AbstractID: 11507 Title: Prostate Brachytherapy Seed Immobilization: Three Novel Techniques as Potential Candidates for Robotic Implementation

Purpose: Local movement and distant migration of radioactive seeds from prostate implants are known to occur frequently. We have developed three novel techniques amendable to robotic delivery for reducing seed migration/movement. This study compares the efficacy of these techniques and investigates the effect of these techniques on I-125 radioactive seeds.
Method and Materials: Three techniques developed for preventing seed movement/migration were: surgical glue (BioGlue®) to seal needle track, Diathermy Coagulation, and Laser Coagulation. The selection of mode and power for laser and diathermy were based on the effectiveness of tissue welding with least tissue lesion, charring and smoke. Dummy seeds were implanted in fresh bovine liver phantoms with and without applying immobilization techniques; then the phantoms were given 10hr continuous rocking motion. Seed movements were measured from initial and final x-ray films. Sustainability of radioactive seeds in these techniques was evaluated by exposing live I-125 radioactive seeds (0.63mCi/seed) in surgical glue, laser and diathermy energy. Activities of the seeds were individually measured and recorded before and after exposing to glue, laser and diathermy. Wipe test was performed to ensure no leakage.
Results: Without applying the immobilization techniques, seed movements were (max/mean): 34.4mm/18.7mm. Seed movements after using immobilization techniques were (max/mean): in Surgical glue 1.1mm/0.9mm; in Diathermy coagulation 2.1mm/1mm; in Laser coagulation 2.9mm/1.1mm. Evaluation of dosimetric distribution indicated that non-immobilized seed movement would alter planned dose distribution considerately, while by using immobilization techniques the deviations in dose distribution were greatly reduced. No significant effects of immobilization techniques were observed on radioactivity of the seeds. Wipe test ensured no leakage.
Conclusions: Results from the experiments revealed that these three novel techniques are quite promising for improving dose distribution by reducing seed movement and migration. Moreover, these methods did not alter normal radioactivity of I-125 seeds and preserved encapsulation.
Acknowledgement: supported by DOD-W81XWH-06-1-0227.