Myo-Inositol - A Marker for Reactive Astrogliosis in Glial Tumors?

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Introduction

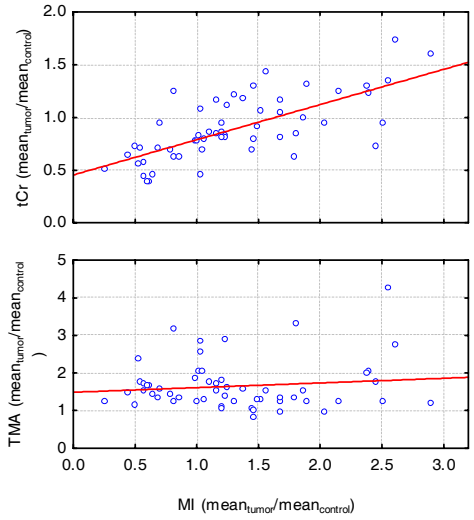
Myo-Inositol (MI) is one of the most abundant metabolites visible in 1H-MRS of the human brain at short TE (≤ 30ms). It's concentration is significantly increased in various diseases (1,2) including brain tumor with a potential role to serve as a diagnostic marker (3). In this study we have investigated the biochemical background of increased MI in order to elucidate the impact of increased MI on differentiation of tumor grade and type.

Methods

2D ^{1}H MRSI with TE of 30 ms was performed before surgery in 56 patients with glial brain tumors. The spectroscopic data were processed and quantified offline using LCModel (4). Concentrations of Myo-Inositol (MI), Trimethylamines (TMA), Creatine/Phosphocreatine (tCr), and N-acetylaspartate/N-acetylaspartateglutamate (tNAA) were evaluated for the whole tumor and normalized to the normal appearing contralateral brain tissue. Necrotic areas were excluded. The normalized peak and mean concentrations of MI were correlated with the types of glial tumors, with the tumor grade and with the concentrations of tCr and TMA. The tumor diagnoses were based on the histopathological grading according the WHO criteria in conjunction with MR imaging.

Results

The mean concentration of MI was significantly higher for all tumor tissues compared to the normal appearing white matter. Gliomatoses and oligo-astrocytomas WHO grade II showed significantly higher concentrations of MI and tCr than the other tumor entities. Significant differences between astocytomas grade II and III were found for mean and maximum tumor values of TMA, however for MI, comparison of maximum tumor signal was required to obtain significance, emphasizing the advantage of CSI for tumor diagnosis. In all glial tumors, the mean concentrations of MI and tCr were positively correlated, while no correlation was found for MI and TMA concentrations as shown in the figure (r = 0.70 for tCr and r = 0.12 for TMA). A similar behaviour was also found for maximum peak concentrations.



Discussion

MI is significantly increased in glial tumor tissue, especially in gliomatoses. Significant differences between low and high grade astrocytomas were found for normalized concentrations of TMA and for maximum tumor concentrations of MI which to some extend confirms previously reported results from Castillo (3). In all glial tumors the increase of MI is positive related to increase of tCr. Such a correlation was found in gliomatoses (6) and in other cerebral diseases like MS (7,1) and HIV (8) which are known for high reactive astrogliosis. A similar process may also be responsible for the observed changes in the other tumor entities.

References

1. Kapeller, P. et al. (2005), J.Neurol.
2. Chang, L. et al. (2004), Neuroimage.
3. Castillo, M. et al. (2000), AJNR Am.J.Neuroradiol.
4. Provencher, S. W. (1993), Magn Reson Med.
5. Michaelis, T. et al. (1993), Radiology.
6. Galanaud, D. et al. (2003), J.Neurosurg.
7. Husted, C. A. et al. (1994), Ann.Neurol.
8. Chang, L. et al. (1997), Neurology.