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COMBINED PHOTODYNAMIC THERMOCHEMOTHERAPY OF ONCOLOGICAL DISEASES CONTROLLED BY MRI AND ELECTRONIC SENSOR

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The early revealing of proliferation by contrast MRI is an important problem in the detection of malignant tumors. In the present work, we continued investigation of early contrast MRI and magnetohydrodynamic thermochemotherapy (MTC) of malignant tumors by BIOSPEC BC 70/30 (Bruker) and scanning electronic sensor (ES) of magnetic carriers by their non-linear magnetization. Neovascularization and early pretumoral changes of outlines of structures of biological tissues under action of malignant cells are a display of first attributes of proliferation which we revealed by contrast MRI with Dextran-ferrite sol (DFS) [1, 2]. Accumulation of DFS and bracing in the healthy tissues were visualized by MRI and quantified by the ES scanning. Experiments showed that DFS appears to be a promising MRI-negative contrast agent for detection of malignant tumors.

The next step was treating the tumors by combination of chlorines (CH) with several procedures and drugs. We used Radachlorin (RCH), Cisplatin (CP), Mitoxantron (MX), Melphalan (MP), Dacarbazine (DC) and Docetaxel (DT). Besides, the effect of RCH's, CP's, MX's, MP's, DC's and DT's can be increased by combining them with DFS. A complex treatment, which combines the magnetically controlled anticancer drugs such as CP and MP containing DFS, targeting them to the tumor tissue by a gradient magnetic field produced by magnetic NdFeB bandages (0.2 T) or by cryomagnet (7.0 T) [3, 4], heating tumor by AC magnetic field with necrotic slime aspiration, and with intraperitoneal and intracavitary introduction of Cyclophosphan, was performed. The experiments were carried out for development of such complex MTCs of the rat glioma C 6, murine B 16 melanoma, mammary Ca 755 adenocarcinoma and Lewis lungs carcinoma (LLC), based on our methods for quantification of magnetic agents [3-5] and optimization of the treatment by 3D near-real-time MRI that controls MTC. Application of DFS as the diagnostic agents for MRI contrast purposes, as well as heating agents combined with chemotherapeutic preparations are promising for the combined diagnosis and therapy of tumors. Early revealing of tumor proliferation by combination of MRI contrast agents such as dextran-ferrite and Magnevist increased the therapy efficiency. Quantitative real-time detection of DF in tumor and liver by an electronic detector allowed definition of preferable therapy, enhanced the effect of photodynamic therapy combined with magnetohydrodynamic thermochemotherapy at rodent models and led to increase of life span for glioma C6 and glioblastoma 101.8 up to 47% and up to 34%, respectively.

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