Abstracts

Development and experimental verification of the wide-aperture catheter-based microwave cardiac ablation antenna

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A new type of catheter-based microwave antenna cardiac ablation applicator has been developed. Unlike previously developed ablation catheters, this device forms a wide aperture that produces a large heating pattern. The antenna consists of the center conductor of a coaxial line, shaped into a spiral and insulated from blood and tissue by a nonconductive fluid-filled balloon. The antenna will be stretched straight inside a catheter for transluminal guiding. Once in place at the cardiac target, the balloon will be inflated, and the coiled spiral antenna will be ejected into the inflated balloon. The wide aperture antenna generates a ring-shaped power pattern. The heat generated from this deposited power is conducted through a volume larger than the spiral diameter, ablating diseased tissue. The resultant lesion profile is both wider and deeper than that of either conventionally used RF catheter-based ablation electrodes or that of other recently reported microwave applicators, and may offer greater heating accuracy and controllability. The new antenna design is tested by measuring S/sub 11/- and Sa/sub 21/- parameters, and by comparing power deposition patterns to conventional monopole antenna in a tissue-equivalent phantom. Heating experiments on in vitro organ tissue and on live pigs using 50, 100, and 150 W of 915 MHz microwave power have been performed to test the efficacy of the wide-aperture antenna design. These studies confirm the hypotheses that the wide-aperture microwave antenna can create lesions of significant depth that may be applicable for the ablative therapy of ventricular tachycardia.

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