Cerebral and Spinal Cervical Cord atrophy rates in a cohort of patients with Multiple Sclerosis on Ocrelizumab: a retrospective study

Brugnoni G[1], Miscioscia A[1] Landi D[1], Nicoletti CG[1], Mataluni G[1], Napoli F[1], Castelli M[1], Marfia GA[1]

[1] Multiple Sclerosis Clinical and Research Unit, Department of Systems Medicine, Tor Vergata University, Rome, Italy

INTRODUCTION

People with Multiple Sclerosis (PwMS) treated with Ocrelizumab, an anti-B cell monoclonal antibody, typically exhibit a relatively stable clinical course(2). However, data on brain and spinal cord atrophy rates in Ocrelizumab-treated PwMS are limited.

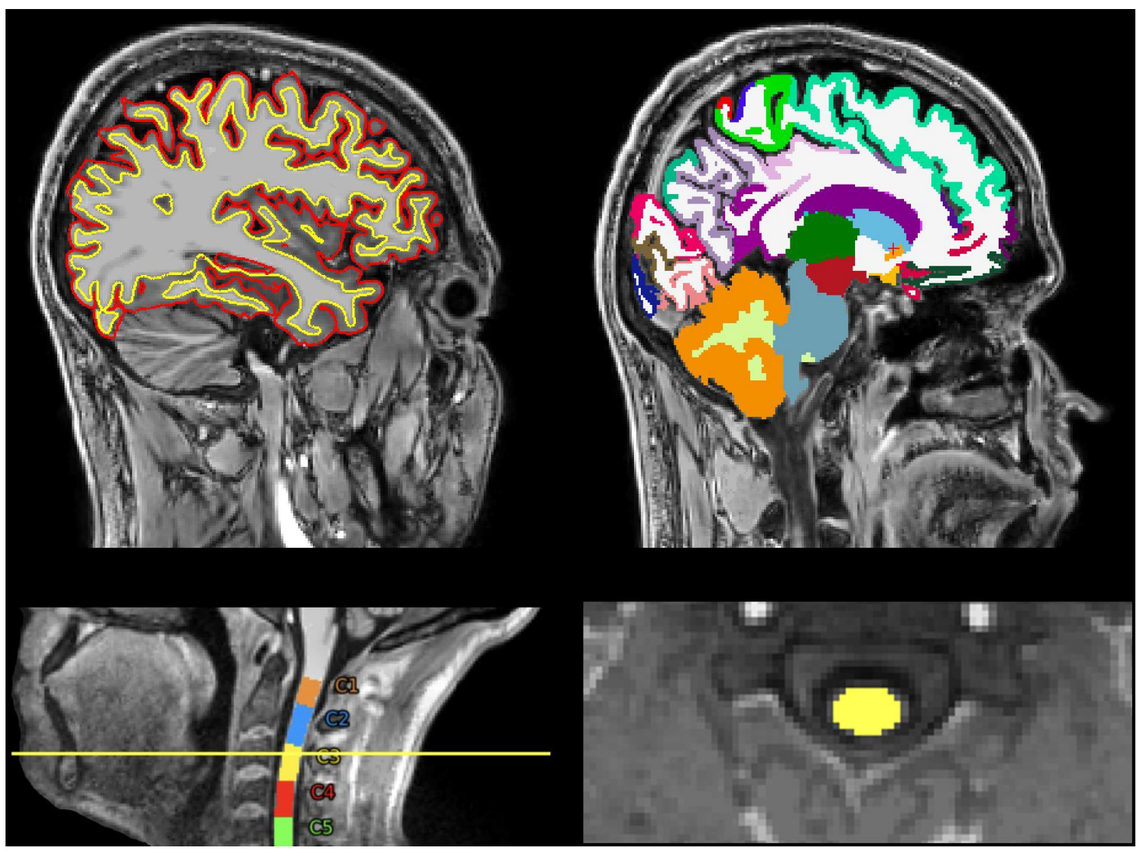
AIM

To assess annual atrophy rates of brain volumes and cervical spinal cord cross-sectional area (CSA) in a cohort of PwMS on Ocrelizumab in order to identify which structure exhibits the higher degree of neurodegeneration in this population.

METHODS

We conducted a retrospective study on a cohort of PwMS treated with Ocrelizumab who had at least 1 year of longitudinal MRI data available. 3 Tesla T1-weighted MRI images were collected at baseline and at 1-year follow-up. Volumes of the whole brain, white matter (WM), subcortical grey matter, and cerebellum, as well as cortical thickness, were obtained using FreeSurfer (version 7.3.2), as shown in Fig 1. Longitudinal processing was performed using FreeSurfer's longitudinal stream to calculate annual atrophy rates. Spinal cord C2–C3 CSA was measured at both time points (T0, T1) using the DeepSeg algorithm from the Spinal Cord Toolbox (version 6.1), and the atrophy rate was subsequently calculated as (T0 – T1)/100. Expanded Disability Status Scale (EDSS) scores were collected for a clinical follow-up of 5 years following the baseline MRI.

Fig 1. Brain and spinal cord volumetry



FreeSurfer (upper figures) and Spinal Cord Toolbox (lower figures) were employed to obtain, respectively, brain whole brain, white matter, subcortical grey matter, cerebellar volumes, cortical thickness and C2-C3 cross-sectional area at baseline and after 1 year.

RESULTS

We identified 25 patients who had been on stable treatment with Ocrelizumab for at least 1 year. Demographic and clinical data are shown in Table 1. Overall, the fastest annual atrophy rates were observed in whole brain and subcortical grey matter volumes. In the subset of patients with clinical progression, cortical thickness and C2-C3 CSA showed the most relevant changes, as shown in Table 2. No significant correlations were found between atrophy rates and EDSS scores, likely due to the small sample size.

Table 1. Demographic and clinical data

N	25
Age, years, mean (SD)	38.40 (7.37)
F%	56
Disease Duration, years, mean (SD)	6.16 (5.16)
Treatment Duration, years, mean (SD)	7.80 (0.65)
N° patients clinically stable	18
N° patients PIRA	5
N° patients RAW	2

Table 2. Atrophy rate data

Measures	% Change in all patients	% Change in the subgroup in progression
Whole-Brain Vol (mm^3)	-0.55%	-0.5%
Cerebral White Matter Vol (mm^3)	-0.14%	0.24%
SubCortical Gray Vol (mm^3)	-0.56%	-0.34%
Total-Cerebellum Vol (mm^3)	-0.17%	-0.05%
Cortical Thickness (mm)	-0.15%	-0.32%
C2-C3 CSA (mm^2)	-0.14%	-0.26%

CONCLUSION

In our cohort, whole brain and subcortical grey matter atrophy emerged as the fastest MRI metrics to change over the course of one year. In a subgroup of patients with clinical progression, changes in cortical thickness and C2-C3 CSA were the most pronounced. These findings support the potential utility of brain and spinal cord volumetric measures, particularly subcortical grey matter and cervical cord CSA, as imaging predictors of subclinical progression.

REFERENCES

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Contact: gabriele.brugnoni97@gmail.com