

MR PERFUSION IMAGING AND VOXEL-BASED DIFFUSION TENSOR IMAGING OF NON-ENHANCING CEREBRAL GLIOMAS

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Purpose: To evaluate the value of MR perfusion weighted imaging (PWI) and diffusion tensor imaging (DTI) in differentiating low grade non-enhancing supratentorial gliomas from high grade non-enhancing supratentorial gliomas.

Method and materials: 33 patients with pathology confirmed non-enhancing supratentorial glioma and dynamic susceptibility contrast(DSC)-GRE-PWI/ DTI data were enrolled in this study, including 17 patients with low grade glioma(WHO grade 1 and 2); 16 patients with high grade glioma (WHO grade 3 and 4). Maximal ratio of relative cerebral blood volume (rCBV), trace apparent diffusion coefficient(trace ADC) and Fractional anisotropy (FA) in the tumor were calculated by voxel-based region of interest(ROI) analysis method (ROI is ranged from 75 pixels to 115 pixels). The difference of mean maximal ratio of rCBV, trace ADC and FA between low grade and high grade group was analyzed by Mann-Whitney U test.

Results: The mean maximal ratio of rCBV and FA in the high grade group (3.91 ± 2.87 , 0.356 ± 0.133 , respectively) are significant higher ($P=0.000$) than the low grade group (rCBV 0.931 ± 0.056 , FA 0.128 ± 0.033). Based on published criteria, threshold values as maximal ratio of rCBV of 1.75/FA value of 0.21 were applied to differentiate high grade from low grade non-enhancing supratentorial gliomas. About 96% patients could be classified correctly, and sensitivity is 100%; although there is only one case with maximal ratio of rCBV of 1.12 and FA value of 0.223, whose small biopsy pathology result was oligodendroglioma, WHO grade 2. This case showed part enhancement in the tumor 5 months after initial operation, thus we still suspect its part anaplastic characteristic. There is no significant difference of mean trace ADC value between groups ($P>0.05$).

Conclusions: Our study proves that there is increased perfusion and higher anisotropy changes in the high grade non-enhancing supratentorial glioma. Combing MR PWI and DTI are useful in the accurate pre-operative grading non-enhancing supratentorial gliomas, which will be important for the clinical therapy..

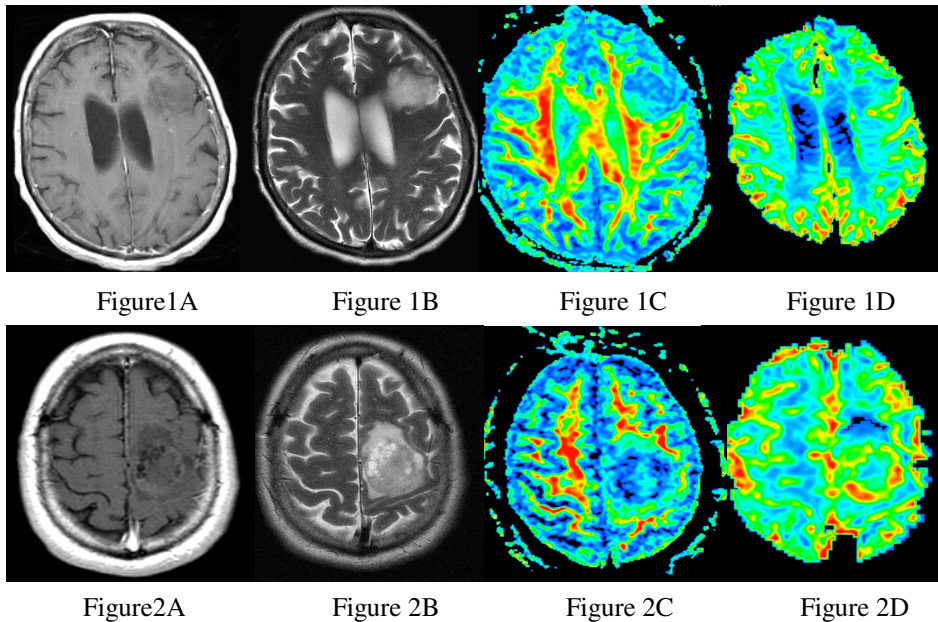


Figure A is post contrast T1WI image, B is T2WI image, C is FA image, D is rCBV image.

Figure 1 is a patient with left frontal oligodendroglioma- WHO grade 2, the FA in the tumor significant decrease accompany with low rCBV.

Figure 2 is a case with left parietal anaplastic astrocytoma- WHO grade 3. There are patchy area with high FA and significant increased rCBV.