Functional connectivity pattern during motor imagery and execution of paretic hand movements of stroke patients.

Motor imagery (MI) has emerged as a promising technique for promoting neuroplasticity and recovery of motor function after a stroke. It is used as an alternative to movement execution (ME). The brain structures involved in MI are largely documented but the existent functional connectivity (FC) during MI and the differences with ME in stroke patients remain underinvestigated. Functional magnetic resonance imaging (fMRI) techniques have the potential to reveal these changes. We aimed to investigate the FC during MI and ME and correlate FC measures between sensorimotor (SMN) regions with motor function of stroke patients.

24 stroke patients with hemiparesis (time post-stroke = 10 ± 21 months; Upper-limb Fugl-Meyer Score (FMS) = 27.2 ± 13.5/66) were included. The patients underwent fMRI examination while they either imagined or executed wrist extension with their affected hand (AH). We studied FC using seed-to-voxels analysis. We compared the FC of SMN regions between MI and ME of AH movement. Additionally, correlations among brain FC measures and behavioral scores of motor function (FMS) were computed.

During MI of the AH in comparison with ME, FC of the ipsilesional SMN (BA 40) was decreased with the ipsilesional somatosensory cortex (BA 2, 40, 5) and the cerebellum. In parallel, it was increased with the bilateral frontal cortex (BA 8, 10) (figure). Besides this, correlation analyses with the FMS revealed that during MI, more impaired patients relied more on functional connections between contralasional BA4 and cerebellum (crus 1 and 2) than less impaired patients did.

The connectivity changes observed may reveal compensatory networks for MI implicating more the frontal lobe and the contralesional hemisphere in most impaired patients. These results characterized the connectivity patterns of ME and MI and may provide new insights into the neural mechanism underlying them.