

Journal Article



In vivo research in astrocytoma cell proliferation with ^1H -magnetic resonance spectroscopy: correlation with histopathology and immunohistochemistry

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Abstract

Introduction Assessment of brain tumor proliferative potential provides important prognostic information that supplements standard histopathologic grading. Proton magnetic resonance spectroscopy (^1H -MRS) gives completely different information, relating to cell membrane proliferation, neuronal damage, energy metabolism and necrotic transformation of brain or tumor tissues. The aim of this study was to investigate the relationship between ^1H -MRS and tumor proliferative potential in astrocytomas.

Methods We studied 34 patients with histologically verified astrocytomas using the ^1H -MRS protocol following routine MRI preoperatively. The tumor in 26 of these patients was classified as grade I/II (low grade), and the tumor in the remaining patients as grade III/IV (high grade) according to the World Health Organization classification criteria of nervous system tumors (2000). The tumor in 21 patients was homogeneous astrocytoma, and of these 17 were classified as low grade and 4 as high grade.

Expression of proliferating cell nuclear antigen (PCNA) was determined immunohistochemically using streptavidin-biotin-peroxidase complex (SP) staining.

Results The ratios of choline (Cho) to *N*-acetylaspartate (NAA) and Cho to creatine (Cr) in those with high-grade astrocytomas ($n=4$) were significantly higher than in those with low-grade astrocytomas ($n=17$) ($t=2.899$, $P=0.009$; $t=3.96$, $P=0.001$, respectively), and were found to be significantly correlated with the expression of PCNA in 21 patients with homogeneous astrocytomas ($r=0.455$, $P=0.038$; $r=0.633$, $P=0.002$, respectively).

Conclusions We conclude that ^1H -MRS may be a valuable method for predicting preoperatively the degree of malignancy of homogeneous astrocytomas by enabling the calculation of the Cho/NAA and Cho/Cr ratios in vivo, and indirect evaluation of the

tumor proliferative potential and prognosis, which are not available using conventional magnetic resonance imaging (MRI).

Keywords Magnetic resonance imaging - Magnetic resonance spectroscopy - Glioma - Proliferating cell nuclear antigen - Immunohistochemistry



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