

INTRACAVITARY APPLICATOR FOR MICROWAVE THERMOTHERAPY

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Introduction: One of prospective domains of microwave thermotherapy is microwave angioplastic for treatment of atherosclerosis. Due to dysfunction of endothelium a sedimentation of cholesterol on a blood vessel wall can happen. This evokes its sequential closing. Basic principle of microwave angioplastic is, that heating gained by microwave energy irradiated into artery by microwave applicator, enables safe clear out of atherosclerotic plates in the wall of vessel.

Methods: This paper describes the design of special applicator for microwave angioplastic. As the most acceptable structure to create intracavitary applicator, coaxial quarter wave monopole, was chosen. The applicator in our model was inserted into vein with blood and surrounded by phantom of muscular tissue. First goal was to obtain good impedance matching between generator and microwave applicator. Then we studied the distribution of absorbed power (SAR) along the applicator. For the applicator working at 2,45 GHz there was maximum of SAR at point of termination of outer conductor.

Results: The function of the microwave applicator was experimentally evaluated by measurement of reflection coefficient. This tested applicator had good impedance matching, less than - 20 dB. Then the distribution of the temperature along the applicator was measured with IR camera. Described applicator was placed in to the phantom of muscular tissue and exposed by 50 W during 1 minute. The temperature grew to 47 °C (fig. 1).

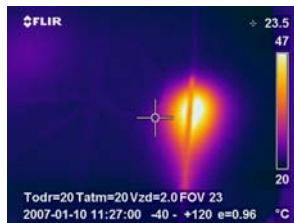


Fig. 1: The distribution of the temperature along the applicator.

Conclusion: This paper describes only technical solution to design the intracavitary applicator for microwave angioplastic. Into the future we plan the cooperation with medical doctors, who will provide us the medical information. Main goal of this project is to determine the optimal temperature for different stadium of this illness.

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References

- [1] Novotná, K.: Intracavitary applicator for microwave angioplastic (in czech). Diploma thesis. Prague 2007.
- [2] Vrba, J.: Medical application of microwave thermotherapy (in czech). Publishing by ČVUT. Prague 2003.