AbstractID: 6842 Title: Inter-fractional prostate motion measured with 3D daily ultrasound images

Purpose: to assess inter-fractional prostate displacement using a 3D ultrasound-based localization system
Materials and methods: IGRT program in our department has been recently enhanced through implementation of a 3D ultrasound-guided system from Resonant Medical Inc. (Montreal, Canada) that combines ultrasonography, optical tracking, and computer technology. During the CT simulation, two ultrasound scans were taken and the best defined target was saved as the Positioning Reference Volume (PRV). At each treatment session, the patient was initially setup using the room lasers aligned with skin marks and then an ultrasound scan was taken and a new target volume would be automatically or manually created. The system computed the required shifts to align the new target volume to the PRV and the treatment couch was moved accordingly. As of now, 52 prostate cancer patients were positioned for treatment using the system. Eleven of them were initially positioned using bony structures shown in portal images and then moved with the ultrasound guidance. The inter-fractional prostate motion related to skin or bony marks were both analyzed.
Results: The average target displacements in the left-right, superior-inferior, and anterior-posterior directions relative to skin marks were 3.9 +/- 2.8, 4.5 +/- 3.0 and 4.9 +/- 3.4 mm, respectively. The standard deviation of the prostate motion slightly decreases with the increase of the PRV volume. Repeated ultrasound scans at the simulation show significant variation (SD > 5 mm) for earlier patients with a great improvement (SD < 4 mm) for the later patients. We found that there is no additional target precision obtained by bony structure-based positioning relative to the skin marks localization.
Conclusion: The target motion is significant and may represent the daily variation of the rectal and bladder fillings. The relatively large standard deviation of prostate motion could be slightly improved with the increase of user's experience.