AbstractID: 9100 Title: Seed Immobilization using Diathermy Coagulation for Brachytherapy Procedure

Purpose: To investigate the efficacy of seed immobilization in prostate brachytherapy using diathermy coagulation method. The method is to confine the seed movement by coagulating the surrounding tissue.

Method and Materials: A diathermy machine was used in the experiment. One active needle electrode together with a neutral electrode (patient pad) was used for tissue coagulation. Experiments were carried out first to find the best mode that can produce effective tissue welding with least tissue lesion, charring and smoke. Experimental observations revealed that Mode "Forced" coagulation with level 1(Frequency:1Mhz, Peak value of HF-voltage:1300Vp) was most suitable. A rocking platform was designed and fabricated, which could move both horizontally and vertically with adjustable speeds. Fresh bovine livers were used in experiments. In each set of experiment, fifteen seeds were implanted into the tissue, with 10 seeds immobilized by coagulating the tissue at two ends of the seeds, while the other 5 free seeds deposited for comparison. Two long needles were inserted into the liver for references. An initial X-ray scan was taken to record the reference positions of these seeds, before putting the phantom onto the rocking platform to simulate accelerated testing scenario of human motion. Two subsequent scans were taken at 10-hour intervals to observe the seed movement.

Results: Experimental results revealed that the seed movement can be greatly reduced using the diathermy coagulation technique. The maximum/mean movements were 37.4mm/19.3mm for seeds without coagulation, and 2.1mm/1mm for the immobilized seeds. Evaluation of the radiation dose distribution revealed that the non-immobilized seed movement would change the planned isodose distribution considerably; while by using diathermy coagulation method to immobilize the seeds, the changes were negligible.

Conclusion: Experimental results reveal that diathermy coagulation can immobilize seeds effectively. We are now designing brachytherapy compatible device to deliver diathermy energy in surgery.

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