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MR perfusion and diffusion imaging in the follow-up of recurrent glioblastoma treated with dendritic cell immunotherapy: a pilot study.

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Abstract

INTRODUCTION: This study aims to determine the potential value of MR-PWI and MR-DWI to differentiate immune therapy-induced inflammatory response from recurrent glioblastoma tumour growth. Both can present as contrast-enhancing lesions on conventional magnetic resonance imaging (MRI).

METHODS: Patients with recurrent glioblastoma who could obtain a total or near-total resection were treated with dendritic cell immune therapy according to the HGG-IMMUNO-2003 trial. A retrospective analysis of 32 follow-up MRI examinations (mean follow-up time 21 months) in eight patients was performed for this pilot study. For the statistical analysis, the 32 examinations were divided into three groups: 0-obtained in patients that remained stable during the follow-up period, 1a-obtained in progressive-tumour patients at time points before definite progression and 1b-obtained in patients at or after progression.

RESULTS: Maximum lesional rCBV ratios were highest in group 1b (Student t test, 9.25 ± 2.68 ; $p < 0.001$) and were higher in group 1a (4.87 ± 1.61 , $p < 0.001$) compared to group 0 (1.22 ± 0.47). The minimum apparent diffusion coefficients (ADCs) in the contrast-enhancing regions were lower in group 1a ($0.62 \pm 0.06 \times 10^{-3}$ mm²/s) than in group 0 ($1.03 \pm 0.43 \times 10^{-3}$ mm²/s, $p = 0.01$) and higher in group 1b (0.76 ± 0.08) compared to 1a ($p = 0.02$). The minimum ADCs in the FLAIR-hyperintense region were lower in group 1a (0.62 ± 0.06 , $p = 0.02$) compared to group 0 (0.76 ± 0.16) but not significantly different in group 1b (0.68 ± 0.07) from groups 0 and 1a ($p = 0.33$, $p = 0.10$). The mean ADCs of the FLAIR-hyperintense region and the mean ADCs of the contrast-enhancing lesion were not significantly different.

CONCLUSION: The maximum lesional rCBV ratios and minimum ADC values in the contrast-enhancing area are potential radiological markers to differentiate between immune therapy-induced inflammatory response and recurrent glioblastoma tumour growth in glioblastoma patients treated with immune therapy.

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