

Optic chiasm involvement in MS, aquaporin-4 antibody-positive NMOSD, and MOG antibody-associated disease

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Inflammatory demyelination in the anterior optic pathway, including the optic chiasm (OC), occurs frequently in relapsing-remitting multiple sclerosis (RRMS), aquaporin4 (AQP4) antibody (Ab) positive neuromyelitis optica spectrum disorder (NMOSD), and myelin oligodendrocyte glycoprotein-Ab associated-disease (MOGAD).

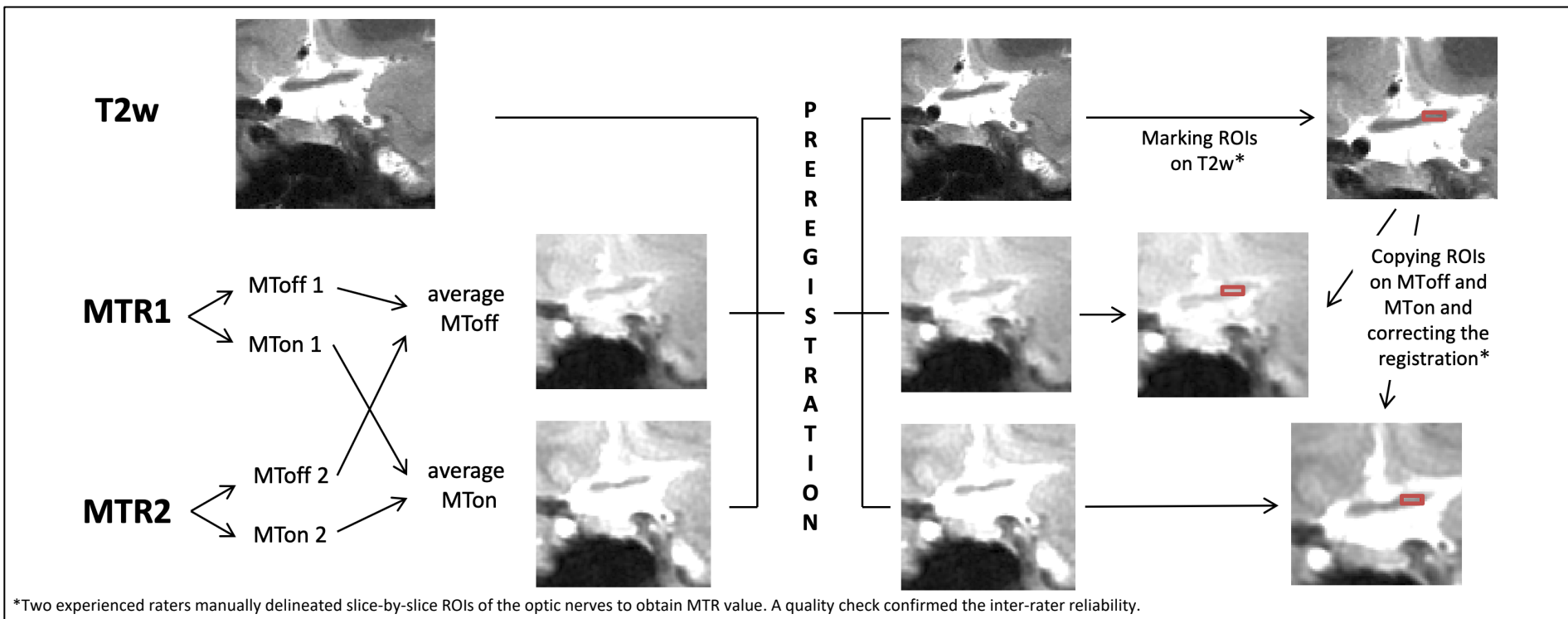
Aims. To evaluate the involvement of the OC in RRMS, AQP4-NMOSD and MOGAD using Magnetization Transfer Ratio (MTR) and explore its relationship with prior optic neuritis (ON).

We retrospectively selected a total of 20 MOGAD patients, 13 AQP4-NMOSD patients, 25 RRMS patients, and 29 healthy controls. As expected, due to the different diseases' characteristics, there was a mismatch in participants groups.

