-171 DOI: 10.31832/smj.1438799

The critical role of MOG antibodies in the disease's pathogenesis underlines an autoimmune response against the MOG protein in the CNS, leading to demyelination and subsequent neurological dysfunction[7]. Diagnostic criteria for MOGAD incorporate the detection of MOG antibodies via cell-based assays, alongside clinical and radiological criteria, underscoring the necessity of MOG antibody testing in the diagnostic evaluation of suspected cases [8].

Therapeutic strategies for MOGAD are patient-specific, focusing on the management of acute episodes and, in some cases, long-term immunosuppression to prevent disease relapse. The approach is influenced by factors such as the clinical phenotype [9].

This study aims to enhance the understanding of MOGAD through a comprehensive analysis of clinical data over four years, highlighting its diagnostic significance and therapeutic implications, and advocating for the integration of MOG antibody testing in clinical practice to improve patient outcomes.

2.MATERIAL and METHODS

This retrospective cohort study was conducted over a period of four years, encompassing a detailed review and analysis of medical records from 90 patients diagnosed with optic neuritis, myelitis, or atypical demyelination. Patients were selected from a tertiary care center's neurology department, ensuring a comprehensive capture of cases presenting with central nervous system (CNS) demyelinating symptoms. The diagnosis of Myelin Oligodendrocyte Glycoprotein Associated Disease (MOGAD) in this study was meticulously aligned with the proposed criteria by the International MOGAD Panel 10. Inclusion criteria were as follows: Patients aged 18 years and older diagnosed with optic neuritis, myelitis, or atypical demyelination. Availability of complete medical records including clinical presentation, serum Anti-MOG antibody testing results, MRI scans, visual evoked potentials (VEP) scans, cerebrospinal fluid (CSF) analysis, and detailed eye examinations by an ophthalmologist.

Exclusion criteria were patients with a prior diagnosis of MS or NMOSD. Incomplete medical records or absence of serum Anti-MOG antibody testing. In addition, special attention was paid to rigorously exclude conditions that mimic MOGAD, with a particular focus on vasculitis and other CNS inflammatory conditions that could potentially confound the diagnosis.

Given the retrospective nature of the study, patient consent was waived by the Institutional Review Board. However, strict confidentiality and anonymity of patient data were maintained throughout the study, in accordance with ethical guidelines and the Declaration of Helsinki.

Serum samples were collected from patients at the time of their initial presentation and screened for Anti-MOG antibodies using the Immunofluorescence Assay (IFA) method.

All patients underwent MRI scans using a 1.5 Tesla MRI machine, following a standardized MS protocol. This protocol included T1-weighted, T2-weighted, Fluid-Attenuated Inversion Recovery (FLAIR), and gadolinium-enhanced T1-weighted sequences, facilitating a thorough examination of the brain and spinal cord to identify demyelinating lesions characteristic of MOGAD. Visual Evoked Potentials (VEP) scans were performed to assess the functional integrity of the visual pathways, particularly in patients presenting with optic neuritis.

Cerebrospinal Fluid (CSF) Analysis was obtained

through lumbar puncture for analysis, including cell count, protein level, oligoclonal bands, and infectious disease markers to rule out alternative diagnoses. An ophthalmologist conducted comprehensive eye examinations on all patients presenting with visual symptoms. This included assessment of visual acuity, color vision, fundoscopy, and measurement of intraocular pressure.

Clinical features, diagnostic approaches, and imaging findings of Anti-MOG antibody-positive patients were systematically analyzed. Descriptive statistics were used to summarize the demographic and clinical characteristics of the patients. The frequency of clinical presentations, imaging findings, and outcomes of treatment interventions were also evaluated.

3.RESULTS

In this retrospective study of 90 cases over the last four years, we identified 7 patients (7.8%) with positive Anti-MOG antibody results, indicating a MOGAD prevalence within our cohort. The demographic profile showed an average age of 47 years, with a distribution of four males and three females. Notably, 3 patients experienced optic neuritis, emphasizing its significance as a prevalent clinical manifestation of MOGAD. Other manifestations included transverse myelitis, sensory deficits, and motor weakness, illustrating the disease's diverse clinical spectrum. The demographic and clinical characteristics of these patients, along with their diagnostic findings and treatment outcomes, are detailed in Table 1.

All patients underwent comprehensive evaluations, including MRI scans, CSF analysis, VEP scans, and ophthalmological assessments, with MRI findings demonstrating the heterogeneity of MOGAD lesions. The absence of oligoclonal bands in CSF analysis for all patients further supported the MOGAD diagnosis, distinct from MS.

MRI findings were diverse: long segment myelitis; brainstem lesion with long segment myelitis; short segment gadolinium-enhancing involvement in the left optic nerve; supratentorial lesion resembling MS; short segment gadolinium-enhancing involvement in bilateral optic nerves; right optic neuritis with normal MRI, confirmed with VEP; and significant supratentorial lesions.

Treatment responses were varied but generally positive. MOG antibodies became negative in 3 of the 7 patients during follow-up; 2 at the six-month mark and 1 after one year. Specific treatments and their outcomes included:

One patient did not stabilize on oral steroids and azathioprine but achieved remission with rituximab.

Four patients reached remission with oral steroid monotherapy.

One patient was treated with rituximab alongside oral steroids and went into remission.

One patient stabilized on oral steroids and azathioprine.

Among these patients, 2 recovered fully, while 5 experienced partial recovery, underscoring the varied efficacy of treatment strategies. Figures 1 and 2 depict MRI features of two patients, highlighting the diagnostic complexity and variability of MOGAD. This study underscores the need for personalized treatment approaches, reflecting the broad clinical and diagnostic spectrum of MOGAD.

Table 1:

Clinical Characteristics, Treatments, and Outcomes of MOGAD Patients

Case	Age (Years)	Gender	Clinical Presentation	Initial Treatment	Outcome	MRI Findings
1	72	Male	Left leg weakness, sensory level deficit, urinary incontinence	IVMP, oral prednisone, azathioprine	Two relapses, stabilized on rituximab	Gross Supratentorial lesion
2	37	Female	Leg numbness, sensation of electric shocks, diplopia	IVMP	Complete recovery, MOG antibodies turned negative	Brainstem lesion and long segment myelitis
3	32	Male	Pain and blurred vision in left eye	Monitored without immunosuppression	MOG antibodies negative at six-month follow-up	Normal MRI, confirmed by VEP
4	26	Female	Weakness in both legs, profound muscle strength reduction	IVMP, plasmapheresis, IVIG	Improvement with rituximab	Long segment myelitis
5	19	Female	Painful blurred vision in left eye	IVMP, plasmapheresis, IVIG	Poor improvement in vision, ongoing oral steroid treatment	Short segment gd+ involvement in left optic nerve
6	32	Male	Numbness and weakness in left leg	Azathioprine, symptomatic treatments	Stabilized on azathioprine	Supratentorial lesion, MS-like
7	62	Male	Sudden onset of painless, blurred vision in both eyes	High-dose steroids, oral steroids	Vision improved, MOG antibodies negative after one year	Short segment gd+ involvement in bilateral optic nerves

Abbrevations: MOGAD, Myelin Oligodendrocyte Glycoprotein Associated Disease; IVMP, Intravenous Methylprednisolone; IVIG, Intravenous Immunoglobulin; MRI, Magnetic Resonance Imaging; VEP, Visual Evoked Potentials; MS, Multiple Sclerosis

Figure 1.

Cranial MRI of Case 1 reveals bilateral, symmetrical T2-FLAIR hyperintense and T1 hypointense lesions across supratentorial and infratentorial regions, with diffusion restriction observed in the right frontal area and a gadolinium-enhancing lesion noted.

