4 YEAR LONGITUDINAL MRI FOLLOW-UP AND 1H SINGLE VOXEL MRS IN 22 PATIENTS WITH OLIGODENDROGLIAL TUMORS OR GLIOMATOSIS TREATED WITH TEMODAL

J-M. Constans1,2, G. Hossu1, F. Kaufmann1, W. Dou1, S. Ruan1, F. Rioult1, J-M. Derlon1, E. Lechapt Zalcman1,2, M. Bernaudin1, F. Chapon1, S. Valable1, P. Courthéoux1, and J-S. Guillamo2,9

1MRI Unit, Caen University Hospital, Caen, Normandy, France, 2CERVOxy and UMR 6232 CI-NAPS, Cytocen, Caen, Normandy, France, 3Mathematics LMNO CNRS UMR 6139, Caen University, Caen, Normandy, France, 4Tsinghua University, Beijing, China, People's Republic of, 5CRESTIC EA 3804, IUT Troyes, Troyes, France, 6CNRS UMR 6072, GREYC, Caen, Normandy, France, 7Neurosurgery, Caen University Hospital, Caen, Normandy, France, 8Pathology, Caen University Hospital, Caen, Normandy, France, 9Neurosciences and Neurology, Caen University Hospital, Caen, Normandy, France

Purpose: to better understand gliom tumor metabolism and post-chemotherapy variation. To determine cerebral variation in MRS area, amplitude, and ratios of metabolites and spectral profiles during a 4 year longitudinal follow-up in 22 patients with oligodendroglial tumors (12; Fig 1a) or gliomatosis (10; Fig 1b) without initial hyperperfusion treated with Temodal and to detect differences in infiltration or proliferation. Gliomatosis Cerebi (GC) is a challenging tumor to treat, having a poor prognosis and poor response to treatment.

Methods: MRI.
Sagittal T1, axial proton density, T2, FLAIR, diffusion, 3D T1 3 planes after gadolinium. MRS : 1H, single voxel (6 to 12 cm3), PRESS with multiple TEs on a 1.5 T (GEMS) MRI. Data processing : SA/GE (Fig 2a) software and home-written automated processing (SCI-MRS-LAB in Scilab cINRIA-ENPC open source code, Fig 2b) yielding amplitudes, areas, ratios, and relative concentrations. Statistical analysis of longitudinal spectroscopic data (every 3 months over 48 months).

Results: quantitative studies in MRI with multi-spectral segmentation and tissular classification are ongoing. Without chemotherapy spectroscopic profiles worsen with increases in Choline/N-Acetyl-Aspartate (Cho/NAA), Cho/Cr and Myo-inositol/Creatine (ml/Cr) ratios, decreases in NAA/Cr and sometimes with increases in lactate. After chemotherapy, treated tumoral volumes, in MRI, change little between two exams while spectroscopic profiles and ratios (Fig 4) do change. MRS could, in fact, be more sensitive than MRI and could, in some cases, be predictive of worsening. Water and creatine are quite stable, which could justify using them for some other ratios to quickly detect spectroscopic variations. Cho concentration could be predictive in 7 out of 15 cases and more sensitive than ratios (5/15). Cho concentration increased in 3 patients with aggravation later in 2 gliomatosis and one oligodendroglioma. There was also a decreased Cho concentration in 3 patients before clinical improvement.

Effect of TE on measurements: Concentration of Naa always has a higher estimation on the short TE while lactate often has a higher estimation on the 288 ms TE.

Spectroscopic and metabolic changes often occur well before clinical deterioration and sometimes before improvement. Therefore, MRS could be more sensitive and detect changes earlier than MRI and sometimes is predictive.

The patient (Fig. 5) had initial clinical MRS showed an increase in the Cho/Cr ratio later, the patient had clinical deterioration.

Discussion and Conclusion: Temozolomide was well tolerated. MRI responses.
MRS showed variable ratios of ml/Cr, Cho/Cr ratio and an increase in NAA/Cr opposite results for those whose These spectroscopic and metabolic changes are quite stable, MRS allows non-variability, but repetition and longitudinal follow-up could allow us to decrease this and to improve prognostic evaluation.

Studying the relationship between MRS measurements, methionine PET, segmentation and perfusion parameters could lead to a better understanding of therapeutic response, especially with regard to chemotherapy, and in the future hypoxia modulators and antiangiogenic molecules could also be monitored in the same way.

References: