Cancer Detection Using Coagulation Therapy with Coaxial Antenna

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Abstract

Nearly seven lakh Indians die of cancer, while over 10 lakh are newly diagnosed with some form of the disease every year. Surgical resection is not always feasible in patients with hepatocellular carcinoma. Microwave Coagulation Therapy (MCT) has been used as an alternative to resection and its efficiency has been evaluated in tissue microwave irradiation from a dipole antenna causes water molecules in the dielectric substance to vibrate dramatically at a frequency of 2.45GHz.

MCT has the advantage over other thermal ablation technique, in that ablation is rapid and the area of ablation is immediately hypoechic on real time ultrasound monitoring and therefore completeness of ablation can be easily monitored in this treatment. Invasive technique is used in which thin microwave coaxial antenna is inserted into the tumor to produce the coagulated region including the cancer cells. Finite element method is used for performing analysis of complex structures.

Cancer is a general term used to refer to a condition where the body's cells begin to grow and reproduce in an uncontrollable way. These cells can then invade and destroy healthy tissue, including organs. Cancer sometimes begins in one part of the body before spreading to other parts. These extra cells lump together to form a growth or tumor. Two types of tumors exist, viz. benign and malignant. Begin tumors are not cancerous. The cells in benign tumors don't spread and it is rare for a benign tumor to be life threatening. On the other hand, malignant tumors are cancerous. The cells in them are abnormal and divide randomly and chaotically. The cells behave aggressively and attack the tissues around them. They also can jump away from the malignant tumor and enter the bloodstream or lymphatic system to form new tumors in other parts of the body. This type of spread is known as metastasis. We have studied about pancreatic cancer liver cancer, kidney cancer and ovarian cancer using COMSOL Multiphysics® software.

Figures used in the abstract

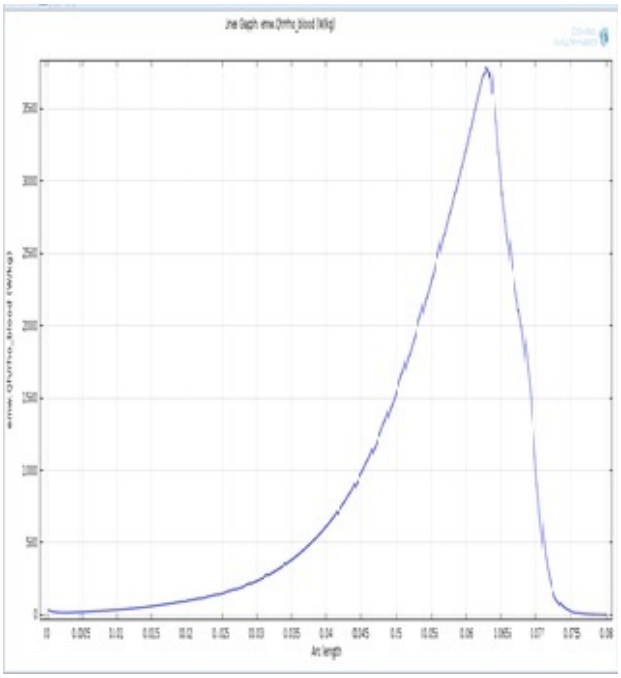

Figure 1: Normalized SAR value of kidney Tissue.

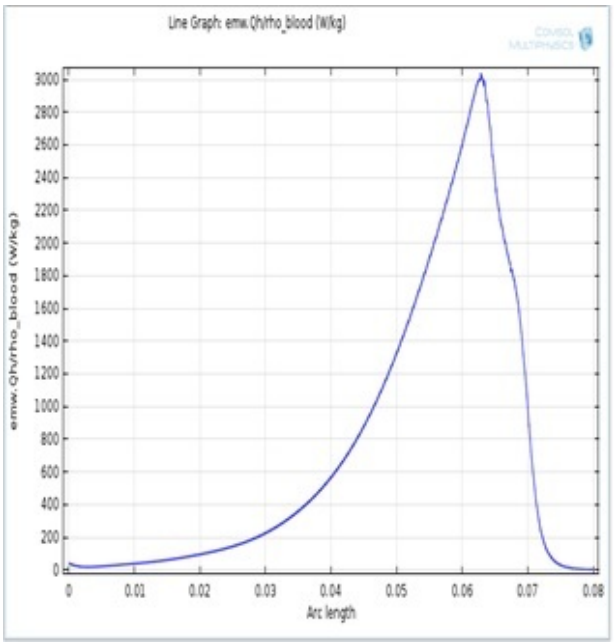

Figure 2: Normalized SAR value of Liver Tissue.

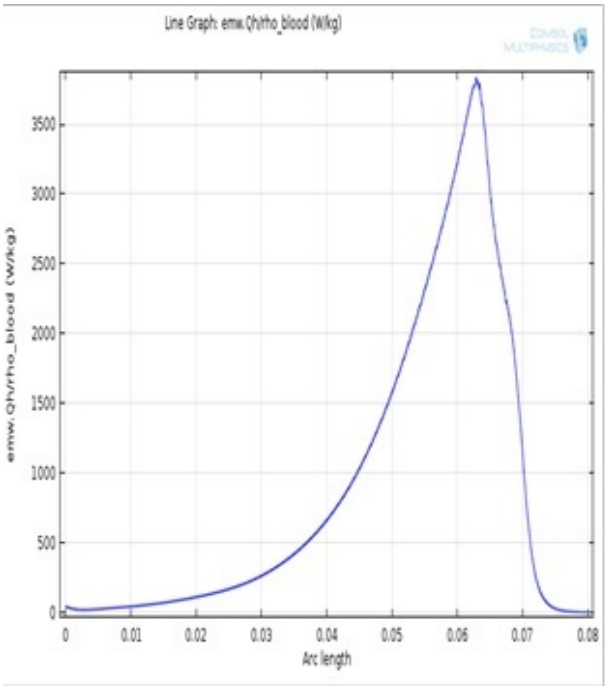

Figure 3: Normalized SAR value of Ovary Tissue.

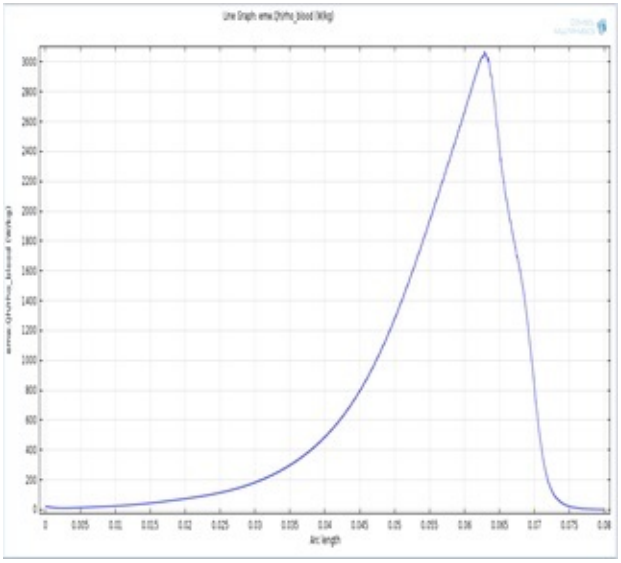

Figure 4: Normalized SAR value of Pancreas Tissue.