SPECIAL SEMINAR

Temperature Monitoring in MR-Guided Thermotherapy: An MR Systems Perspective

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Image-guided application (or removal) of localized or regional heat in tumors is an exciting approach that has pushed the envelope of the state-of-the-art in minimally invasive cancer treatment. Deep-region or superficial mild heating (41-43°C) of tumors has been used as an adjuvant to radio- and chemo- therapies, while focal heating at much higher temperatures (>>55°C) can directly initiate apoptosis of tumor cells. In both applications, fast and accurate monitoring of 2D/ 3D spatial distribution of temperature with MR thermometry is often critical to ensure that diseased and healthy tissues are subjected to appropriate levels of thermal dose. This presentation discusses some of the challenges to temperature monitoring in RF hyperthermia and MR-guided focused ultrasound, and describes examples of a MR systems-level approach to ameliorate these challenges. In the RF hyperthermia context, we will discuss how different MR transmit-receive architectures may be leveraged to potentially (i) improve the quality of temperature monitoring, and (ii) lower overall MR-RF hyperthermia system cost and footprint. In the brain MR-guided focused ultrasound context, we will discuss the impact of transducer ground plane layout on gradient-induced eddy currents when echo planar imaging is used for fast MR thermometry.

BIOGRAPHY

After joining the GE Global Research Center (GRC) in Niskayuna, NY as a Magnetic Resonance Scientist in 2008, Desmond worked on multiple projects in various stages of the R&D pipeline. His current research interests include MR-guided thermotherapy, and local specific absorption rate (SAR) management for ultra-high field multi-channel RF transmit MRI systems. His team's work on novel dual-function MR-RF heat applicators had led to a first prize award in the Engineering category at the ISMRM 2011 meeting. He has delivered several invited presentations at thermotherapy-related conferences, co-authored more than 65 journal and conference publications, and serves actively as a peer scientist reviewer for several journals. Desmond had also worked on RF transmit hardware systems, novel contrast mechanisms for oncology applications, image reconstruction, and functional MRI and electro-cortical stimulation for pre-surgical planning. In his current role as Manager of the MRI Laboratory at GRC, he leads a team of scientists and engineers that develops high-performance MRI platforms and advanced applications.

Desmond obtained his M.S.E and Ph.D. (2008) degrees in Electrical Engineering from the University of Michigan with emphases in signal processing and biosystems. In 2014, he completed his M.B.A. at New York University with a specialization in Finance.