Improved MR spectral analysis for a PFC-filled endorectal prostate surface coil compared to an air-filled coil.

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Introduction: Prostate MR spectroscopy requires the use of an endorectal surface coil to obtain adequate signal in the region of interest. Routinely, endorectal coils are inflated with air to fix the coil in position within the rectum as close to the prostate as possible. This contributes to magnetic field inhomogeneity that may hinder MR spectroscopy, especially in the peripheral zone close to the coil. Since most clinically significant cancers occur in the peripheral zone, inflating the coil with air is less than ideal. We aim to show, using a prostate phantom, that inflating a prostate coil balloon with perfluorocarbon (PFC) during MR spectroscopic imaging improves quantification of spectra from voxels near the coil.

Methods: All MR spectra were obtained in a 1.5 Tesla Symphony scanner (Siemens Medical Solutions, Malvern, PA). A 4-liter plastic phantom tub was constructed and filled with a solution of 30 mM citrate (Cit), 30 mM creatine (Cre), and 30 mM choline (Cho). An endorectal receive only prostate coil (Medrad; Indianola, PA) was inserted from the side and inflated with either 60 cc of air or PFC (Perflubron; Alliance Pharm. Corp., San Diego, CA). A vertical strut prevented buoyant movement when the coil was inflated with air. T2-weighted images were obtained with the body coil in 3 planes to provide localization. The 3D spectroscopic imaging sequences used were identical to that used *in vivo* and thus included spectral water and fat suppression and eight outer volume saturation slabs. All measurements were performed with 512 data points, TR = 650 msec, TE = 120 msec, voxel size 6.0 x 6.0 x 6.0 mm, interpolated to a 16 x 16 x 16 matrix. The spectra were quantified in the time domain, using the AMARES algorithm (1) included in the MRUI software program (2).

Results: Table 1 shows the Cho/Cre ratio in a central slice, comparing the mean and coefficient of variation (CoV) values in the central eight voxels of the four rows closest to the coil. Table 2 shows similar information for the Cit/Cre ratio, and Table 3 shows similar information for the Cho/Cit ratio.
In all three cases there is greater variability in the row next to the coil inflated with air, compared to PFC. Further, the metabolite ratios also vary from row to row, with the magnitude of the variability being greater for air inflation of the coil, compared to PFC. If the ratios from different slices are compared, there is a greater variability in the mean ratio values for the first row for the air filled coil than for the PFC filled coil (data not shown.)

	Air		PFC	
Row	Mean	CoV(%)	Mean	CoV(%)
1	3.105	13.669	2.798	5.406
2	3.161	5.522	2.691	4.152
3	2.954	2.681	2.761	1.777
4	2.709	1.651	2.815	1.036

Table 1: Mean and CoV values for Cho/Cre

	Air		PFC	
Row	Mean	CoV(%)	Mean	CoV(%)
1	1.784	10.833	1.765	4.613
2	1.911	4.527	1.784	5.273
3	1.886	4.112	1.834	6.100
4	1.771	4.511	1.798	6.256

Table 2: Mean and CoV values for Cit/Cre

	Air		PFC	
Row	Mean	CoV(%)	Mean	CoV(%)
1	0.578	7.448	0.633	4.613
2	0.605	4.291	0.665	3.530
3	0.638	1.817	0.665	2.875
4	0.653	1.144	0.639	2.129

Table 3: Mean and CoV values for Cit/Cho

Conclusions: These results demonstrate that an endorectal coil filled with PFC gives more uniform spectral analysis results especially in the peripheral zone close to the coil which is of most clinical interest. This suggests that a PFC filled coil may increase the diagnostic value of a clinical MR spectroscopy analysis exam.

Refs:
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