Use of Intraoperative MRI Limits Routine Postoperative MRIs in Pediatric Neurosurgical Patients

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Introduction: Intraoperative magnetic resonance imaging (iMRI) is a technology that utilizes intraoperative imaging to improve surgical navigation and the ability to perform complete resection of brain tumors. The number of centers employing this technology has increased since its development in the mid-1990s.[1,2] Although there are many reports describing the utility of iMRI in adult neurosurgical patients, there is little literature describing its use in pediatric neurosurgical populations. One additional potential benefit of this technology is its ability to limit the need for a routine postoperative MRI. This is of particular importance in pediatric patients, since many need sedation or general anesthesia to obtain successful imaging sequences. Thus, avoidance of a postoperative scan and its consequent risk would be advantageous. We have previously presented our initial experience with iMRI to guide intraoperative therapeutic decision making in pediatric neurosurgical patients.[3] We now present our initial series of patients who underwent resection of intracranial masses to determine if iMRI decreases the need for routine postoperative scans.

Methods: Records from the Departments of Anesthesiology, Neurosurgery and Radiology were screened to identify all patients who had undergone procedures for tumor resection using the iMRI from the opening of this OR in November 2005 through May 2006. These patients had their charts reviewed through November 2006 to identify all MRI scans obtained anytime in the 6 months following surgery. Patients were divided into two groups, those who had an initial postoperative MRI (defined as an MRI of the head during the same admission as the surgical procedure) and those who did not have an initial postoperative MRI. All patients were further evaluated to determine if they underwent a follow up MRI at a later date and when these occurred.

Results: There were 32 patients who met the criteria for this study; 12 had an initial postoperative MRI and 20 did not (Table 1). All patients had follow-up imaging performed between 1 and 6 months postoperatively. During the first three months, all the patients underwent routine imaging as if they had their operations performed not using iMRI; in other words they had a routine postoperative MRI within 72 hours of the procedure in order to gain experience with this new technology and determine if intraoperative scans following tumor resection were comparable to images obtained in the standard fashion prior to discharge from the hospital. After this period, scans were obtained prior to discharge only if the neurosurgeon and/or radiologist had special concern. Immediate postoperative MRIs in these patients were essentially no different from intraoperative images.

	Patients Having Procedures During Initial Experience with iMRI (11/05-2/06)	*Patients Having Procedures After Initial Period (2/06- 5/06)*
Initial Postoperative Scan (n=12)	***9***	***3***
No Initial Postoperative Scan (n=20)	***0***	***20***

Discussion: We have previously reported that a variety of neurosurgical procedures in children can be aided by utilizing a mobile 1.5T MRI for intraoperative guidance. An additional benefit appears to be limiting the need for routine postoperative imaging after intracranial mass resection. It had been routine practice at Children's Hospital Boston to obtain a postoperative MRI within 72 hours after conventional resection of an intracranial mass. After initial experience was gained with this iMRI, we stopped obtaining routine postoperative MRIs as the images obtained postoperatively were unchanged from and of the same quality as those images obtained intraoperatively. There were 3 of 23 patients who had immediate postoperative MRIs in this series after the practice was changed. The reasons were 1) re-evaluation of a suspect area after swelling had resolved in the sella, 2) concern regarding "contrast creeping", and 3) an oncology recommendation to evaluate the patient for metastases related to the intraoperative pathology report. In summary, intraoperative imaging is valuable not only for intraoperative navigation and facilitation of tumor resection, but also for limiting the number of routine postoperative imaging procedures required.

References: 1) Manninen PH, et. al. *J Neurosurg Anesthesiol* 2000; 2(2): 141-148.

2) Black PMcL, et. al. *Neurosurgery* 1997; 41(4): 831-45.

3) McClain CD, et. al. Initial Experience with a Mobile 1.5T MRI for Intraoperative Guidance in Pediatric Neurosurgery – Presented at the SNACC 2006 Annual Meeting, Chicago, IL