

# Impact of lesion damages along the whole motor pathways on disability in multiple sclerosis

*M. Gaubert<sup>1,2</sup>, B. Combès<sup>2</sup>, E. Bannier<sup>1,2</sup>, V. Callot<sup>3,4</sup>, J.-C. Ferré<sup>1</sup>, G. Hamon<sup>1</sup>, R. Chouteau<sup>5</sup>, A. Kerbrat<sup>5,2</sup>*

<sup>1</sup>Rennes University Hospital (CHU), Department of Neuroradiology, Rennes, France, <sup>2</sup>University Rennes, Inria, CNRS, Inserm, IRISA UMR 6074, Empenn U1228, Rennes, France, <sup>3</sup>Aix Marseille Univ, CNRS, CRMBM, Marseille, France, <sup>4</sup>APHM, Hôpital Universitaire Timone, CEMEREM, Marseille, France, <sup>5</sup>Rennes University Hospital (CHU), Department of Neurology, Rennes, France

**Topic:** 27: MRI & PET

**Abstract text: Introduction:** The anatomical substrate of motor disability in MS patients is not fully understood. Studying the distribution of corticospinal tracts (CST) lesions per side, from the brain to the end of the thoracic spinal cord (SC) could provide a better association with patient motor deficits evaluated per limb.

**Objectives:** i) To describe lesion preferential location along the CST; ii) To investigate the association between CST lesions and motor functional consequences, as measured using the EDSS, and the ASIA motor scores and electrophysiology (Central motor conduction time (CMCT)) per limb.

**Methods:** 21 relapsing remitting MS (median EDSS=2.5) and 9 progressive MS patients (median EDSS=5.2) with clinical pyramidal symptoms were scanned on a 3T Siemens MRI scanner. White matter lesions were segmented on 3D FLAIR for the brain, on T2\* for cervical SC and T2 for thoracic SC. For each patient, registration to an atlas was computed using Anima and SCT toolboxes. Lesion volume fraction along the CST (defined as "lesion volume along the CST"/"overall CST volume") was calculated separately for the both sides on 3 regions: brain including brainstem, C1 to C7 (C1C7) and T1 to T10 (T1T10). Finally, the relationships between lesion volume fraction and the associated lateralized disability scores were assessed using multiple linear models, adjusting for age and disease duration.

**Results:** In MS patients, lesion volume fraction was higher in the C1C7 portion compared to the brain and T1T10 portion (all  $p$ 's < .001; mean=2%, 10% and 2%, for brain, C1C7 and T1T10, resp). No evidence of correlation was found between lateralized lesion volume fraction in each portion of the CST and EDSS score or ASIA score per limb, except for a mild correlation between EDSS and lesion volume fraction on the right CST (standardized beta=.39,  $p$ =.041). We observed strong positive associations between lesion volume fraction in C1C7 and CMCT for superior and inferior limbs on the right side and for superior limbs on the left side (all std-beta > .6; all  $p$ 's < .005). Finally, we observed a mild positive association between lesion volume fraction in T1T10 and CMCT for inferior limbs on the left side (std-beta=.53;  $p$ =.02).

**Conclusions:** CST damage is not homogeneous along the tract and predominates in the cervical portion. It has clear consequences on motor conduction velocities measured using electrophysiology. Future work will include an assessment of lesion severity to better explain lesion consequences on motor disability.

**Disclosure:** Malo Gaubert: nothing to disclose

Benoît Combès: nothing to disclose

Elise Bannier: nothing to disclose

Virginie Callot: nothing to disclose

Jean-Christophe Ferré: nothing to disclose

Guillaume Hamon: nothing to disclose

Raphaël Chouteau: nothing to disclose

Anne Kerbrat: nothing to disclose

**Travel Grant / Young Scientific Investigators' Sessions:** I will not apply for Travel Grant or Young Scientific Investigators' Session

**1. I confirm that I previewed this abstract and that all information is correct. I accept that the content of this abstract cannot be modified or corrected after submission deadline and I am aware that it will be published exactly as submitted. Abstracts may be withdrawn until 31 August 2021:** Yes

**2. Submission of the abstract constitutes my consent to publication (e.g. conference website, programmes, etc.):** Yes

**3. I herewith confirm that the contact details saved in this system are those of the corresponding author, who will be notified about the status of the abstract. The corresponding author is responsible for informing the other authors about the status of the abstract:** Yes