AbstractID: 3378 Title: Assessing Prostate Volume During Conformal Radiotherapy Using Implanted Fiducial Markers

Purpose:
Evaluate changes in the volume of the prostate gland during radiation therapy using implanted fiducial markers.

Method and Materials:
The study includes 15 patients being treated for prostate cancer with 84Gy in 42 fractions. Prior to treatment, gold fiducial markers are implanted in the apex, base and posterior aspect of the prostate under ultrasound guidance. Daily on-line image-guidance is achieved using an orthogonal pair of MV portal images. Under research protocol, daily volumetric images are captured using a kV cone-beam CT enabled linac. These images, reconstructed on a fine voxel grid ($0.25mm^3$), allow precise 3-D localization of the implanted markers using a threshold based auto-segmentation technique. Acquisitions that exhibited marker movement due to patient motion were excluded from the analysis. The contoured prostate volumes were between 31.9 and 77.2 cc with a median value of 41.8cc. The triangular area spanned by the three implanted markers was measured each day and normalized by the triangular area in the planning CT to allow comparisons between patients.

Results:
The correlation between the area of the seed triangle and the contoured prostate volume was measured to be roughly linear with R^2=0.63. Based on this patient population, the prostate grows in size during the first two weeks of treatment by approximately 4% and then subsequently shrinks by 7%. The crossover point occurs roughly half way through the treatment course.

Conclusion:
The triangular area spanned by three implanted fiducial markers was shown to be a reasonable surrogate to the prostate volume. Based on this surrogate, the prostate volume in 15 patients was measured to increase in the first two weeks of treatment, followed by a subsequent decrease in volume by approximately 7% over the duration of the treatment course.

Conflict of Interest (only if applicable):
This work is sponsored by the Elekta Synergy Research Consortium.