Neuroglial Tumor Proton Spectroscopy

P. Y-K. Wang[1], P. Varallyay[2], W. Coshow[3], G. Wilson[4]

[1]Radioogy, OHSU, Portland, OR, United States, [2]Radiology, National Institute of Neurosurgery, Budapest, Hungary, [3]OHSU, Portland, OR, United States, [4]Philips Medical Systems, Seattle, WA, United States

Abstract: Neuroglial tumors contain both neuronal and glial elements and are the slowest growing CNS tumors, we report our experience in MR proton single voxel and CSI spectroscopy in 6 neuroglial tumors: gangliocytoma(1), gangliogliomas(4) and DIG(1), all classified as favorable low grade WHO grade I tumors. These tumors all have good prognoses but are rare entities, with the commonest, gangioglioma, representing 1% of brain tumors. Their location in the temporal lobe makes obtaining diagnostic adequate spectra extremely challenging with frequent nondiagnostic MRSI. There was great variation in Cho/NAA ratios (0.6-3.9) and average Cho/NAA ratios was 1.8 in gangliogliomas, higher than reported for low-grade gliomas.

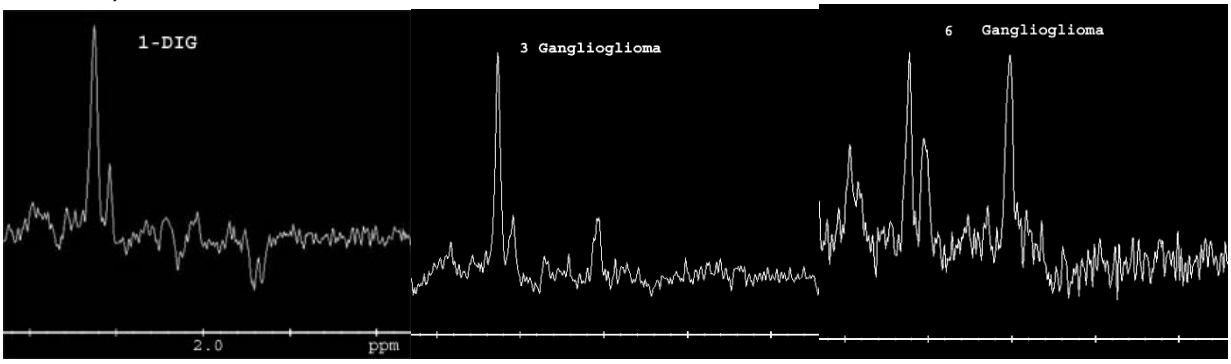
Introduction: Neuroglial tumors are much more common in the younger population, Gangliogliomas(age 8-25), Gangliocytomas(age < 30), and Desmoplastic Infantile Gangliogliomas (age < 2) and have excellent prognosis. Favored locations are the temporal lobes, posterior fossa and brainstem. MR proton spectra of low-grade neuroglial tumors are highly variable and may have higher NAA/Cho and NAA/Cr ratio than seen with low-grade gliomas. Average ganglioglioma Cho/NAA was 1.69 but was highly variable. However, malignant transformation if occurs, tends to involve the glial elements, it is therefore expected that spectra should be similar to gliomas reflecting its grade

Methods: 6 patients (ages 9-77) underwent MR imaging and spectroscopy on a 1.5T MR scanner (LX, GEMS), imaging included SE sagittal/axial T1, coronal FLAIR, axial FSE T2 and postcontrast axial T1 sequences. Water-suppressed single voxel PROBE-PRESS spectra were acquired (TR/TE 1500/144 ms, 144 NEX). All spectra were acquired after contrast, with voxel size and positioning adjusted to obtain spectra of the mass and the contralateral normal side. Adequate multivoxel PRESS MRSI (24x16 phase-encode, TR/TE 1000/144 ms) were obtained in 2/6 cases reflecting difficult localized field shimming. Postprocessing of data was performed with PROBE or local software fitting to Gaussian peaks when PROBE was unable to determine peaks, yielding metabolite ratios: NAA/Cho, Cho/Cre and NAA/Cr. All spectra reported were of diagnostic quality.

Results: Metabolite ratios:

	NAA/Cr T	NAA/Cr N	**Cho/Cr T**	Cho/Cr N	**Cho/NAA T**	Cho/NAA N	**Lactate**
DIG	***0.75***	2.4	**3.3**	1.0	***6.8***	0.4	y
G-cytoma	***1.4***	2.4	**2.5**	1.0	***1.6***	0.4	n
G-glioma	**1.1**	1.25	**4.4**	1.1	**3.9**	0.85	n
G-glioma	**1.0**	1.8	**1.3**	1.3	**1.3**	0.7	n
G-glioma	***1.6***	1.9	**1.1**	1.3	***1.3***	0.7	y
G-glioma	***2.1***	1.7	**1.2**	1.4	***0.6***	0.8	n

T- tumor, N-normal



Contralateral control ratios varied greatly; Cho/NAA (0.4-0.85), NAA/Cr (1.25-2.4).
One case of DIG has relative greatly elevated choline, low NAA with Cho/NAA 6.82, and low NAA/Cr 0.75.
One case of gangliocytoma has relative elevated Cho/NAA 1.61.
In gangliogliomas, there is marked variability of metabolite ratios; Cho/NAA (0.6-3.9), Cho/Cr (1.1-4.4), NAA/Cr (1.1-4.4)

Conclusion: MRSI often did not yield diagnostic spectra depending on the region, whereas single voxel studies did. Normal spectra vary depending on location, so a contralateral control should be done esp. in the temporal lobes. Lactate may be seen in low grade neuroglial tumors. Grade I neuroglial tumors have significant variability in the metabolite ratios from normal (case 6) to very abnormal (cases 1 & 3) with very high Cho/NAA ratios more often than seen with low grade gliomas. The occurrence of these tumors in the younger population makes a mass lesion with high Cho/NAA ratio may not be a high grade glioma in the younger patient.