Abstracts

A Helical Microwave Antenna for Welding Plaque During Balloon Angioplasty

P. Liu and C.M. Rappaport. "A Helical Microwave Antenna for Welding Plaque During Balloon Angioplasty." 1996 Transactions on Microwave Theory and Techniques 44.10 (Oct. 1996, Part II [T-MTT] (Special Issue on Medical Application and Biological Effects of RF/Microwaves)): 1819-1831.

A catheter-based microwave helix antenna has been developed in an attempt to improve the long-term success of balloon angioplasty treatment of arteriosclerosis. When the balloon is inflated to widen vessels obstructed with plaque, microwave power is deposited in the plaque, heating it, and thereby fixing it in place. By optimizing the helix pitch angle and excitation frequency, the antenna radiation pattern can be adjusted to deposit microwave power preferentially in the plaque while avoiding overheating the healthy artery. The optimal power deposition patterns of helical antennas are analytically computed for four-layered concentric and four-layered nonconcentric cylindrical geometries, which model symmetric and asymmetric occluded arteries. Experiments were performed on occluded artery phantom models with a prototype antenna for both symmetric and asymmetric models, which matched the theoretical predictions well, indicating almost complete power absorption in the low-water-content simulated plaque.

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