Detection of the Supplementary Motor Area (SMA) by using fMRI

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Purpose: To examine activation of the supplementary motor area by using EPI-fMRI.

Materials and Methods: Fifteen subjects, aged 17-48 (men:10, women:5), without motor dysfunction were imaged using fMRI. MR imager was a Siemens 1.5 T Magnetom Vision system with a standard head coil. All fMR images were obtained on the oblique axial plane perpendicular to the marginal sulcus. Parameters of EPI were TR/TE: 1.0/66.0, flip angle: 90^0, FOV: 22x22, matrix: 128x128, and slice number/slice thickness/gap: 10/4/0.8 with fat suppression. Patients were imaged during finger-thumb tapping for 18 sec, followed by the rest for 18 sec (acquisition time for each imaging: 1.59 sec). All 36 measurements were obtained in each study. Motor activation study for one subject consisted of 3 sets of finger movements on the each hand and both the hands. Activation images were processed by subtraction of average images in the rest from subsequent images on the activation. The EPI images entered a statistical image analysis protocol with a Siemens software. SMA and primary motor area (PMA) were detected on the base of the central sulcus.

Results: Incidence of SMA activation on fMRI (77 %) was lower than that of the primary motor cortex (96 %). For SMA activation, concordant activation was most common (44 %) during finger tapping of the right hand, discordant activation was most common (57 %) during finger tapping of the left hand, symmetric activation was most common (40 %) during finger tapping of the both hands.

Conclusions: Our experiments support that SMA activation conforms to left hemisphere dominancy.