Improved visualization of intra-axial gliomas on enhanced MR imaging with gadobenate dimeglumine compared to gadopentetate dimeglumine: implications for therapeutic intervention

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PURPOSE : To determine whether the high relaxivity contrast agent gadobenate dimeglumine (Gd-BOPTA) offers increased information for treatment planning in patients with cerebral glioma compared to equimolar gadopentetate dimeglumine (Gd-DTPA).

METHOD AND MATERIALS : Forty-seven patients with cerebral gliomas each underwent two MR examinations at 1.5 T. One examination was performed with 0.1 mmol/kg bodyweight Gd-BOPTA and the other with Gd-DTPA at identical dose. Administrations (2 ml/sec) were in randomized order and the interval between examinations was 2–7 days. T1wSE and T2wFSE sequences were acquired pre-dose with post-dose repetition of the T1wSE sequence. Acquisition parameters and post-dose acquisition time were identical for the two examinations. Three fully blinded readers independently evaluated all images for lesion border delineation, definition of disease extent, visualization of lesion internal morphology, lesion contrast enhancement and global preference. Differences were evaluated with the Wilcoxon signed rank test. Reader agreement was assessed using weighted kappa (κ) statistics. Quantitative lesion enhancement (% enhancement, lesion-to-brain ratio [LBR] and contrast-to-noise ratio [CNR]) was determined.

RESULTS : Gd-BOPTA was preferred globally in 24, 30 and 30 of 47 patients (readers 1, 2, 3, respectively) whereas Gd-DTPA was preferred in just 1 patient (all readers). Analogous findings were obtained for all other qualitative parameters. For each reader and each qualitative parameter the improved performance with Gd-BOPTA compared to Gd-DTPA was highly significant ($p < 0.0001$). Three-reader agreement ranged from $\kappa = 0.49$ (63.8%) for lesion internal morphology to $\kappa = 0.68$ (80.9%) for definition of disease extent. Quantitative enhancement was significantly greater after Gd-BOPTA (% enhancement and LBR: $p < 0.0001$; CNR: $p < 0.004$).

Fig. Contrast enhanced images of a glioma with Gd-DTPA (left) compared with Gd-BOPTA (right)

CONCLUSION : The significantly improved depiction of gliomas (better lesion delineation, better definition of tumor extent and internal morphology and greater lesion enhancement) achievable with 0.1 mmol/kg Gd-BOPTA compared to equimolar Gd-DTPA facilitates improved interventional planning and better patient management.

CLINICAL RELEVANCE/APPLICATION : The greater enhancement capabilities achievable with 0.1 mmol/kg Gd-BOPTA compared to equimolar Gd-DTPA facilitates improved interventional planning and better patient management.