Demographic characteristics	MS	AQ4-NMOSD	MOG-AD	HC	p-value*
Number of patients	25	13	20	29	
Gender, M / F (male %)	9 / 16 (36.0%)	3 / 10 (23.1%)	7 / 13 (35.0%)	6 / 23 (20.7%)	
Age, years (mean \pm SD)	44.6 \pm 11.8	45.3 \pm 11.2	33.9 \pm 16.4	35.9 \pm 12.8	p = 0.001
Age at disease onset, years (mean \pm SD)	34.2 \pm 9.5	37.6 \pm 13.3	27.8 \pm 17.8	//	p = 0.012
Disease duration, months (mean \pm SD)	10.4 \pm 6.6	7.7 \pm 7.3	6.2 \pm 6.1	//	p = 0.012
EDSS, median (range)	2.0 (1.0 – 7.5)	3.0 (1.0 – 6.5)	2.0 (0.0 – 6.5)	//	p = 0.003
Ambulation score, median (range)	0.0 (0.0 – 3.0)	2.0 (0.0 – 4.0)	1.0 (0.0 – 4.0)	//	p < 0.001
Visual FS, median (range)	0.0 (0.0 – 5.0)	0.0 (0.0 – 4.0)	0.0 (0.0 – 4.0)	//	p = 0.003

* p-value obtained using ANOVA test and χ^2 test depending of the nature of the variable, to compare the subject groups.

Methods and material

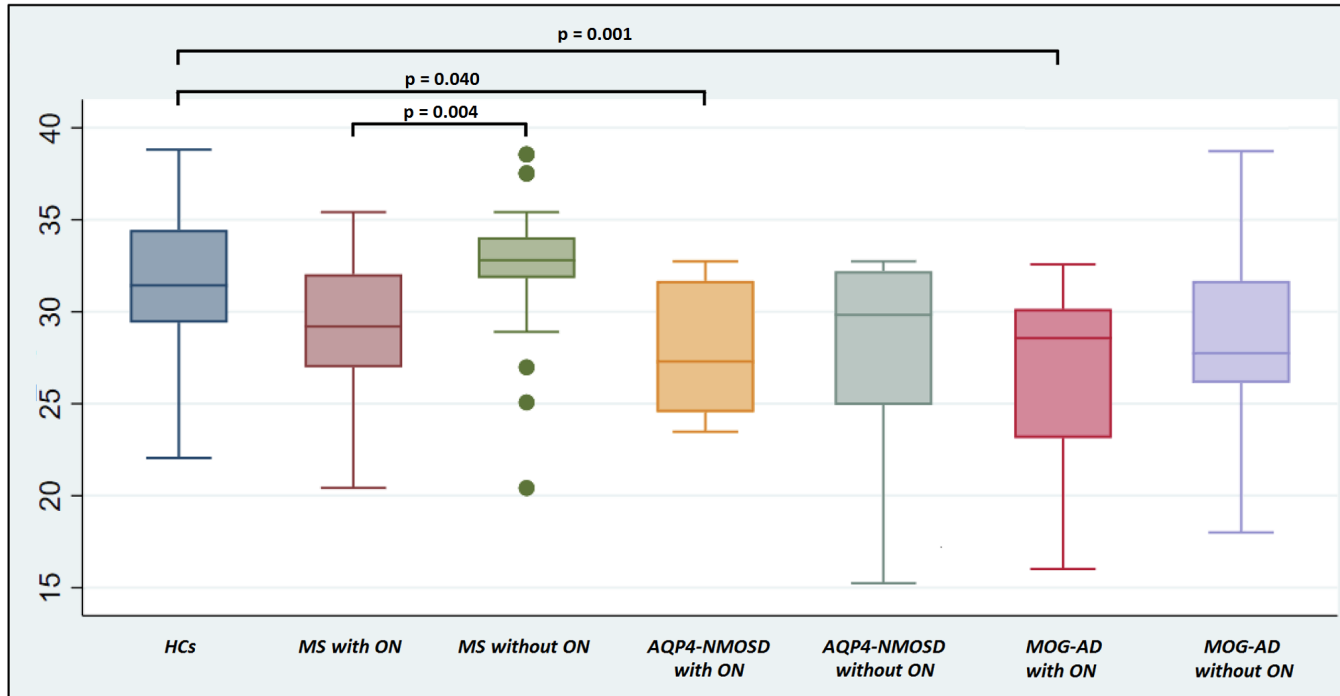


Statistical analysis. Age-, sex-, and disease duration-adjusted linear regression models were used to compare the measures between the groups ($p < 0.05$).

