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Functional Magnetic Resonance Imaging-Guided Brain Tumor Resection [Original Articles]

Hall, Walter A. MD, MBA; Kim, Peter MD, PhD; Truwit, Charles L. MD

From the Department of Neurosurgery, State University of New York Upstate Medical University, Syracuse, NY; and Department of Radiology, Hennepin County Medical Center, Minneapolis, MN.

Reprints: Walter A. Hall, MD, MBA, Department of Neurosurgery, SUNY Upstate Medical University, 750 E Adams St, Syracuse, NY 13210 (e-mail: hallw@upstate.edu).

Abstract

Objectives: We evaluated the safety and efficacy of using functional magnetic resonance imaging (fMRI) brain activation data obtained at both 1.5 and 3 T to guide brain tumor resections using 1.5-T intraoperative MRI (ioMRI) guidance.

Materials and Methods: From January 1997 to March 2006, fMRI was performed on 29 patients before attempted brain tumor resection. Functional MRI was used to identify and coregister areas of brain activation for motor (n = 18), speech (n = 6), motor and speech (n = 4), and short-term memory and speech (n = 1) with respect to the tumor using a 1.5-T and two 3-T MRI scanners. Surgical resection was accomplished using 2 different 1.5-T ioMRI systems. The appropriate MRI scan sequences were obtained during surgery to determine and maximize the extent of the surgical resection depending on the tumor type.

Results: Of 29 patients, 20 (69%) had radiographically complete fMRI-guided tumor resections and 2 (7%) had successful MRI-guided brain biopsy because of the proximity of their astrocytomas to the eloquent cortex. The tumors were oligodendrogliomas (n = 16), astrocytomas (n = 4), meningiomas (n = 3), glioblastomas multiforme (n = 2), a pleomorphic astrocytoma (n = 1), and a dysembryoplastic neuroepithelial tumor (n = 1). The preoperative fMRI data were accurate in all cases. After tumor resection, 7 patients (26%) had transient neurologic deficits that resolved completely within 1 month of the surgical procedure in all cases. No adverse events associated with ferromagnetic instrumentation occurred.

Conclusions: Functional MRI was accurate for localizing areas of eloquent neurologic function before ioMRI-guided brain tumor resection.

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