

Model of applicator for intracavitary brachytherapy of liver created

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Liver cancer is an unfortunately widespread oncological disease of the abdominal cavity. Currently, the most effective method of treatment is hepatectomy. But the treatment carries a high possibility of tumor recurrence because of residual malignant tissue. To reduce this risk, intracavitary brachytherapy of the liver is proposed via incorporation of an applicator with radioactive medicine in proximity to residual tissue. The main task for realization of this technique is designing the applicator and its parameters.

A model of an applicator for intracavitary [brachytherapy](#) of the [liver](#) using Re188, which is a beta- and gamma-emitting isotope, has been designed at the MEPhI Medical Physics Department. A mathematical model of an applicator in a GATE/Geant4 environment has been used to determine optimal parameters. This software environment has been used for modeling of the radiation transfer process based on the Monte Carlo method. GEANT4 Application for Tomographic Emission (GATE) has tools for calculating dose distribution and characteristics of scattered fields while conducting radiation therapy, and allows the use radionuclides and materials of the simulation system Geometry and Tracking (Geant4).

Implementation of radiation safety standards for the most radiosensitive organs has been checked with the help of the model, and the results became a basis for a conclusion about the possibility of using of this applicator in medicine.

Future project development requires a series of experiments with different constructions and their parameters. Analyzing the results should make it possible to choose designs that best fulfill medical and technical requirements. If necessary, scientists will make further changes and check them experimentally.

As similar technologies are not currently applied in medicine, the development of this project will significantly improve existing methods of liver cancer treatment and could lead to similar application in other organs.

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