PRESURGICAL FUNCTIONAL BRAIN MAPPING WITH MSI AND INVASIVE CORTICAL MAPPING

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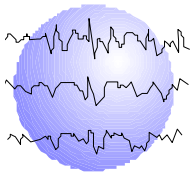

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Please consider this information to be preliminary findings.

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OBJECTIVE

The purpose of this study was to examine correlation of MSI functional mapping and invasive brain mapping in epilepsy and brain tumor patients.

BACKGROUND

Presurgical functional mapping is critical for epilepsy and brain tumor surgery.

Invasive cortical mapping may result in complications due to the prolongation of surgery or the need for 2 Surgeries when electrodes are implanted.

Non-invasive mapping tools include:

PET --measures metabolism (low spatial and temporal resolution);

fMRI --detects the rate of OHB and DHB;

MSI --maps the actual neuronal activity in real time with high temporal and spatial resolution

MATERIALS AND METHODS

Equipment: 148-channel Magnes 2500 WH System, 4-D Neuroimaging Inc., San Diego, CA

Patients: At Minnesota Epilepsy Group between Dec 2004 and June 2006, 29 patients received both functional brain mapping with MSI and invasive brain mapping (11 patients with intra-operative mapping, 18 with subdural electrode placement).

MSI protocols:

language --word recognition task,

somatosensory--pneumatic piston as stimuli, and

motor cortex --voluntary finger tapping.

MSI Analysis: Single equivalent dipole modeling. Co-registered on 3D SPGR MR images (1.4 mm slice thickness).

RESULTS

In the 29 patients, there were 8 patients with language mapping, 26 with motor mapping and 16 with somatosensory mapping.

Functional critical MSI dipoles were located around the sulcus corresponding to the cortical mapping on cortical surface.

There were no non-predicted neurological deficits after resective surgery in 28 patients. One patient did not undergo resection due to the overlapping of motor cortex and epileptogenic focus.

CONCLUSIONS

MSI brain function localization correlates well with invasive cortical mapping on cortical surface.

MSI functional mapping is an accurate tool for surgical planning.

Appropriate utilization of MSI may reduce the number of cases requiring invasive functional mapping

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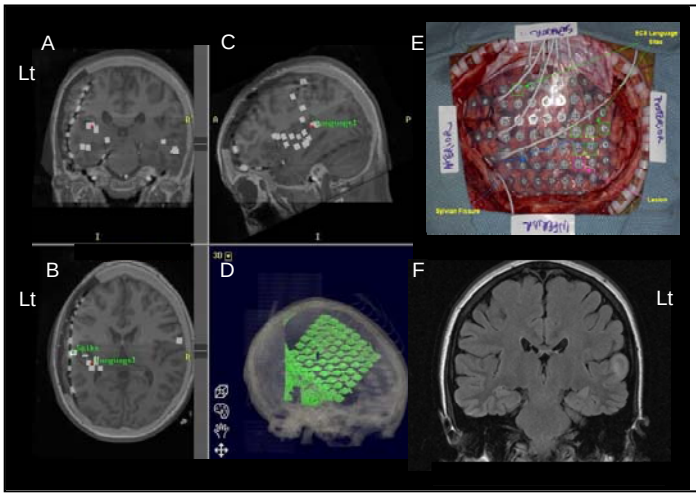
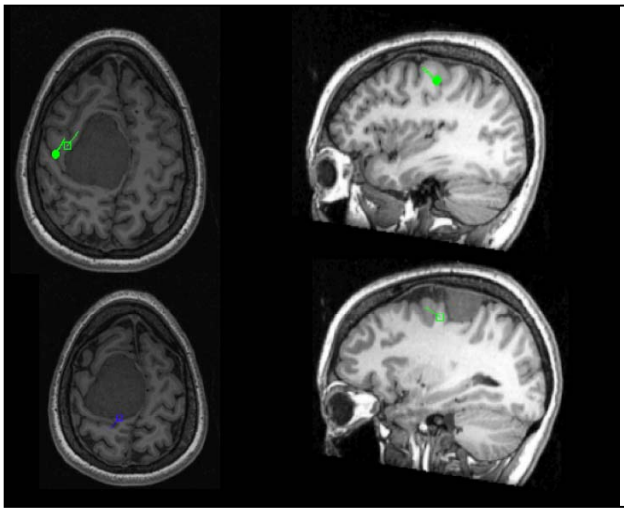


- 20 y.o female patient, hybrid images of pre-operative MRI (with MSI information) and post grid CT generated with Stealth Neuronavigation System (Medtronic) (Figs. A,B,C,D). With the electrodes shown on CT and brain structure on MRI, these Images allow us to correlate MSI and Electrical cortical stimulation (ECS) accurately.
- 8X8 grid with subfrontal and inferior temporal strips were placed under the guidance of MSI (Fig. E). ECS confirmed the same language region mapped with MSI on the left posterior superior temporal gyrus as shown on hybrid image.
- FLAIR image (Fig. F) demonstrates MTS and lesion at superior temporal gyrus



30 y.o. old female with left leg weakness was diagnosed with frontal parasagittal extraaxial tumor. MSI mapped motor function for finger (green dots) and foot (green squares), and somatosensory function for ankle (blue square). Intra-operative mapping confirmed the MSI localization. The pathology was read as a meningioma.