Microwave Applicators for "BPH" Treatment

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Abstract: *In this paper we would like to describe our new technical results dealing with microwave applicators for intracavitary cancer and/or prostate (BPH) treatment.*

INTRACAVITARY APPLICATORS

These applicators are being used above all for prostate treatment in the case of BPH (Benign Prostate Hyperplasia). Until now more than 1000 patients has been successfully treated here in Czech Republic. We have mainly investigated two basic types of these applicators: monopole/dipole applicator and a helical coil applicator. Our intracavitary applicators are designed to work at 434 MHz and we do some experiments on 915 MHz as well. In this contribution we would like to discuss effective heating depth of intracavitary microwave hyperthermia applicators, based on the comparison of the theoretical and experimental results.

Basic mechanisms and parameters influencing (limiting) heating effective depth are described and explained. Several graphs can demonstrate the effective heating depth with respect to frequency *f* and with respect to the radius *R* of the applicator. Generally we can say, that the effective heating depth *d* is less than the radius *R* of the discussed cavity. For lower frequencies (tenth of MHz) it is near to this limit, in the case of higher frequencies (hundreds of MHz) it is significantly bellow it.

EXPERIENCES AND RESULTS

The basic type of intracavitary applicator is a "dipole/monopole applicator". The construction of this applicator is very simple, but we have found and experimentally verified, that the SAR distribution is not good. Typically there is a second maximum, produced by back wave around the coaxial cable, see Fig. 1.

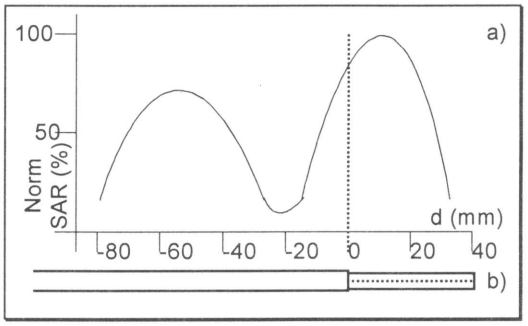

Figure1: Dipole applicator

Therefore we want to reduce this second maximum and optimise the focusing of SAR in predetermined area of biological tissue. The best optimisation is to use the helical coil antenna structure. After coil radius and length optimisation we have obtained very good results of SAR distribution, see Fig. 2.

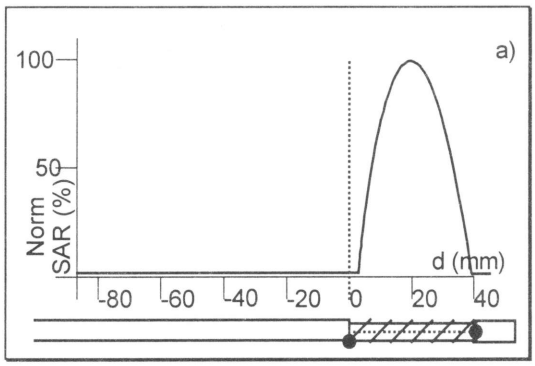

Figure 2: Helical coil applicator