

Coaxial Helix Antenna for Microwave Coagulation Therapy in Liver Tissue Simulations

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Abstract : This paper is concerned with microwave (MW) ablation for a liver cancer tissue by using helix antenna. The antenna structure supports the propagation of microwave energy at 2.45 GHz. A 1½ turn spiral catheter-based microwave antenna applicator has been developed. We utilize the three-dimensional finite element method (3D FEM) simulation to analyze where the tissue heat flux, lesion pattern and volume destruction during MW ablation. The configurations of helix antenna were Helix air-core antenna and Helix Dielectric-core antenna. The 3D FEMs solutions were based on Maxwell and bio-heat equations. The simulation protocol was power control (10 W, 300s). Our simulation result, both helix antennas have heat flux occurred around the helix antenna and that can be induced the temperature distribution similar (teardrop). The region where the temperature exceeds 50°C the microwave ablation was successful (i.e. complete destruction). The Helix air-core antenna and Helix Dielectric-core antenna, ablation zone or axial ratios (Widest/length) were respectively 0.82 and 0.85; the complete destructions were respectively 4.18 cm³ and 5.64 cm³.

Keywords : liver cancer, Helix antenna, finite element, microwave ablation

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