NANOSECOND PULSED ELECTRIC FIELDS CAUSED BREAST CANCER SELF-DISTRUCTION: UNDER IN VIVO MAGNETIC RESONANCE IMAGING EVALUATION

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Breast cancer is one of the major malignant tumors threatening the health of women. With the changes in people’s lifestyle and diet, the incidence rate of breast cancer continues to rise all over the world. Despite the considerable progress in conventional cancer therapies such as surgery operation, radiotherapy, chemotherapy and incretion therapy, the intrinsic limitations of these therapies such as drug resistance still make the therapeutic effect dissatisfactory.

In this study, nude mice inoculated with human breast cancer cell line MCF-7 were treated by nanosecond pulsed electric fields (nsPEF), a novel promising technique in cancer therapy. High frequency electromagnetic field distribution of the parallel plate electrodes was simulated by Ansoft HFSS software. The average tumor volumes in treated group almost stayed the same after 10 days, but in control group the volumes increased to 8 fold larger. The typical structural changes of the tumors after nsPEF treatment were observed in vivo in a 3.0T clinical magnetic resonance imaging (MRI) system with an own-made animal-used radiofrequency coil. High quality images were achieved to evaluate the contrast from control and treated group. Other MRI technologies in clinical cancer diagnosis will be potentially used to investigate the changes in tumors. Immunohistological tests indicate significant inhibition in tumor growth after nsPEF treatment. Thus nsPEFs can serve as a drug-free treatment for breast cancer, which may have potential applications in clinics.

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