Intraoperative magnetic resonance imaging and pituitary surgery

THEODORE H. SCHWARTZ, M.D.

Departments of Neurosurgery, Otolaryngology, Neurology, and Neuroscience, Weill Cornell Medical College, NewYork-Presbyterian Hospital, New York, New York

Coburger et al. performed a retrospective study of 2 serial but nonconsecutive groups of patients in which microscope-based, paraseptal, fluoroscopically guided transphenoidal surgery (TSS) was performed for mostly pituitary tumors, in which intraoperative MRI (iMRI) was not used in the first group and was used in the second group. The authors claim that for those patients in whom gross-total resection (GTR) was intended there was a statistically higher rate of GTR in the iMRI group, and for the rest of the patients, in whom GTR was not intended, there was a significantly lower volume of residual tissue in the iMRI group. Based on these data they recommend the use of iMRI for pituitary surgery when the technology is available.

Although several prior studies have already shown that iMRI increases extent of resection, the control group has always consisted of the same patients whose surgeries were halted when the surgeon thought that all tumor was removed, and the experimental group consisted of the same patients after iMRI showed residual tumors. Such a study design leads to bias because the surgeons may have same patients after iMRI showed residual tumors. Such a study design leads to bias because the surgeons may have ended up with larger-volume residual tumors and hence did not measure preoperative tumor volumes, it is possible that the first group of patients started out with larger-volume tumors and hence may have ended up with larger-volume residual but a similar extent of resection. Additionally, the volume of residual tumor was not statistically different between the 2 groups. The absence of preoperative volume measurements is even more of a concern because the percentage of patients with residual tumor was also not statistically different between the 2 groups. Only the percentage of patients with intentional subtotal resection who had residual intrasellar tumor was significant.

The second design flaw is that the authors separated out patients in whom GTR was the goal of surgery. Such a decision is inherently subjective. Did both surgeons have exactly the same criteria for choosing patients in whom a GTR could be achieved? Were cases evenly divided between these 2 surgeons? Was this determination made prospectively or retrospectively? The authors do not state that they kept a prospective database of patients who they thought could get a GTR, so it must have been done retrospectively. This is problematic, because the authors also knew which patients were in the iMRI group and thus were not blinded during this assessment.

Finally, the outcome measurement of the volume of residual tumor is not a good surrogate for extent of resection. Because the authors did not measure preoperative tumor volumes, it is possible that the first group of patients started out with larger-volume tumors and hence may have ended up with larger-volume residual but a similar extent of resection. Additionally, the volume of residual tumor was not statistically different between the 2 groups. The absence of preoperative volume measurements is even more of a concern because the percentage of patients with residual tumor was also not statistically different between the 2 groups. Only the percentage of patients with intentional subtotal resection who had residual intrasellar tumor was significant.

This finding is even less noteworthy because the iMRI group had a higher proportion of functional tumors, which are more likely to be smaller tumors, and the non-iMRI group had a higher percentage of suprasellar tumors, which are larger in volume.

With regard to the authors’ statistically significant findings, the power of their statistics is not robust given the sample size. For example, in the iMRI group there were 4 patients lost to follow-up. If only 1 of these patients did not have a GTR, the authors’ findings would not be statistically significant \( (p = 0.071; \) Fisher exact test). As for their second finding, as previously mentioned, the volume of residual tumor is actually not significantly different between the 2 groups; it is the presence of an in-
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In conclusion, although iMRI probably increases extent of resection and rates of GTR for standard microscope-based TSS, the results do not compare to those that can be achieved with the adoption of the endoscope and extended transsphenoidal approaches. Moreover, the endoscope is far cheaper and does not increase the length of the surgery as dramatically as iMRI does. Whether iMRI offers a significant incremental improvement in surgical outcome above those provided by the endoscope and extended approaches is not clear, and will require further investigation, but at this time the data do not justify the incremental cost.

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Disclosure

The author reports no conflict of interest.

References


Response

JAN COBURGER, M.D.
Department of Neurosurgery, Uniklinikum Ulm, Günzburg, Germany

I thank Professor Schwartz for his comment, and I appreciate the opportunity to write a reply in this issue. There are several limitations in our study, due to its retrospective nature. The purpose was not to compare resection rates of iMRI-enhanced microsurgical technique with endoscope, but to analyze the added benefit of iMRI in microsurgical resection of pituitary adenomas. From our point of view this comparison is still up to date, because the majority of neurosurgeons perform pituitary adenoma resection using