Visualization of Gray Matter Atrophy and Anterior Corticospinal Tract Signal Hyperintensity in Amyotrophic Lateral Sclerosis Using 7T MRI

Virginie Callot, Aurélien Massire, Maxime Guye, Shahram Attarian, Annie Verschueren

Visualization of gray matter atrophy and anterior corticospinal tract signal hyperintensity in Amyotrophic Lateral Sclerosis using 7T MRI

Virginie Callot [1,2], PhD, Aurélien Massire [1,2], PhD, Maxime Guye [1,2], MD, PhD, Shahram Attarian [3], MD, PhD, Annie Verschueren [3], MD

[1] Aix-Marseille Univ, CNRS, CRMBM, Marseille, France
[2] APHM, Hôpital Universitaire Timone, CEMEREM, Marseille, France
[3] APHM, Reference Centre for Neuromuscular Disorders and ALS, Hôpital Universitaire Timone, Marseille, France

Two ALS patients presenting with different phenotypic descriptions went for 7T MR examination: a man with left upper-limb amyotrophy due to lower motoneuron (LMN)-predominant ALS (ALSFRS=33/48, left ulMRC=15/25, right ulMRC=25/25, UMNs=17/55), in whom anterior GM hemiatrophy could be seen (figA) and a woman with spastic tetraparesis due to upper motoneuron (UMN)-predominant ALS (ALSFRS=34/48, left and right ulMRC=21/25, UMNs=55/55) exhibiting lateral corticospinal but also anterior tracts hyperintensities (figB), while posterior and lateral sensory tracts were preserved.

Consistent with respective clinical features, and in line with recent reports [1-2], these imaging findings open great perspectives for WM/GM impairment description in ALS at 7T.

ALSFRS : ALS Functional Rating Scale (normal value 48); **ulMRC** (muscle power grading): Upper Limb Medical Research Council scale (normal value = 25); **UMNs** (reflecting UMN involvement) : Upper Motor Neuron score (normal value 24/55, most severe score 55).

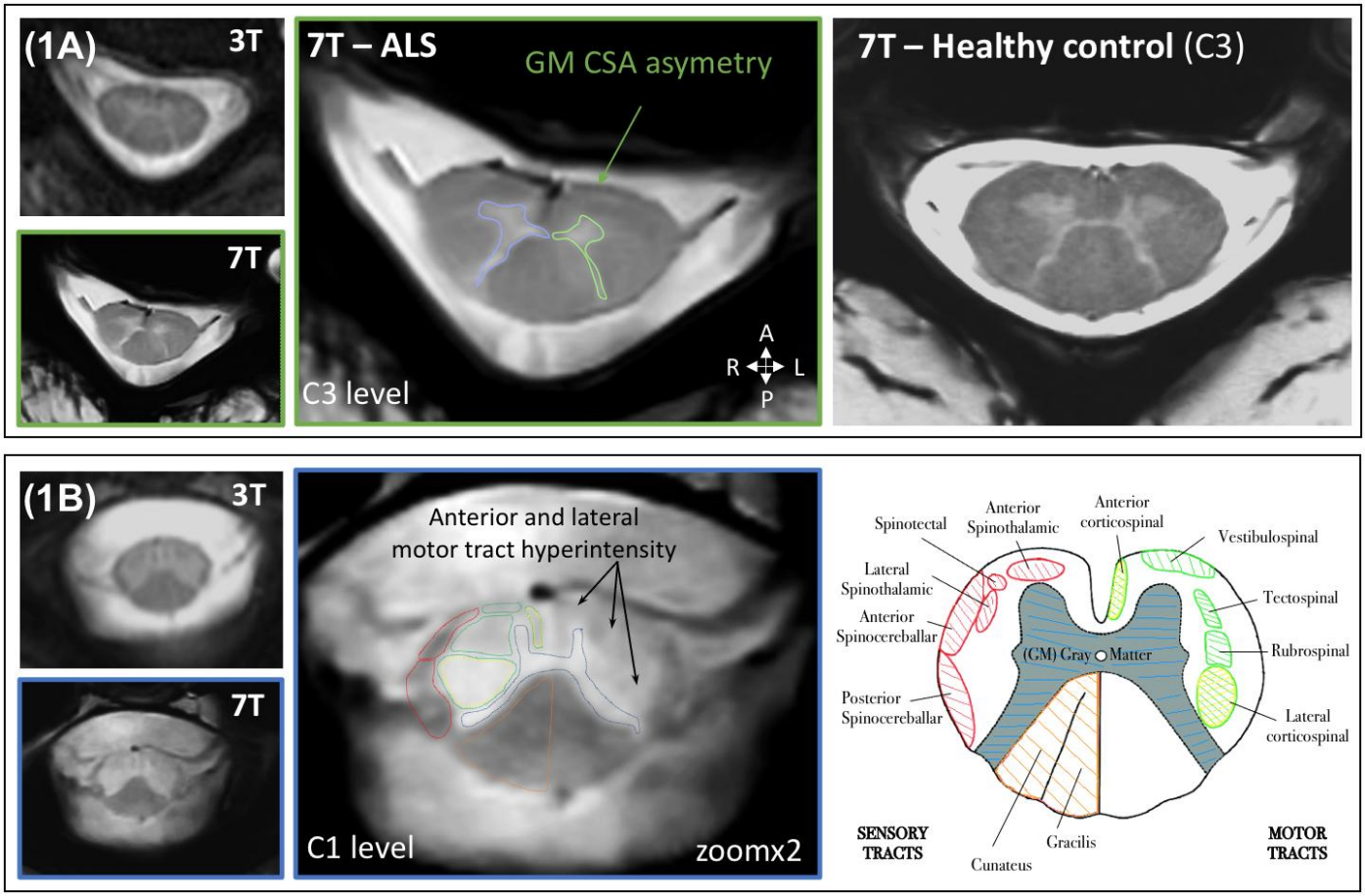

Figure 1 *– 7T ALS MRI - Multi-echo-gradient-echo T_2*-weighted images (18 slices, 6minutes) acquired at 3T (0.5x0.5x5mm^3, no gap) and 7T (0.27x0.27x2mm^3) in 2 patients: (A) LMN-predominant ALS presenting with a 10-to-20% left/right asymmetric GM atrophy; (B) UMN-predominant ALS presenting with bilateral motor tracts degeneration (CST and others) with sign of impairment of the anterior tracts.*

References

1. Dula AN, Pawate S, Dortch RD, et al. Magnetic resonance imaging of the cervical spinal cord in multiple sclerosis at 7T. Mult. Scler. 2016; 22:320–328.

2. Barry RL, Vannesjo SJ, By S, Gore JC, Smith SA. Spinal cord MRI at 7T. Neuroimage 2018; 168:437-451.