Supplementary Material

Supplemental Table 1 | Associations of cervical cord volumes and SC WM percentage with the 9HPT and T25FW

Cervical cord volume		
	AQP4-IgG+NMOSD	**MOGAD**
9HPT dominant hand	ß=0.27, p=0.162	ß=-0.19, p=0.514
9HPT non-dominant hand	ß=0.13, p=0.571	ß=0.04, p=0.874
T25FW	ß=-0.21, p=0.443	ß=-0.41, p=0.096
SC WM percentage		
	AQP4-IgG+NMOSD	**MOGAD**
9HPT dominant hand	ß=0.14, p=0.487	ß=0.12, p=0.678
9HPT non-dominant hand	ß=0, p=0.999	ß=0.45, p=0.083
T25FW	ß=-0.15, p=0.579	ß=0.31, p=0.225

AQP4-IgG+NMOSD, aquaporin-4 antibody seropositive neuromyelitis optica spectrum disorders; MOGAD, myelin oligodendrocyte antibody associated disease; T25FW, timed 25-foot walk test mean time; 9HPT. 9-hole peg test mean time.

Supplemental Table 2 | Descriptive longitudinal clinical and SC phenotypic case series of patients with additional attacks between MRI visits

Patient	Clinical History	SC MRI findings
Subject 1, F, 51y Diagnosis: AQP4-IgG+NMOSD Age at onset: 22 y Attacks before Baseline - Over 29 years after disease onset multiple episodes of ON (1/year) - 25 years after disease onset single episode of Myelitis and ON Prior immunotherapy - Single administration of mitoxantrone, discontinuation due to sepsis - Octagam: 43 months - Single administration of Rituximab (persistent B-cell depletion)	**Baseline visit 09/2017:** Disease duration: 29 y EDSS: 3.5 Pain location: feet Average Pain Intensity 24h: 0/10 Average Pain Intensity 4w: 1/10 Neuropathic Pain Score: 7/35 No immunotherapy **Clinical visit 10/2018:** Attack 04/2018: ON RE Symptoms: Visual impairment restricted walking distance and impaired balance Therapy: IVMP Attack 09/2018: ON RE	**09/2017: Scanner 1** GM (mL): 0.079 (20.73%) WM (mL): 0.302 (79.27%) Cervical Cord (mL): 0.38 **10/2018: Scanner 1** GM (mL): 0.091 (22.81%)* WM (mL): 0.308 (77.19%)** Cervical Cord (mL): 0.40

No relevant comorbidities	Symptoms: Visual impairment Therapy: 6x IA EDSS: 4.0 Pain location: Head/neck, legs Average Pain Intensity 24h: 1/10 Neuropathic Pain Score: 6/35 No immunotherapy	*It can be seen that 1 month after an ON attack, the GM percent in the SC increased by 2% from baseline and the cervical cord volume also increased. **WM% does not increase, and as it is complementary to the GM % in the cord, it decreased over time.
Subject 2, F Diagnosis: AQP4-IgG+NMOSD Age at onset: 60y Attacks before baseline - One myelitis No prior immunotherapy	**Baseline Visit 11/2017:** Disease duration: 11 months EDSS: 6.5 Pain location: trunk Average Pain Intensity 24h: N.A. Average Pain Intensity 4w: 10/10 Neuropathic Pain Score: 8/35 No Immunotherapy **Clinical Visit 11/2018:** Attack 06/2018: Myelitis	**11/2017: Scanner 1** GM (mL): 0.07 (16.75%)* WM (mL): 0.347 (83.01%)** Cervical Cord (mL): 0.42 **11/2018: Scanner 1** GM (mL): 0.079 (19.95%)*

Comorbidities: - Spinal canal stenosis C4-6 with intervertebral disc graft C4/5 without myelopathy Recurrent myoclonus attacks of the arms without loss of consciousness (differential diagnosis: spinal myoclonus)	Symptoms: sensorimotor spinal cord syndrome below Th10, bladder and bowel disturbance Therapy: N.A., no IVMP EDSS: 6.0 Pain location: trunk Average Pain Intensity 24h: 8/10 Average Pain Intensity 4w: N.A. Neuropathic Pain Score: 15/35 Immunotherapy: Rituximab since 12/2017	WM (mL): 0.317 (80.05%)** Cervical Cord (mL): 0.40 *It can be seen that with an additional myelitis within 5 months of the second MRI visit, the GM% increased by 3%, even though the cervical cord volume decreased. **WM% also decreases (~3% between visits), and as it is complementary to the GM % in the cord.
Subject 3, F, 51 y Diagnosis: MOGAD Age at onset: 47y Attacks before baseline - Four myelitis attacks - Three brainstem attacks	**Baseline Visit 09/2018:** Disease duration: 30 months EDSS: 3.5 Pain location: Head/neck, trunk, hip, legs, feet Average Pain Intensity 24h: 5.5/10	**09/2018: Scanner 1** GM (mL): 0.082 (17.71%)* WM (mL): 0.381 (82.29%)** Cervical Cord (mL): 0.46

