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## USE OF HIGH-INTENSITY FOCUSED ULTRASOUND (HIFU) IN PERCUTANEOUS ABLATION OF IMPLANTABLE MAMMARY TUMOUR IN RATS.

P. KAPLIŃSKA-KŁOSIEWICZ<sup>1</sup>, A. CZARNECKA<sup>1</sup>, D. Strzemecki<sup>1</sup>, K. ANDRZEJEWSKI<sup>2</sup>, K. KACZYŃSKA<sup>2</sup>, Ł. FURA<sup>3</sup>,  
T. KUJAWSKA<sup>3</sup>, D. SULEJCZAK<sup>1</sup>

<sup>1</sup>Department of Experimental Pharmacology, Mossakowski Medical Research Institute, Polish Academy of Sciences, Warsaw, Poland; <sup>2</sup>Department of Respiration Physiology, Mossakowski Medical Research Institute, Polish Academy of Sciences, Warsaw, Poland; <sup>3</sup>Department of Ultrasound. Institute of Fundamental Technological Research, Polish Academy of Sciences. Warsaw, Poland; corresponding-author - dots@op.pl

Cancer is one of the deadliest and highest mortality (after heart disease) civilization diseases. One of the deadliest cancers is breast cancer, which ranks first in terms of morbidity in women. In the fight against these conditions, new therapies and more effective techniques are constantly being sought to eliminate cancer cells while sparing healthy cells. One of the newest minimally invasive methods is the use of high-intensity focused ultrasound (HIFU) waves produced by special ultrasonic probes. The purpose of our study was to evaluate the effectiveness of the HIFU beam generated by the probe used in inducing ablation of implantable cancer cells in a rat model of breast tumor while sparing the surrounding healthy tissue cells.

Male Wistar rats were subjected to implantation of MAT B III breast cancer cells, which produced a tumor 0.5 cm in diameter within a week of injection. The tumor was then subjected to percutaneous HIFU treatment, and 3 days after treatment, the animals were sacrificed under deep anesthesia, and the tissue covering the treated area was collected and prepared for histological and immunohistochemical studies.

HIFU treatment has been shown to cause marked changes in tumor structure and morphology. A significant number of extravasations and hemorrhages were observed, as well as degeneration and death of tumor cells with sparing of adjacent healthy tissue. Numerous swellings were observed in the tumor parenchyma, adjacent to which were cells at various stages of degeneration, with numerous vesicles within the cytoplasm and damaged organelles. The tumor cells died by necrosis.

IHC studies showed a marked decrease in the immunosignal for VEGF, a vascular endothelial growth factor, in HIFU-treated tumors, which clearly correlated with a reduced number of blood vessels in the observed volume. Labelling of cell nuclei with bisbenzimidazole (Hoechst) showed a decrease in cell density in the ablated areas, and a massive influx of small immune cells into the remaining tissue sections of the tumor volume at the time studied. The ablated tumor cells were characterized by a disturbed morphology of the cell nuclei. An increase in IR for NFκB was observed. This is a transcription factor involved in numerous processes related to cell death and survival, as well as in the activation of the inflammatory response and the processes of degeneration and death of cells exposed to various damaging factors. An increase in IR for the Bcl-2 and Bax proteins was also found. In contrast to control tumors, in which a predominance of IR for Bcl-2, a protein that promotes cell survival, a predominance of Bax, a protein associated with cell death, was observed in ablated tumors.

HIFU treatment results in effective ablation and death of tumor cells while preserving healthy cells in the surrounding tissue.

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