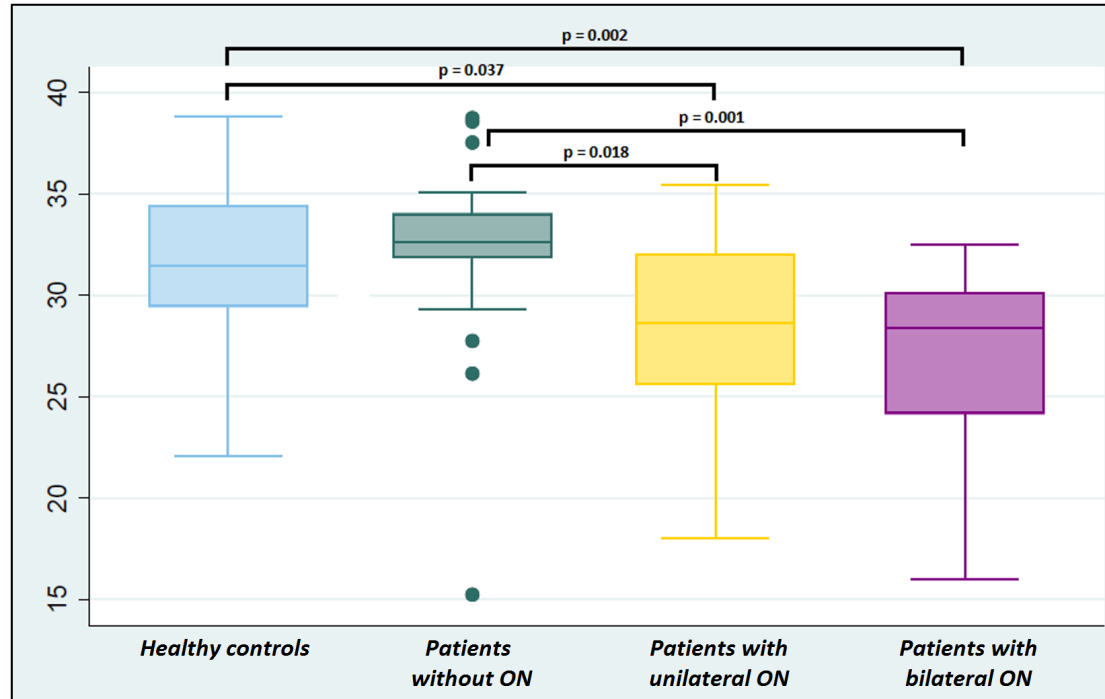
Clinical characteristics	MS	AQ4-NMOSD	MOG-AD	p-value*
Number of patients	25	13	20	
ON, prevalence in patients (%)	10 / 25 (40.0%)	10 / 13 (76.9%)	17 / 20 (85.0%)	p < 0.001
ON number (mean ± SD)	0.44 ± 0.58	1.54 ± 1.13	2.85 ± 2.80	p = 0.002
Time from first ON, months (mean ± SD)	69.17 ± 65.83	101.56 ± 78.45	91.15 ± 81.61	p = 0.731
Time from last ON, months (mean ± SD)	33.00 ± 0.00	72.84 ± 71.15	45.64 ± 48.16	p = 0.607
ON, prevalence in eyes (%)	11 / 50 (22.0%)	16 / 26 (61.5%)	28 / 40 (70.0%)	p < 0.001
Bilateral ON, prevalence in patients (%)	1 / 11 (9.1%)	6 / 10 (60.0%)	11 / 28 (39.3%)	p = 0.001
Relapsing ON, prevalence in patients (%)	0 / 11 (0.0%)	4 / 10 (40.0%)	15 / 28 (53.6%)	p = 0.004

* p-value obtained using ANOVA test and χ^2 test, depending of the nature of the variable, to compare the 3 subject groups.

