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Magnetic nanoparticle-induced hyperthermia treatment under magnetic resonance imaging

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Abstract

Super paramagnetic iron oxide Fe_3O_4 nanoparticles prepared via photochemical reaction in pure form were used for inducing hyperthermia to treat subcutaneous Ehrlich carcinoma implanted in female mice. Our results indicate that the mean temperature profiles at the rectum, periphery of the tumor surface and at the center of the tumor during hyperthermia treatment increased gradually. The maximum temperature achieved in the tumor center was 47±1°C after 20 min with radiofrequency exposures at 25 kW. The acquired magnetic resonance images identified apoptotic cells in the center of the tumor which were exposed to magnetic resonance hyperthermia (MRH). Apoptotic cells presented as dark signal intensity in the T1-weighted images were further confirmed by pathological examinations. Also, the results revealed that the tumor size in the all mice exposed to MRH was still as same as before the treatment, but the rate of tumor growth was very slow when compared with the growth rate of the control group.

Biography

Ahmed Abd El Wahab El Shahawy has acquired his BSc, MSc in Biophysics and then Ph.D. in Nanotechnology and Applied Medical Physics from faculty of Science, Cairo University in 2012. His thesis was evaluated externally from the Department of Medical Applied Physics and Material Science, Johns Hopkins University, USA and Department of Medical Applied Physics, Lab of Nanotechnology and Magnetism (NANOMAG) Research Technological Institute, University of Santiago de Compostela, Spain. He has over 15 years of experience in superintending the MRI & CT Scan in several sites in Cairo. He is a Biomedical Physics consultant and applications developer at the Children Cancer Hospital. He is a lecturer at Misr University for Science and Technology (MUST) and applications consultant at Siemens healthcare.