Prior immunotherapy - Three cycles of Rituximab - Mycophenolate mofetil + Prednisolon since 02/2017 Comorbidities - Cervical spine syndrome - Vitamin D deficiency - Migraine - Anxiety disorder	Average Pain Intensity 4w: 5/10 Neuropathic Pain Score: 17/35 Immunotherapy: Mycophenolate mofetil since 02/2017. **Clinical Visit 09/2020:** Attack 01/2019: Myelitis Symptoms: Paresthesia, Hyperalgesia Therapy: IVMP, PLEX Pain location: Head/neck, trunk, hip, legs, feet Average Pain Intensity 24h: 4.75/10 Average Pain Intensity 4w: 5/10 Neuropathic Pain Score: 22/35 Immunotherapy: Tocilizumab + IVIG since 04/2020	**09/2020: Scanner 2** GM (mL): 0.067 (16.30%)* WM (mL): 0.344 (83.70%)** Cervical Cord (mL): 0.41

	Clinical Visit 08/2021: Attack 12/2020: Myelitis Symptoms: Numbness in the area of the anus - aggravation of previous symptoms (burning whole body pain, backpain) Therapy: oral prednisone, PLEX Pain location: Head/neck, trunk, hip, legs, feet Average Pain Intensity 24h: 2/10 Average Pain Intensity 4w: 3/10 Neuropathic Pain Score: 22/35 Immunotherapy: Tocilizumab + IVIG since 04/2020	**08/2021: Scanner 2** GM (mL): 0.061 (15.17%)* WM (mL): 0.341 (84.83%)** Cervical Cord (mL): 0.40 *It can be seen that the GM% consistently decreases by ~1% between visits and the cervical cord volume also decreases with additional myelitis attacks between visits. **WM% also increases (~1% per visit), and as it is complementary to the GM % in the cord.

Subject 4, F Diagnosis: MOGAD Age at onset: 53 y Attacks before baseline - Two confirmed brainstem attacks, one including the cervical myelon Prior immunotherapy - Azathioprine: 3 months (discontinuation due to elevation of liver transaminases) - Low-dose prednisone p.o.: 24 months No relevant comorbidities	**Baseline Visit 09/2018:** Disease duration: 29 months EDSS: 2.0 Average Pain Intensity 24h: 5/10 Average Pain Intensity 4w: 7/10 Neuropathic Pain Score: 8/35 No Immunotherapy **Clinical Visit 10/2019:** Attack 04/2019: Myelitis Symptoms: Sensory spinal cord syndrome with dysesthesia below Th12 Therapy: IVMP EDSS 3.0 Pain location: Head/neck, arms, hands, legs, feet Average Pain Intensity 24h: 6/10 Average Pain Intensity 4w: 0/10 Neuropathic Pain Score: 6/35	**09/2018: Scanner 1** GM (mL): 0.073 (18.43%)* WM (mL): 0.323 (81.57%)** Cervical Cord (mL): 0.40 **10/2019: Scanner 1** GM (mL): 0.061 (16.27%)* WM (mL): 0.314 (83.73%)** Cervical Cord (mL): 0.38 *It can be seen that with an additional myelitis attack between visits, the GM% was decreased by ~2% in a year and the cervical cord volume decreased as well.

	Immunotherapy: Rituximab since 03/2019	**WM% increases, and as it is complementary to the GM % in the cord.

AQP4-IgG+NMOSD, Aquaporin-4-IgG positive neuromyelitis optica spectrum disorder; EDSS, Expanded disability status scale; F, female; GM, grey matter; h, hours; IA, immunoadsorption; IVMP, intravenous methylprednisolone; m, male; mL, milliliters; MOGAD, myelin oligodendrocyte glycoprotein associated disease; PLEX, plasma exchange; p.o., per os; RE, right eye; SC, spinal cord; w, weeks; WM, white matter; y, years. Asterisks denote observational notes made in each patient visit pertaining to their SC MRI.