Microwave Applicators for “BPH” Thermotherapy

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Paper deals with new results in the field of intracavitary microwave applicators used for Benign Prostatic Hyperplasia (BPH) treatment.

Costs and risks associated with classical BPH treatment (TURP and open surgery) have promoted the development of minimally invasive methods. Microwave thermotherapy, varying forms of laser treatment, transurethral needle ablation, etc. have all been developed in the 1990s. The underlying principle behind these methods is to coagulate prostatic adenomatous tissue by means of heat. Of all the available minimal invasive treatment modalities, transurethral microwave is one of the most wide spread at present [1].

We have investigated basic types of microwave intracavitary applicators suitable for BPH treatment, i.e., monopole, dipole and a helical coil structures. These applicators are designed to work at 915MHz. In the conference contribution we would like to discuss it's effective heating depth, based on the comparison of the theoretical and experimental results. Basic mechanisms and parameters influencing (limiting) heating effective depth are described and explained in ref. [2–4].

The basic type of intracavitary applicator is a monopole applicator. The construction of this applicator is very simple, but numerically modelled (calculated by software product SEMCAD) and measured “Specific Absorption Rate” (“SAR”) distribution along the applicator is more complicated. During measurements of SAR along the applicator we have found, that typically there is not only a one main “SAR” maximum (first from the right side), but also a second and/or higher order maximas can be created, being produced by outside back wave propagating along the coaxial cable. To eliminate this second maximum and optimise the focusing of “SAR” in predetermined area of biological tissue needs to use the helical coil antenna structure. After coil radius and length optimisation we have obtained very good results of “SAR” distribution.

As a novel results of our work we could mention that various microwave applicators for prostate cancer or BPH treatment have been developed and evaluated. Theoretical analysis of effective heating depth of these applicators and its experimental evaluation will be given.

REFERENCES


