Validation of the MOG-AR score: a retrospective multicenter study

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Introduction and objectives

Myelin oligodendrocyte glycoprotein antibody-associated disease (MOGAD) is an antibody-mediated disorder characterised by a demyelinating event and serum/CSF MOG antibodies (MOG-Abs) positivity. Relapses can occur in 40-60% of cases, increasing to 70% over a follow-up > 5 years. Disease course is highly unpredictable. Among factors potentially predicting relapses, MOG-Abs persistency, age, and onset phenotype have been identified. Discordant data have been reported on the influence of sex and ethnicity, while early treatment with immunosuppression and prolonged steroids seems to reduce relapse risk

Recently, a simple score (the MOG-AR Score), including onset age, sex, onset attack phenotype, use of immunosuppressive therapy, and duration of oral glucocorticoids treatment has been proposed to identify patients at high relapse risk since onset.

Aim of this study was to provide the first validation of the MOG-AR Score in a national multicenter cohort and to assess other variables associated with a relapsing disease course.

Methods

We retrospectively identified consecutive MOGAD patients in 24 different Italian centers between 01/2017 and 01/2025. Clinical and paraclinical data of patients with at leat 1 year follow-up were obtained from referring physicians and included in a dedicated database. The parameters included in the MOG-AR Score (onset age > 45 years, sex, attack phenotype, immunosuppressive therapy at onset, oral corticosteroids use for at least 3 months) were analysed to assess correlation with disease course. Patients were stratified in 4 groups based on the MOG-AR score (grade 1: 0-4, grade 2: 5-8, grade 3: 9-12, grade 4: 13-16).

Receiving Operator Characteristic (ROC) curves were constructed to assess MOG-AR score performance. Considering that a MOG-AR score of 9 or higher was considered predictive of MOGAD relapses, sensitivity (TP/TP+FN) and specificity (TN /FP+TN) with 95% confidence interval (CI) were calculated accordingly.

Univariate binary logistic regression models were performed to assess the risk of relapsing disease according to age at onset, sex, clinical phenotype, presence of infectious/vaccine triggers, receiving an additional acute treatment (corticosteroids + plasma exchange and/or intravenous immunoglobulin), oral steroids use for at least 3 months, use of an immunosuppressive treatment after the 1st event.

Variables resulting from the univariate analysis with a p-value ≤ 0.50 were included in a multivariate binary regression model.

Kaplan–Meier survival curves were plotted to assess time to first relapse (for the relapsing patients) or time to las follow-up (for the monophasic course) according to MOG-AR score, as well as the same variables explored in the univariate logistic regression model. Differences between survival curves were compared using the log-rank test. Statistical analyses were performed using IBM SPSS 25.

Results

Cohort description

Among 260 patients, 34 were excluded for insufficient clinical information, while 36 were excluded for an insufficient follow-up. Of the 190 included patients, median age at onset was 37 years-old [IQR 22.5-50.6], and 107 (56.4%) were female. The most frequent clinical presentation at onset was optic neuritis (n=91, 47.9%), followed by myelitis (n=48, 25.3%), and ADEM (n=24, 12.6%).

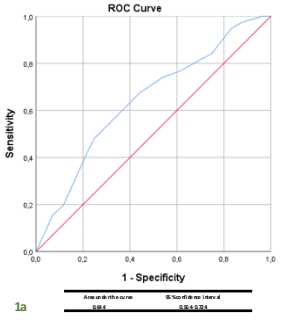
Median EDSS at onset was 3 [IQR 2-4.5]. High-dose steroids followed by at least 3 months oral steroid tapering were administered in 58 (30.7%) patients, while immunosuppressive treatment at first event was initiated in 54 (28.4%) patients. Median follow-up duration was 43.6 months [24.8-75.4] and 78 (41%) experienced at least one relapse

