AbstractID: 1686 Title: Radiation dose and temperature dependence of metabolite signals in proton magnetic resonance imaging and spectroscopy

The quantification of metabolite signals in proton magnetic resonance imaging and spectroscopy (MRI/S) is important for both diagnosis and treatment of diseases. Accurate measurement of metabolite signals in MRI/S in radiotherapy and hyperthermia (RT+HT) patients may be affected by temperature and radiation. Here, we investigate the effects of temperature and radiation dose on metabolite signals acquired by MRI/S in a phantom containing in-vivo concentrations of N-acetylaspartate, Creatine, Choline, myo-inositol in water doped with 0.10 % GdDPTA. The solutions were subjected to radiation using a Varian 21EX Clinac linear accelerator and analyzed with a PRESS sequence (TR/TE 1500/35,8 phase-cycle) in a head coil on a GE 1.5 Tesla MRI/S System. The radiation doses of 10, 20 and 30 Gy were delivered over multiple fractionations with a fractional dose of 500 cGy. Solutions receiving no radiation were examined over a temperature range of 18-22 C. The preliminary results indicate that the integral of the magnitude of nuclear magnetization signal in the free induction decay (FID) over the decay time decreased and the signals for NAA, Cr, Ch and mI in the spectra increased with increasing radiation dose. The magnitude of the nuclear magnetization at the echo time in the FID for water decreased with increasing temperature as a result of decreasing equilibrium nuclear magnetization with temperature through Boltzmann's relation. The NAA, Cr, Ch, mI and water signals in the spectra increased with increasing temperature. The RMS noise increased and SNR decreased with increasing temperature.