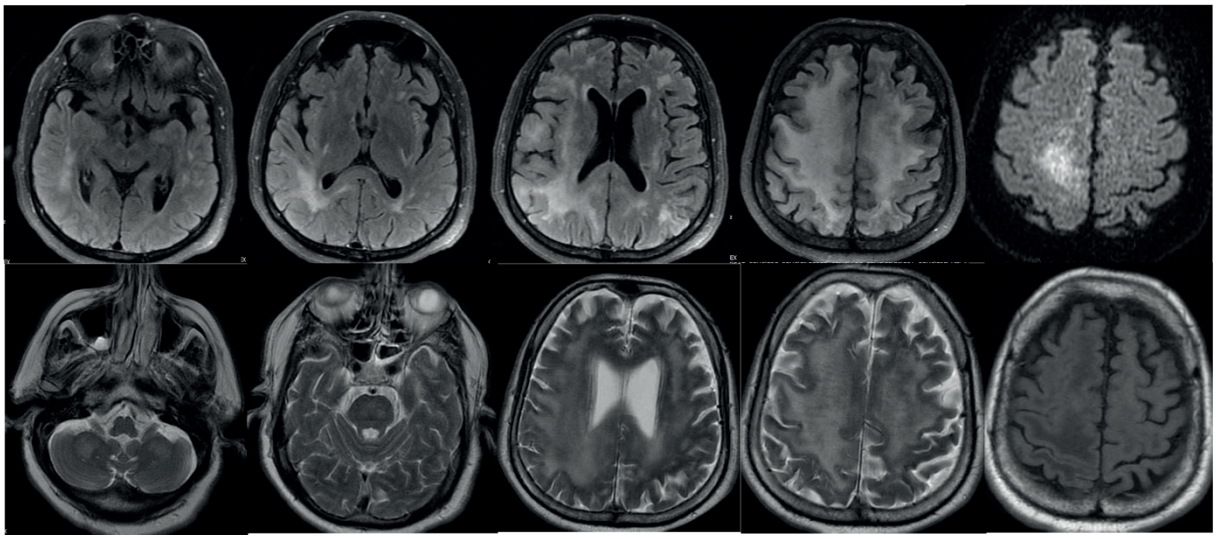
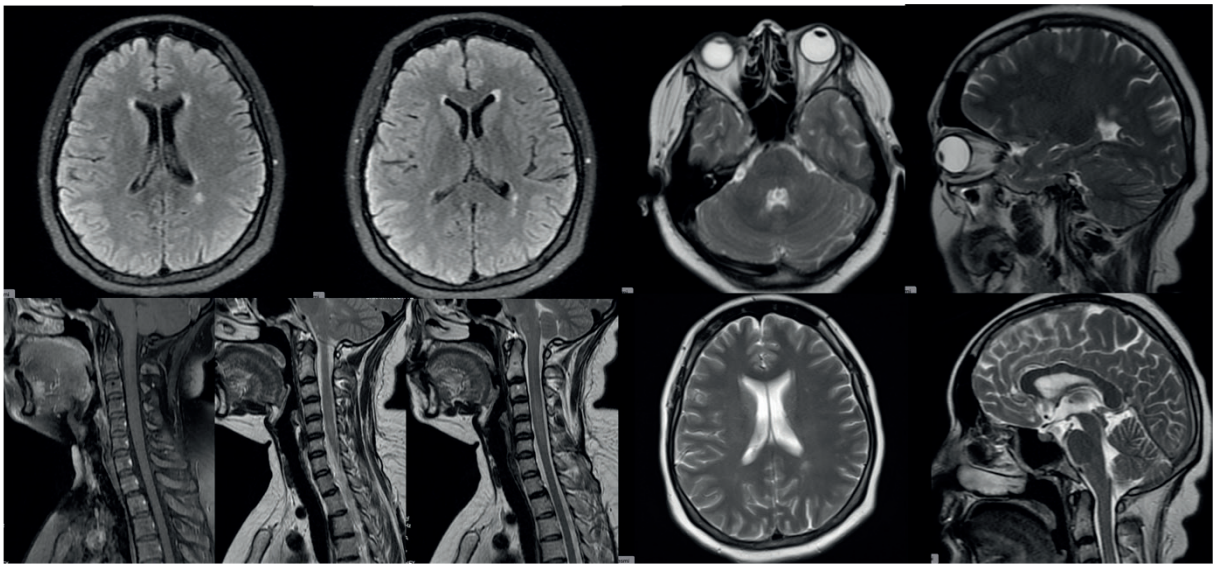


Figure 2.

