AbstractID: 13374 Title: Monitoring Response of Liver Cancer to Targeted Radiation Therapy with a Novel 31P/1H MRS Coil

Purpose: To present a novel multi-channel dual-tuned $^{31}P/^{1}H$ MRS coil which allows for non-invasive acquisition of in-vivo phosphorus (^{31}P) spectroscopy data from the whole liver. We hypothesize MRS data collected with this coil can improve the assessment of early tumor response to targeted radiation therapy. **Method and Materials:** A novel dual-tuned 8-channel $^{31}P/^{1}H$ coil for a Siemens 3T Tim Trio whole Body MRI scanner was designed and validated. The coil consists of two plates placed anterior and posterior of the patient's torso, with four ^{31}P receive elements (24x20 cm^2) each. Furthermore each plate has one ^{31}P transmit element and one ^{1}H transmit-receive element. Thus the coil allows for ^{31}P MRS, conventional MRI, and ^{1}H MRS during the same scan session. For our clinical study the ^{31}P MRS data was acquired with a 2D slice selective free-induction-decay (FID) sequence using the following parameters: TE 2.3 ms, TR 1 s, field of view (FOV) 400x400x30 mm^3, nominal voxel size 25x25x30 mm^3, 30 weighted averages. Each free-induction-decay (FID) was acquired with 2048 points over a bandwidth of 5000 Hz. The resulting scan time was about 25 min. **Results:** *In vivo* ^{31}P liver spectra and ^{1}H MRI images of the entire liver were successfully acquired in healthy volunteers and patients undergoing targeted radiation therapy. The optimized ^{31}P MRS sequence allowed for identification and quantification of ATP, phosphomonoesters (PME), phosphodiesters (PDE), and inorganic phosphate (Pi) metabolites throughout the liver on an axial slice. Metabolic differences between healthy and malignant liver tissue were clearly identified. **Conclusions:** We have shown that our novel $^{31}P/^{1}H$ MRS coil allows for assessing ^{31}P metabolites in lesions located in deep tissue, while being able to run conventional MRI imaging scans during the same scan session.