AbstractID: 10911 Title: Correction strategy to overcome non-random target motions for hypofractionated spine body radiotherapy

Purpose: Non-random target motions have been reported for hypofractionated spine stereotactic body radiotherapy (SBRT), largely due to prolonged treatment delivery as compared to conventional radiotherapy. In this study, we aim to develop an adaptive correction strategy to overcome such non-random target motions.

Method and Materials: Intra-fraction target motions of more than 200 treatment sessions were analyzed. These target motions were detected using an in-room dual kV x-ray imaging system. Non-random target motions was characterized in six degree of freedom (DOF) that included translations (x-, y-, z- shifts) and rotations (roll, yaw, pitch). Based on the observed incidence and motion characteristics, a correction strategy based on periodic interventions (e.g., via realigning the patient or the beams) was developed in order to correct the effects of such motions to an acceptable level. The population averaged time intervals for implementing the strategy were calculated for different treatment sites that included cervical, thoracic, and lumbar-sacral lesions.

Results: Non-random target motions were found to be present for every case studied regardless of target locations. Cervical spine targets were found to possess the highest incidences of non-random target motions as compared to other sites ($p<0.0001$). The correction strategy employing periodic intervention was found to be effective in compensating the observed target motions. The average time intervals required to maintain the target motions to within 1 mm in translation or 1 degree in rotation were 5.5 min, 5.9 min, and 7.1 min for cervical, thoracic, and lumbar-sacral lesions, respectively.

Conclusion: Interventions of approximately every 5-8 minutes or less are warranted in overcoming non-random target motions in protracted spine SBRT treatments.