Short TE MR Spectroscopy of Primary Pediatric Brain Tumors: The Significance of Myoinositol in Tumor Characterization

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Purpose
To evaluate the ability of proton MR spectroscopy (MRS) to provide information regarding histology, grade, and behavior of pediatric brain tumors.

Materials & Methods
A total of 75 patients were evaluated with MRS and MR imaging at our institution. Many of these patients had multiple MRS examinations. The MRS was performed using single voxel technique on a 1.5 T imaging unit using a TR/TE of 2000/35 ms. The voxel size was consistently 8 cc. The voxel was placed in the most solid appearing portion of the patient’s tumor and as far away from the calvarium and sinuses as possible. MRS was performed prior to contrast administration. Of the 75 patients, 59 were selected for evaluation in this study based on quality of their spectra. The tumors examined were of variable pathology; 10 astrocytomas, 14 juvenile pilocytic astrocytomas (JPA), 2 pleiomorphic astrocytomas (PXA), 7 brainstem gliomas (BSG), 7 primitive ectodermal tumors (PNET), 7 ependymomas, 2 hemangiopericytomas, 1 choroid plexus papilloma (CPP), 3 gangliogliomas, 4 hamartomas, 1 teratoma and 1 germinoma. Peak area ratios were determined using the provided manufacturer software for NAA:Cr, Cho:Cr, and mI:Cr. The presence of lactate and lipids was noted also. Correlation with pathology, grade, MIB index, and imaging findings was performed.

Results
The metabolite ratios did not appear to be predictive of tumor histology. Myoinositol (mI), however, appears to be a key metabolite in evaluation of pediatric brain tumors. Myoinositol was elevated in all brain tumors. There was a trend for even further elevation in the lower grade tumors. Oligodendroglioma was an exception to this observation. The high-grade tumors or lower grade tumors that appeared to undergo transformation to a higher grade demonstrated a decrease in mI. The level of mI appeared to correlate with the level of choline for all tumors. Infiltrating tumors revealed a relative preservation of NAA.

Conclusion
Even though MRS does not appear to be predictive of tumor histology, it can be helpful in evaluating grade and behavior of pediatric brain tumors. Lower grade tumors tend to demonstrate higher levels of mI. Infiltrating tumors appear to relatively preserve NAA.

References

