

## Longitudinal fMRI changes following tumor-like lesions in multiple sclerosis.

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### Introduction.

Several functional magnetic resonance imaging (fMRI) studies (1) have demonstrated movement-related cortical adaptive functional changes in patients with stable MS with different disease phenotypes. Only one study has assessed the short-term fMRI changes in a single patient following an acute relapse (2). In order to investigate the possible role of cortical reorganization in clinical recovery in MS, in this study, we used fMRI to assess the movement-associated cortical changes following an acute motor relapse secondary to a single tumor-like lesion. We also evaluated the relationship between the degree of clinical recovery and longitudinal fMRI changes in motor areas.

### Patients and methods.

We recruited 12 right-handed patients (5 male; mean age=35±14 years) after a clinical attack involving the motor system secondary to a large demyelinating lesion of the brain. Nine patients had a relapsing-remitting disease course, while three patients were at their first clinical attack. In a single session, we obtained fMRI during repetitive flexion-extension of the last four fingers of the impaired and unimpaired hand, and dual-echo sequences of the brain. In four patients a longitudinal fMRI study was also performed (mean follow-up duration=six months). FMRI data were analyzed using SPM99 (3). Hand motor performance was assessed using the nine-hole peg test (NHPT).

### Results.

The primary sensorimotor cortex (SMC) of the unaffected hemisphere was significantly more activated during task performance with the impaired hand than with the unimpaired hand. On the contrary, during task performance with the unimpaired hand, the cerebellum of affected side and several motor areas in the unaffected cerebral hemisphere, including the primary SMC, the secondary sensorimotor area and the thalamus were significantly more active. Tumor-like lesion volume was significantly correlated with relative activation of the primary SMC, bilaterally ( $r=-0.86$  and  $-0.85$ ), whereas NPTH score was significantly correlated with relative activation in the primary SMC of the affected hemisphere ( $r=0.88$ ).

Longitudinal fMRI examinations showed a progressive recovery of function of the primary SMC of the affected hemisphere in the two patients with a clinical improvement. On the contrary, in the other two patients, who did not show any clinical recovery, there was a progressive recruitment of several regions in the frontal lobes, bilaterally.

### Conclusion.

Tumor-like MS lesion affecting the motor system can determine short- and medium-term cortical changes mainly characterized by the unmasking of pathways in the unaffected hemisphere. The regain of function of "classical" motor areas of the affected hemisphere seems to be a critical step for the subsequent clinical recovery.

### References.

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