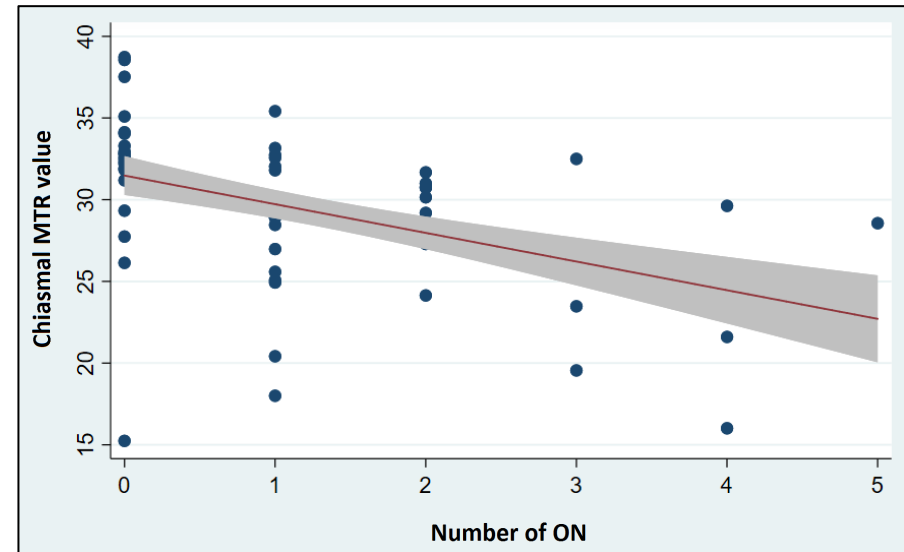
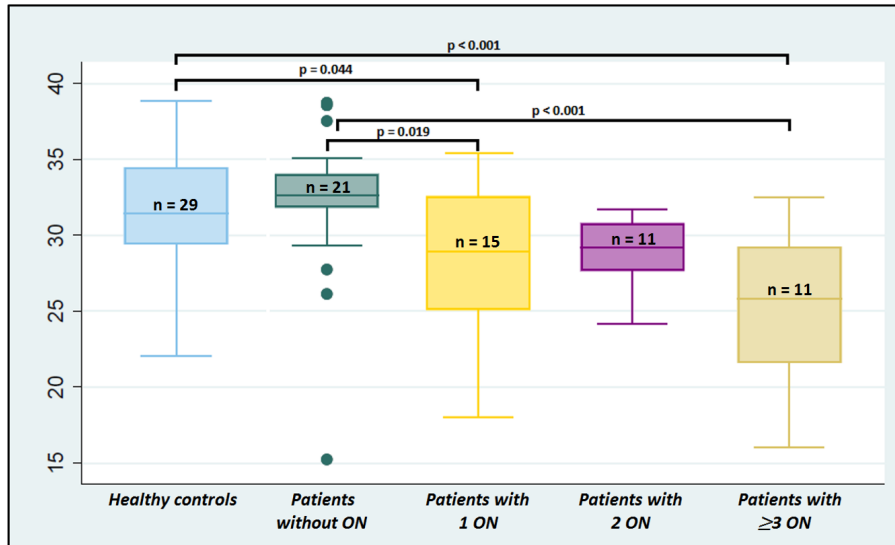
- **Chiasmal MTR values** in **patients with previous ON** were lower in AQP4-NMOSD ($p=0.040$) and MOGAD ($p=0.001$) than **HC**.
- In patients with RRMS and previous ON, MTR values were lower than **patients without prior ON** ($p=0.004$).



- When considering **all patients with demyelinating diseases**, patients with previous ON had lower chiasmal MTR values when compared to HC (unilateral: $p=0.037$; bilateral: $p=0.002$) and to patients without ON (unilateral: $p=0.018$; bilateral: $p=0.004$).



- When considering **all patients with demyelinating diseases**, patients with monophasic and relapsing ON patients had lower chiasmal MTR values when compared to HC ($p=0.044$; $p<0.001$) and to patients without ON ($p=0.019$; $p<0.001$).
- A **correlation** was found between MTR values and number of ON episodes ($\rho=-0.55$, $p<0.001$).



Microstructural damage in the optic chiasm correlated with the number of ON episodes across inflammatory demyelinating diseases.

A higher number of episodes is associated with lower chiasmal MTR, supporting its role as **an accessible target for the assessment of the visual pathway** in inflammatory diseases.