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Session Type: **General Session**

Session Title: **Imaging and Treatment Delivery**

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Topic 1: Image-guided Therapeutic Techniques

Publishing Title: **The Use of an Injectable Tissue Spacer in Conjunction With Adaptive Radiotherapy for Prostate Cancer**

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Purpose/Objective(s): To demonstrate the efficacy of using an injectable tissue spacer, MRI imaging and adaptive radiotherapy to decrease the rectal dose during intensity modulated radiation therapy for prostate cancer.

Materials/Methods: Between December 2009 and August 2010, 34 prostate carcinoma patients were treated with either combined high dose rate (HDR) brachytherapy plus intensity modulated radiation therapy (IMRT) or IMRT alone. The IMRT was delivered in 33 to 45 fractions of 180cGy. In conjunction with radiotherapy, the patients were administered a tissue spacer compound to increase the separation between the prostate and the rectum. The tissue spacer was injected transperineally into the prostate-rectal inter-space in order to enhance separation. In order to monitor any changes in the spacer compound throughout the course of treatment, the patients were imaged via MRI at various stages: pre-injection, post injection, and every two weeks until the conclusion of treatment. In those cases where the tissue spacer degraded significantly, adaptive radiotherapy was applied and the patients were re-planned accordingly. DVH analysis was performed for both pre and post injection anatomy.

Results: MRI analysis revealed the tissue spacer was able to generate an additional 1.0 cm mean separation between the prostate and rectum. As a result, there was a significant reduction in rectal dose. The additional prostate rectal spacing decreased the maximum and mean rectal dose by 11.5% and 30.0%, respectively, while the rectal wall V60 and V70 decreased by 19.12% and 19.87%, respectively. Bi-weekly MRI imaging revealed that the tissue spacer separation dissipates over time. A graph of the mean separation over time reveals an initial decay of 20% over 4 weeks followed by a more rapid decay of 60% over the following two weeks.

Conclusions: Injection of a tissue spacer in the prostate-rectal inter-space is an effective means to reduce rectal dose for prostate IMRT. MRI imaging indicates enhanced prostate-rectal spacing on the order of 1 cm is readily achievable. This spacing provides significant dosimetric advantages for treatment planning and delivery. The tissue spacer dissipates over time so the anatomy returns to its baseline state. However, given that the separation reduces over time, temporal monitoring and adaptive radiotherapy must be used in conjunction with the tissue spacer.

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