

## AbstractID: 10761 Title: Drug Eluting Implanted Devices to Increase Biologic Effective Dose in Image Guided Radiation Therapy

**Purpose:** Image guided radiation therapy (IGRT), such as lung SBRT using fiducials or prostate brachytherapy, implant objects essential to the radiation treatment, but offering no therapeutic benefit. Such devices offer a vehicle for in-situ delivery of radiosensitizer which could increase the biologic effective dose of the radiation. This work studies the achievable drug coverage as a function of the chemical and physical properties of the drugs and devices.

**Method and Materials:** Drug concentration around a spherical eluter is parameterized in order to separate the physical properties of the eluter and effective diffusion elimination modulus ( $\phi_b$ ) of the drug. Computer modeling is used to simulate drug distributions produced by configurations of eluters that could be encountered in either stereotactic body radiation therapy (SBRT) for lung or ultrasound guided prostate implants. Measures of tumor coverage and normal tissue involvement are evaluated for multiple combinations of eluter sizes and  $\phi_b$ . Elution kinetics from polymer coating of gold substrate was evaluated.

**Results:** A small number of fiducials, as in lung SBRT, would require either a relatively large fiducial or chemical engineering of the drug to produce a low value of  $\phi_b$ . The many spacers seen in prostate brachytherapy provide enough eluters to sensitize a portion of the prostate with values of  $\phi_b$  in the vicinity of reported values. The use of drug eluting brachytherapy spacers would enable a more localized enhancement in biologic effective dose than possible by a local brachytherapy boost. Timed release of docirubicin from a polymer coating on a gold substrate is possible.

**Conclusion:** IGRT techniques already implant devices in targets as part of the standard of care. These devices may be enhanced with drug eluting coatings to provide localized increase in biologic effective dose without increasing the physical dose involved in the therapy.

**Conflict of Interest (only if applicable):**