Cranial MR imaging of Case 2 reveals several nonspecific hyperintense lesions, in addition to an expansive myelitis image spanning the C1-C5 spinal segments.



4.DISCUSSION

Our retrospective study, evaluating 90 cases over four years and identifying a 7.8% prevalence of MOGAD within our cohort, contributes valuable insights into the clinical manifestations, diagnostic challenges, and treatment responses associated with MOGAD. Our findings underscore the heterogeneity in clinical presentations, ranging from limb weakness and sensory deficits to visual disturbances, aligning with existing literature that emphasizes the varied phenotypes encountered in MOGAD, complicating diagnosis and management [9,11].

The demographic data, with an average age of 47 years and a slight male predominance, align with previous studies highlighting that MOGAD can affect adults and children, without a clear gender predisposition [12,13]. The diversity in clinical presentations observed in our cohort, including cases with relapses despite treatment, reflects the complex nature of MOGAD and the necessity for individualized treatment strategies [9, 14].

Our study further illustrates the diagnostic journey for MOGAD patients, emphasizing the significance of comprehensive diagnostic evaluations, including MOG-IgG testing, to distinguish MOGAD from other demyelinating diseases like MS 3,10. This aligns with recommendations for standardizing MOG-IgG tests to improve clinical care [1,15].

Treatment outcomes in our study varied, with most patients responding to immunosuppressive therapies, yet some experienced relapses, highlighting the need for ongoing evaluation and adjustment of treatment regimens [16,17]. This mirrors broader challenges in MOGAD management, where early and accurate diagnosis, followed by appropriate treatment, is crucial to preventing relapses and minimizing disability [9,18].

Our study's insights into the clinical course of MOGAD, from diagnosis through treatment, contribute to the growing body of evidence aimed at improving patient outcomes. While our findings reiterate the need for heightened awareness and understanding of MOGAD within the medical community, they also highlight the challenges patients face, from diagnosis to treatment. This underscores the importance of specialized care and the development of standardized diagnostic criteria and treatment protocols [10, 19].

Our study, while providing valuable insights into the clinical manifestations and management of MOGAD, is subject to several limitations. Notably, the retrospective nature of our analysis and the reliance on medical records from a single center may introduce recall bias and limit the generalizability of our findings. Our sample size, although significant for a disease as rare as MOGAD, still may not fully capture the heterogeneity of the broader MOGAD patient population, especially considering the potential variability in diagnostic criteria and treatment protocols over the four-year study period. Additionally, the absence of a control group limits our ability to compare the specificity of our findings to other demyelinating diseases. The study's dependence on Anti-MOG antibody testing, with known variability in assay sensitivity and specificity, could also influence the accuracy of our diagnoses. Furthermore, the limited follow-up duration may not adequately capture the long-term clinical outcomes and treatment efficacy for MOGAD patients. These limitations underscore the need for future prospective, multicenter studies with larger and more diverse populations to validate our findings and expand our understanding of MOGAD.

5.CONCLUSION

In conclusion, our study reinforces the complexity of MOGAD as a distinct demyelinating CNS disease, with significant variability in clinical presentations and treatment responses. It emphasizes the critical need for early, accurate diagnosis and tailored treatment strategies to improve patient outcomes. Future research should focus on longitudinal studies to better understand the disease course and optimize management strategies, thereby enhancing the quality of life for individuals living with MOGAD.

Acknowledgement

None

Disclosure of interest

The Authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authorship Contributions

Concept: AT, AAA, ÖE, BB, VS. Design: AT, AAA, ÖE, BB, VS. Data Collection or Processing: AT, AAA, ÖE, BB, VS. Analysis or Interpretation: AT, AAA, ÖE, BB, VS. Literature Search: AT, AAA, ÖE, BB, VS. Writing: AT, AAA, ÖE, BB, VS.

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