Use of a high b-value for diffusion weighted imaging of peritumoral regions to differentiate high-grade gliomas and solitary metastases.

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Abstract

BACKGROUND: To determine whether apparent diffusion coefficient (ADC) values obtained using a b-value of 3000 s/mm² can be used to differentiate high-grade glioma (HGG) from solitary metastases (SM).

METHODS: Forty patients underwent conventional magnetic resonance imaging (MRI) and standard and high b-value diffusion-weighted imaging (DWI). Minimum, maximum, and mean ADC values (ADC_MIN, ADC_MAX, and ADC_MEAN, respectively) were measured from ADC maps obtained for the two b-values for each subject. ADC ratios were also measured. A receiver operating characteristic (ROC) curve analysis was used to determine the cutoff ADC value for distinguishing between HGG and SM.

RESULTS: All ADC values for the peritumoral region of the HGGs examined were lower than those for the SM. Furthermore, a larger statistical difference was observed for ADC_MIN, ADC_MAX, and ADC_MEAN values at a b-value of 3000 s/mm² versus 1000 s/mm² (P < 0.0001, P = 0.0010, and P = 0.0001 versus P = 0.0001, 0.0030, and 0.0002, respectively). A discriminant analysis identified the greatest log likelihood for the ADC_MIN values obtained at a b-value of 3000 s/mm², and the cutoff value for differentiating HGG and SM was 0.890 × 10⁻³ mm/s².

CONCLUSION: ADC values from DWI using a high b-value were found to distinguish HGG and SM. The lowest degree of overlap was obtained when an ADC_MIN value was obtained at a b-value of 3000 s/mm².


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KEYWORDS: diffusion-weighted imaging; high b-value; high-grade glioma; solitary metastasis; standard b-value

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