Residual pituitary adenomas after surgical treatment: improved depiction with gadobenate dimeglumine compared to gadopentetate dimeglumine

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Purpose: Pituitary Adenomas account for 10-15% of all intracranial primitive neoplastic lesions. Surgical debulking is often the first approach to management. However, residual adenomatous tissue after surgery can be detected in up to 50% of cases and is clearly associated with a high risk of tumor recurrence. Gamma knife surgery is frequently a good therapeutic option in these cases since the risk of damage to surrounding structures is minimal. In order to remove as much of the recurrent tumor as possible, accurate depiction of the residual tumor tissue is critical. Gadobenate dimeglumine (MultiHance; Bracco) has markedly greater r1 relaxivity in blood compared to traditional contrast agents because of weak and transient interaction with serum proteins. Numerous studies have shown that lesion enhancement and available diagnostic information is greater on gadobenate dimeglumine-enhanced images (1-4). However, little is known of the potential of gadobenate dimeglumine for improved depiction of residual pituitary adenoma. This preliminary study was performed to intra-individually compare gadobenate dimeglumine with gadopentetate dimeglumine at equivalent dose (0.1 mmol/kg bodyweight) for MR imaging of residual pituitary adenoma in patients who had previously undergone surgical treatment.

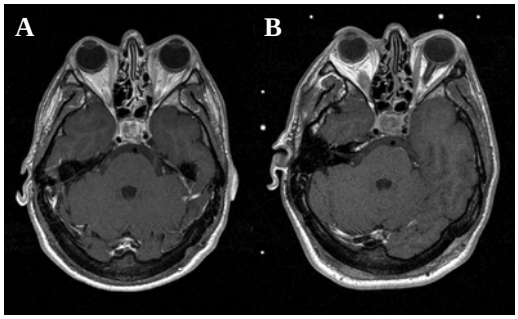
Materials & Methods: Institutional review board and regulatory approval were granted; written informed consent was obtained for all patients. Fifteen patients (6 males, 9 females) with residual pituitary adenoma amenable to gamma knife surgery were enrolled. Patients underwent two MR examinations at 1.5T separated by 48 hours. The imaging parameters were identical for the two studies. Contrast agent administration was fully randomized: 10 received gadobenate dimeglumine for the first examination and gadopentetate dimeglumine for the second while the remaining 5 patients received the two agents in the reverse order. The first of the two examinations was performed after positioning the stereotaxic helmet. The volume and injection rate were identical for the two examinations. Images were evaluated in terms of lesion morphology, dimension and border delineation, degree and pattern of lesion enhancement, and definition of the involvement of nearby structures (e.g. cavernous sinuses). Overall preference for one examination over the other was assigned in blinded fashion in terms of lesion detectability and diagnostic confidence.

Results: Results of the blinded evaluation of images are summarized in Table 1. Readers 1 and 2 expressed a preference for gadobenate dimeglumine for one or more of the qualitative evaluation endpoints for 4-9 patients and 3-4 patients, respectively. Conversely, a preference for gadopentetate dimeglumine was expressed by the two readers for only 1-2 patients each. In terms of global diagnostic preference readers 1 and 2 preferred gadobenate dimeglumine in 6 and 3 cases respectively and gadopentetate dimeglumine in 2 and 1 cases, respectively.

Conclusions: It is crucial to accurately distinguish residual adenoma from adjacent structures such as residual normal pituitary tissue, optic nerves, and other vascular structures in order to better plan subsequent radiotherapy after surgical treatment. Residual tumor often displays a different enhancement pattern compared to normal adjacent structures and gadolinium contrast agents are effective at depicting this different enhancement. The results of this preliminary study in 15 patients seem to indicate that improved depiction of residual pituitary adenoma on follow-up MR imaging after surgical treatment may be achievable in more patients with 0.1 mmol/kg gadobenate dimeglumine than with gadopentetate dimeglumine at equivalent dose. The improved depiction of residual tumor may permit more accurate definition of the surgical target volume for subsequent gamma knife therapy.

Table 1
Qualitative parameters

	Reader 1		Reader 2	
	Gadobenate dimeglumine preferred	Gadopentetate dimeglumine preferred	Gadobenate dimeglumine preferred	Gadopentetate dimeglumine preferred
Lesion Border delineation	5	2	3	2
Extent of disease	4	1	0	0
Lesion internal morphology	5	0	3	1
Lesion contrast enhancement	9	2	4	1
Global diagnostic preference	6	2	3	1



Large residual tumor and recurrence of a pituitary macroadenoma. The internal morphology of the lesion and its delineation from adjacent structures is more evident on axial T1w images after 0.1 mmol/kg gadobenate dimeglumine (A) than on corresponding images after 0.1 mmol/kg gadopentetate dimeglumine (B)

References

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