

## Four Battery fMRI Experimental Setup for the Localization of Functional Areas as a Clinical Routine Tool

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**Purpose:** To develop a four battery fMRI technique for motor, sensory, language and memory functions as a clinical routine tool and to evaluate its performance of the localization of functional areas.

**Materials and Method:** fMRI studies were performed for normal volunteers in a GE MR unit (Horizon Echospeed, Ver. 5.6). A single shot gradient echo EPI sequence (TR/TE/flip angle=3000ms/60ms/90, FOV=240 mm, matrix=128x128) was modified to store raw data acquired before FFT procedure and MR images were not reconstructed on a MR unit. Raw data were transferred into a satellite workstation and images were reconstructed through offline reconstruction algorithm. Reconstructed images were used for a mapping functional areas using a home-made program or SPM. For a four battery fMRI technique including motor, sensory, language and memory, a block design with one activation(on) and two rest(off) periods was used and a total of 34 phases (14/10/10 phases=off/on/off) was scanned. In each paradigm, the same experiment was performed twice. Scan time to be taken for performing a given paradigm was estimated and the locations of functional areas were evaluated.

**Results:** The functional areas related to motor, sensory and language systems except memory were reliably well localized. It took about 4 minutes to perform one paradigm, which resulted in a total time of 30 minutes for a full four battery fMRI study including the preparation time for the acquisition of T1-weighted MR images. The postprocessing time taken to obtain a functional map image from raw data was 30 minutes.

**Conclusions:** The time taken for a full four battery fMRI study was within the practical limit for a clinical routine tool and the localization of various functional areas in cerebral cortex was successful. In conclusion, four battery fMRI technique developed in our laboratory may be clinically useful for the evaluation and management of neurological/neurosurgical patients.