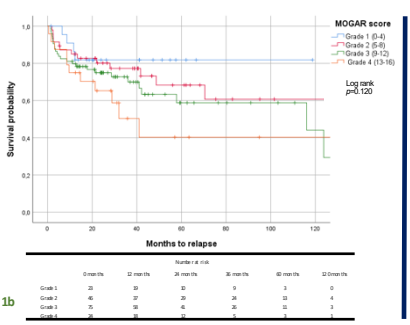
MOG-AR score application

Relapses occurred in 4/23 (17.4%) of Grade 1 cases, in 18/51 (33.3%) of grade 2, in 41/88 (46.6%) of grade 3, in 14/28 (53.6%) of grade 4, p=0.030. ROC curve analysis showed an area under the curve of 0.644 (95% CI: 0.565-0.723), *Figure 1a*.

Using the proposed cut-off of 9 (Youden's index in our cohort = 9.5), MOGAR score had a sensitivity of 53.85% [95%CI 55.60-73.93%] and a a specificity of 65.18 [95%CI 55.60-73.93.

When assessing time to relapse with the Kaplan-Meier analysis (n=168) according to the MOG-AR score, the difference was not statistically significant across different groups (*p*=0.120), *Figure 1b.*





Analysis of individual factors associated with relapse risk

The use of oral steroids use for at least 3 months (0.51 95%CI 0.26-0.97, p=0.044), receiving an additional acute treatment (OR 0.31 95%CI 0.12-0.80, p=0.016) and starting an immunosuppressive treatment after the 1st event (OR 0.37 95%CI 0.17-0.73, p=0.006) were associated with a lower risk of having a relapsing disease in the univariate analysis . In the multivariate analysis only the initiation of immunosuppressive treatment after the first event was associated with a lower risk of having a relapsing disease (OR 0.42 95%CI 0.20-0.85, p=0.019).

When assessing time to relapse with Kaplan Meyer analysis **only starting an immunosuppressive treatment after the first event was associated with a lower risk of having a relapse (p=0.035).** *Figure 2*

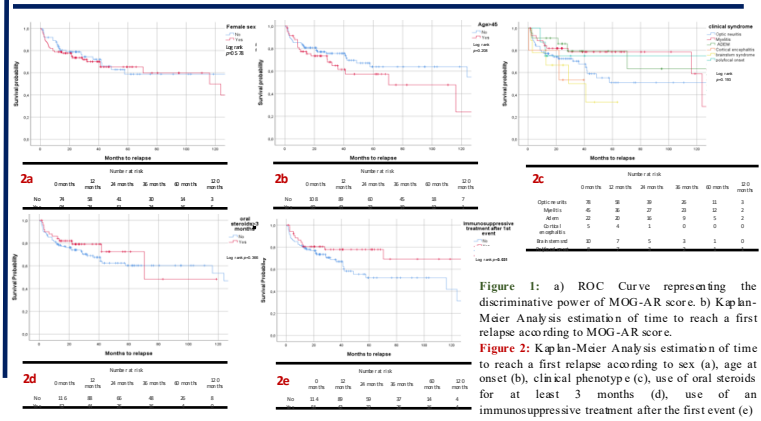


Figure 1: a) ROC Curve representing the discriminative power of MOG-AR score. b) Kaplan-Meier Analysis estimation of time to reach a first relapse according to MOG-AR score.

Figure 2: Kaplan-Meier Analysis estimation of time to reach a first relapse according to sex (a), age at onset (b), clinical phenotype (c), use of oral steroids for at least 3 months (d), use of an immunosuppressive treatment after the first event (e)

Conclusion

MOG-AR score failed to reliably predict a relapsing disease course.

Only immunosuppressive treatment administered after the onset event could influence the relapse risk.

However, immunosuppressive treatment administration should take into consideration the risk of overtreatment and adverse events occurrence

Reference: Xu Y, et al. A Simple Score (MOG-AR) to Identify Individuals at High Risk of Relapse After MOGAD Attack. Neuroimmunol Neuroinflamm. 2024 Nov;11(6):e200309. doi: 10.1212/NXI.0000000000200309. Epub 2024 Sep 9.

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