Dynamics of choroid plexus volume in multiple sclerosis patients treated with hematopoietic stem cell transplantation

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Introduction

Choroid plexus volume (ChPv) is a potential biomarker of immune-cell trafficking into the CNS, being its increase associated with new focal (and possibly chronic) inflammation in multiple sclerosis (MS).[1] Some treatments reduce ChPv, but, to our knowledge, no data are available on autologous hematopoietic stem cell transplantation (AHSCT), a haematological procedure encompassing the administration of high-dose chemotherapy drugs bioavailable within the CNS.[2]

Objectives

To investigate longitudinal changes of ChPv volume in MS patients undergoing AHSCT, exploring potential correlations with response to treatment.

Materials and methods

Relapsing MS patients consecutively treated with AHSCT who longitudinally performed brain MRIs at pre-defined time points (before, at months 6 and 12 after AHSCT, and then yearly) with a standardized protocol on the same 3T machine (Ingenia, Philips) were included. Choroid plexus volume within lateral ventricles was semiautomatically segmented on T1 images using Free-Surfer software with manual adjustments. T2 lesion volume was manually segmented on 3D-FLAIR images using 3DSlicer software.

Results

Twelve MS patients were included: 11/12 (92%) females; 5/12 (42%) relapsing-remitting (RR-)MS. Baseline characteristics are summarized in Table 1. At baseline MRI, no gadolinium-enhancing lesions were detected in all the patients, and only 1/12 (8%) patient had experienced MS relapse in the previous 3 months. Over a median follow-up after AHSCT of 26 months, two patients relapsed at months 8 and 15, both showing new lesions in the spinal cord with unchanged brain lesion load. At the last available follow-up, EDSS stabilized or improved in 8 cases, and worsened in 4. Individual trajectories showed ChPv reduction over follow-up, except for the two relapsed patients, both showing ChPv enlargement before relapse onset. ChPv remained increased above baseline in the one patient with breakthrough disease activity and associated EDSS worsening, whereas it decreased thereafter in the case who stabilized. Brain T2 lesion load was stable in all the cases but one, showing a transient increase at month 6 not associated with changes in ChPv.

Table 1: Baseline characteristics of the MS patients included (n=12).

	Median	(range)
Age, years	42	(28 – 48)
MS duration from disease onset, years	14	(5 – 23)
DMT duration, years	7	(1 – 20)
Number of previous DMTs	3	(1 – 6)
Wash-out DMT - AHSCT, months	6	(1 – 70)
EDSS score	4.0	(1.5 – 6.5)
Time interval last relapse – baseline MRI, months	5	(3 – 8)
	n	(%)
Sex, female	11	(92%)
MS form, RR	5	(42%)
Gd+ lesions on baseline MRI	0	(0%)
Relapse within 3 months before AHSCT	1	(8%)

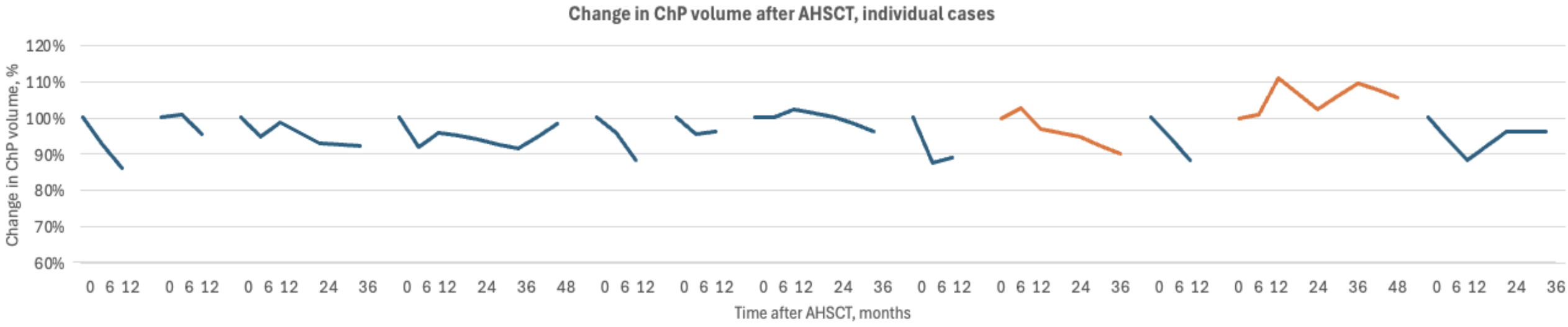

Figure 1: Individual patterns of choroid plexus (ChP) volume percentage change compared to the baseline scan (time 0) in the 12 MS patients included. Each patient is represented by a line graph, and ChP volume change (y axis) is plotted against the timepoint of MRI assessments in months (x axis). AHSCT responders (blue) showed a trend to ChP volume stabilization or decrease after AHSCT, whereas ChP enlargement was observed in the two patients who relapsed (orange).

Discussion and Conclusions

At individual level, ChPv reduced after AHSCT despite lack of recent focal inflammation at baseline in 92% of the cases, suggesting that AHSCT affects pro-inflammatory cell replenishment in the CNS even in the absence of overt inflammatory activity. Interestingly, ChP volume increase was associated with the formation of new lesions in the spinal cord only, suggesting that pathogenetic lymphocytes may use ChP as an entry point irrespective of lesion formation site. These preliminary data further support the effect of AHSCT on both acute and chronic inflammation, suggesting that ChPv could serve a promising biomarker of compartmentalized inflammation and response to treatment.

References: 1. Klistorner S. et al., Longitudinal enlargement of choroid plexus is associated with chronic lesion expansion and neurodegeneration in RRMS patients. Mult Scler. 2024 Apr;30(4-5):496-504.; 2. Muraro PA et al., Autologous haematopoietic stem cell transplantation for treatment of multiple sclerosis and neuromyelitis optica spectrum disorder - recommendations from ECTRIMS and the EBMT. Nat Rev Neurol. 2025 Mar;21(3):140-158.