fMRI Seems Reliable for Brain Tumor Mapping

BY AMY ROTHMAN SCHONFELD
Contributing Writer

NEW ORLEANS — Functional MRI seems to be a reliable, safe, and effective technique to guide preoperative planning of brain tumor resection from eloquent cortex when used in conjunction with intraoperative stereotactic guidance, according to Kristin Houseknecht.

One benefit of using functional MRI (fMRI) preoperatively is that surgeons can avoid extensive intraoperative maneuvers such as awake craniotomy and cortical mapping.

"Awake craniotomy has the advantage of allowing real-time evaluation of function. However, there are unique intraoperative risks associated with awake craniotomy, and it also requires a willing and compliant patient," noted Ms. Houseknecht, who is a fourth-year medical student at the University of South Florida, Tampa.

In this large series gathered as a retrospective chart review, 209 patients were identified who had undergone fMRI and then resective craniotomy under general anesthesia for either primary or secondary brain tumor in eloquent cortex between July 2002 and December 2005.

Postoperatively, 53% were neurologically stable, 30% showed neurologic improvement, and 17% experienced a decline in neurologic function.

Of those who had postoperative impairment, deficits were transient in about 30% and permanent in 13%.

Most patients in this group recovered rapidly and were discharged from the hospital within 2 days.

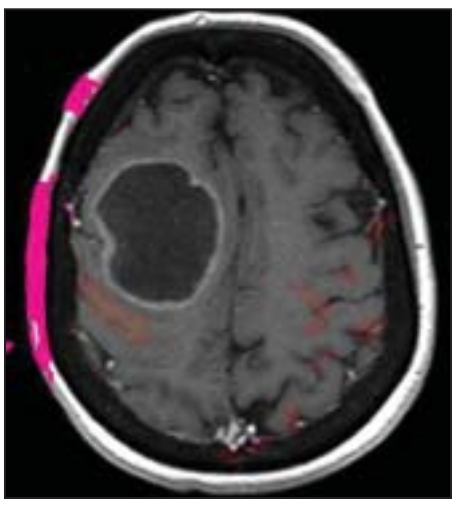
Tumors were located in the frontal (31%), parietal (20%), and temporal (11%) lobes, mostly within a single lobe.

Pathologically, 34% of tumors were glioblastoma, 12% grade 3 glioma, and 7% grade 2 glioma, and in a large number of patients, the brain tumors were secondary to cancer in other regions.

About half of the group had presented with motor deficits, 8% had speech deficits, and 11% had cognitive problems.

fMRI paradigms were chosen according to the function of the eloquent cortex in proximity to the brain tumor.

A test of foot flexion and extension or finger tapping was used to evaluate motor cortex and a number counting paradigm was employed to test the speech cortex.



COURTESY DR. F. REED MURTAGH

Right motor strip (red shading) activated when the patient moved her left hand; at 1 month post resection of lesion, the patient was neurologically stable.

"The majority of patients were able to satisfactorily complete the fMRI paradigms," Ms. Houseknecht said.

Intraoperative somatosensory evoked potential monitoring was used to confirm sensory and motor cortex in some patients.

"Currently most tumors in eloquent cortex are referred to tertiary or quaternary referral centers because traditionally these cases are treated with an awake craniotomy to minimize postoperative neurologic deficits," according to Dr. Nicolas Arredondo, a neurosurgery chief resident at the University of South Florida and one of the coinvestigators of the study.

"These preliminary data suggest that with preoperative fMRI and meticulous surgical technique, comparable outcomes may be possible in some cases without all of the resources that are required to successfully perform an awake craniotomy," he commented.

Since the close of the enrollment date for this study, several hundred more patients with brain tumors have undergone fMRI, Ms. Houseknecht said at the American Society of Neuroradiology annual meeting.

"These results are just the tip of the iceberg," he said. ■