

Highly-Efficient Microwave Antenna Affording Directional Control of Thermal Ablation

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Technology description

Researchers at Kansas State University have developed a high-efficiency microwave antenna affording directional control of thermal ablation profiles within biological tissue. Microwave ablation is a minimally invasive technique used for image-guided thermal destruction of surgically unresectable tumors, cardiac arrhythmias, and localized benign disease. In this technique, the microwave antenna is inserted into or adjacent to the targeted tissue, and the microwave energy radiated by the antenna is absorbed by surrounding tissues leading to heating and necrotic cell death at temperatures in excess of 50 °C. However, conventional antennas have cylindrically symmetrical radiation patterns that do not afford spatial control of power deposition patterns, which may result in undesirable heating of vital, non-targeted tissues.

To address these concerns, researchers at KSU have employed computational models to optimize dimensions and materials to build a state-of-the-art antenna that affords spatial control of energy deposition patterns and avoids undesired cable heating that may cause heating of non-targeted tissues. Extensive experimental and numerical modeling studies have been conducted to demonstrate validity, working principle and characterization of this device, with excellent results.

Advantages

The antenna creates a directional, highly-targeted microwave radiation pattern, sparing tissues in a preferred direction.

The device would work by simply orienting the antenna towards the target structure and away from critical tissue structures that should not be damaged.

The device can also be used to access tumors endo-luminally or endovascularly.

The device overcomes impedance matching issues by careful selection of antenna dimensions and materials.

Institution

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