

AbstractID: 5447 Title: Optimization of outer volume suppression for improved prostate MR spectroscopic imaging

Purpose: To adapt a new MR Spectroscopy (MRS) technique employing non-cuboidal voxels, called conformal voxel MRS (CV-MRS), for use in prostate spectroscopic imaging in order to reduce contamination of spectra by lipid signal surrounding the prostate.

Method and Materials: CV-MRS uses twenty or more spatial saturation (SS) pulses, placed around the prostate, to reduce the lipid signal affecting the spectra within the prostate. A water/oil phantom was designed to simulate the prostate and surrounding lipid signal. Use of the new CV-MRS technique reduced the lipid signal contamination by 84% as compared to standard cuboidal voxel MRS. To further reduce the lipid contamination, the routinely used 90 degree flip angle used for each SS pulse was modified to take into account the regrowth of lipid signal with its short T_1 relaxation time.

Results: Contrary to our expectations, resulting spectra from the optimized approach actually showed an increase in lipid contamination by 10%. We tracked the problem down to overlapping SS pulses. Using a simulated 3D model, we found that 68% of the volume we were trying to saturate experienced multiple overlapping SS pulses, with some regions being saturated 7 or more times. Regions of the volume experiencing an even number of SS pulses were found to increase the lipid contamination signal by 88% to 200%. Conversely, regions experiencing an odd number of SS pulses had a reduction in lipid contamination of 55%.

Conclusion: Changing the ordering of the SS pulses, such that the overlapping pulses occur later in the train of 20 SS pulses reduced the problem of lipid signal from those overlapping volumes. In summary, we have developed an improved outer volume saturation technique which reduces lipid contamination problems in prostate MR spectroscopic imaging.