AbstractID: 6688 Title: A cone beam CT–guided online plan modification technique to correct interfractional anatomic changes for prostate cancer IMRT treatment

Purpose: To develop an online plan modification technique to compensate for the interfractional anatomic changes for prostate cancer IMRT treatment based on the daily cone beam CT (CBCT).

Methods and Materials: Pre-treatment CBCT were acquired after patients were set up using skin marks. Instead of moving the couch to rigidly align the target, or performing re-planning, we modified the leaf sequence in the original IMRT plan to account for the interfractional target motion and deformation based on the daily CBCT. The MLC leaf positions for each subfield were automatically adjusted based on the position and shape change of target projection in the beam's-eye-view (BEV). Three prostate cases were adapted to evaluate the proposed method and the results were compared with those obtained with bony-structure-based correction (Strategy1), prostate-based correction (Strategy2) and CBCT-based re-planning (Strategy3) strategies.

Results: For case 1, there was a large prostate deformation. With our MLC modification method, the prostate coverage was improved to 94.0% from 85.3% with Strategy1 and 88.7% with Strategy2, the seminal vesicle (SV) coverage was improved to 93.9% from 60.7% with Strategy1 and 75.4% with Strategy2. For the other two cases, the prostate interfractional target deformation was insignificant, and the prostate coverage using our method was comparable to Strategy2, Strategy3 but was better than Strategy1. The SV coverage was significantly improved with our method compared with Strategy1 and Strategy2 and was similar to that with Strategy3. The DVHs for OARs with our method were similar to those with Strategy3.

Conclusions: The proposed method is superior to the bony-structure-based and prostate-based correction techniques, especially when large interfractional target deformation exists. Its dosimetric performance is similar to that of the re-planning strategy, but with much higher efficiency. This method may be used clinically to compensate for the inter-fractional target position and shape changes in prostate IMRT.