OMICS International
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Marianthi-Vasiliki Papoutsaki, J Nucl Med Radiat Ther 2015, 6:4
http://dx.doi.org/10.4172/2155-9619.S1.003

International Conference on
Medical Physics
August 03-05, 2015 Birmingham, UK

Polyvinylpyrrolidone phantom at ice-water temperatures as a multiple parameter quantitative mr quality control test object

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For quantitative MR quality control, an ideal phantom must provide reliable and reproducible multi-parameter measurements without any temperature dependence. Despite the fact that several phantoms have been presented in the literature, there is still a need for a phantom, which would provide reliable and reproducible values of temperature-dependent magnetic resonant (MR) parameters with values relevant to the corresponding physiological ranges with temperature control. In this study, a new polyvinylpyrrolidone (PVP) temperature-controlled phantom is presented for the quality control of quantitative T1, T2 and diffusion measurements. This phantom is cylindrical and contains 7 vials, one of distilled water and six of aqueous Polyvinylpyrolidone solutions. Its temperature control was achieved by filling it with ice-water. T1-weighted, T2-weighted and diffusion-weighted measurements were performed on a 1.5T MR scanner by using an Inversion Recovery technique, a multi-echo spin echo sequence and single shot echo planar imaging acquisition respectively three times in order to assess their short and long-term repeatability. For each measurement, the corresponding parameter maps were calculated and the T1, T2 and ADC values of each vial were estimated. The results indicate good short and long-term repeatability. The ADC estimates and the relation with the PVP concentrations were consistent with previously published results covering a range of physiologically relevant values. T1 and T2 values were comparable with the corresponding values of biological tissues and fluids respectively. As a conclusion, a PVP phantom at ice-water temperatures is suitable and reliable for multi-parametric quantitative MR quality control in a clinical setting.

Biography

M-V Papoutsaki is a medical physicist. She has completed her PhD at the age of 30 at University of Crete in research field of MRI polymer gel dosimetry in radiotherapy. Her PhD results were presented in conferences and scientific articles were published. Since 2014, she is undertaking her postdoctoral training as MRI physicist for clinical trials at the Institute of Cancer Research. Her current post gives her the opportunity to be involved in the development of multi-centre trials within a clinical setting, as well as to improve her research skills. .

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