Conformal Antenna Applicator for Microwave Ablation Therapy

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According to Center for Disease Control (CDC), the number of deaths associated with cardiac arrest was over 2.5 million in the United States in 2011 alone. Arrhythmias have been the number one trigger for these heart attacks especially for those living with an existing heart disease. One successful treatment technique for the chronic arrhythmias has been Radio Frequency (RF) ablation in the last two decades. Recently, microwave (MW) ablation emerged as a new technology with potential to eliminate the problems associated with RF ablation. Some of the problems associated with RF ablation include high power requirements (up to 200W), the use of ground pads and associated skin burns, and the small zone of ablation (~mm). In contrast to RF ablation, MW ablation uses higher frequencies (915 MHz and 2.4 GHz) and work on an electromagnetic energy propagation principle. When the microwave power is turned on, an antenna on the MW probe radiates electromagnetic energy into the tissue creating the ablation zone. As a result, besides the heart, MW ablation can be used for many organs such as lung and bones with higher impedance values where RF ablation would fail. Despite many advantages, there are still major problems associated with the current MW ablation systems. These problems are mainly due to the narrowband nature of the antennas used in these systems. In order to eliminate these problems, we utilize ultra-wideband antennas for more efficient and unique MW ablation therapy. The designed conformal antenna operates at 608 MHz, 915 MHz, 2.4 GHz and 5.8 GHz. We provide results regarding return loss, SAR, and ablation zones.