Apparent diffusion coefficient in glioma

IDH wild type glioma showed lower ADC values, which also correlated with poor survival in both IDH mutant and IDH wild-type gliomas, irrespective of histologic grade. A subgroup with IDH-mutant gliomas with lower ADC had dismal survival similar to that of those with IDH wild-type gliomas [1)].

The ADC value can potentially reveal the differences in cellularity and nuclear atypia of gliomas [2)].

Several studies have analyzed a correlation between the apparent diffusion coefficient (ADC) derived from diffusion weighted magnetic resonance imaging and the tumor cellularity of corresponding histopathological specimens in brain tumors with inconclusive findings.

Theoretically, high cellularity in advanced gliomas may impede free water diffusion and thus lead to a decreased ADC value. In a study by Higano et al., the minimum ADC varied significantly between WHO grade III [3)].

Another study also revealed a significantly higher frequency of low ADC values in high- compared with low-grade gliomas [4)]).

Data confirms a previously reported inverse correlation between ADC and tumor cellularity. However, the correlation in the Eide et al article is weaker than the pooled correlation of comparable previous studies. Hence, besides cell density, other factors, such as necrosis and edema might influence ADC values in glioblastomas [5)].

ADC measurements are better than rCBV values for distinguishing the grades of gliomas. The combination of minimum ADC and maximum rCBV improves the diagnostic accuracy of glioma grading [6)].

The purpose of a meta-analysis was to summarize data regarding associations between minimum apparent diffusion coefficient (ADCmin) and KI 67 in different tumors. MEDLINE library was screened for associations between ADCmin and KI 67 in different tumors up to April 2017. Overall, 23 studies with 944 patients were identified. Associations between ADC and KI 67 were analyzed by Spearman's correlation coefficient. The pooled correlation coefficient between ADCmin and KI 67 for all included tumors was ρ = -0.47. In detail, the correlation coefficients for separate tumors were as follows: cerebral lymphoma: ρ = -0.61 (95% CI = [-0.82; -0.41]); cervical cancer: ρ = -0.56 (95% CI = [-0.68;-0.43]); pituitary neuroendocrine tumor: ρ = -0.55 (95% CI = [-1.31; 0.22]); glioma: ρ = -0.40 (95% CI = [-0.55; -0.24]); breast cancer: ρ = -0.37 (95% CI = [-0.74; -0.01]); meningioma, ρ = -0.15 (95% CI = [-0.38; 0.07]) [7)].

1)
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