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Study for Extracting the Corticospinal Tract Related to the Right Hand and Foot Movement Using the Functional Magnetic Resonance Imaging and Diffusion

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Object: To extract the corticospinal tracts (CST) related to right hand and foot movements and to identify their location in the corona radiata by using the functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI). **Subject and Method :** fMRI and DTI experiments were performed at Philips 1.5T Gyroscan Intera MR scanner for 10 right-handed normal subjects (5 men: avg. 35 yrs., 5 women: avg. 32 yrs.). Using echo planner imaging (EPI) pulse sequence and the blood oxygen level-dependent technique fMRI data were acquired under the block paradigm of alternate rest for 30 s and movement for 30 s. The hand and foot movements consisted of ventral flexion and extension with 1Hz of period. The fMRI data were analyzed with SPM2 (The Wellcome Department of Imaging Neuroscience, UCL, UK). DTI data were acquired at the same scanner with spin echo EPI pulse sequence having two diffusion gradients and following imaging parameters: number of diffusion sensitizing gradients=32, b=1000s/mm².

Considering the fMRI results hand movement and foot movement related CST were obtained with DTI-Studio (CMRM, Jons Hopkins Medical Institute, USA). **Results:** Right hand movement related CST passes through the top of the left cerebral peduncle, corona radiata and hand motor area and right foot movement related corticospinal tract passes through the top of the left cerebral peduncle, corona radiata and foot motor area. The validity of the obtained tracts were supported by the anatomical MR images of the patients having hand motor and foot motor dysfunctions. **Conclusions:** Our method extracting the CST related to the hand and foot movements may be useful for the study about the somatotopic structure of the neuronal fiber tracts.

Keywords : Functional Imaging, Diffusion Tensor Imaging, Corticospinal Track