AbstractID: 13969 Title: The effect of respiratory motion on the dose distribution of free-breathing stereotactic body radiation therapy for spinal tumors

Purpose: Stereotactic Body Radiation Therapy (SBRT) has been used increasingly for the management of spinal lesions. This study was performed to investigate the effect of respiratory motion on the dose distributions of spine SBRT patients. **Method:** 4D CT and treatment planning data for thoracic spinal lesions (T5 and T8) in two linac-based SBRT patients was studied retrospectively. Bony structures of the spine were visually inspected in all 10 phases of the 4D CT images and there was no spinal motion observed. Tumors were contoured by radiation oncologists on the 50% phase of the 4D CT images, which corresponded to end exhalation. A single-fraction dose of 20Gy and 14Gy was prescribed to CTV20 (gross tumor) and CTV14 (contiguous marrow cavity) respectively. Intensity modulated treatment plans were constructed on the 50% 4DCT phase and copied to all other phases of the 4D data set for comparative dose calculations. The DVHs of CTV20, CTV14, and the spinal cord were compared between actual dose, which is the sum of dose from all phases, and planned dose, which was done on 50% phase of 4D CT images. **Results:** The impacts of chest wall and diaphragm motion on the dose distribution were analyzed. Treatment plans that incorporated all respiratory phases resulted in improved CTV20 coverage less than 2% but the maximum dose within spinal cord was increased 3~4%. **Conclusion:** Respiratory motion has a modest impact on the dose distribution of spine SBRT treatments including a 3-4% increase in cord dose. Motion control methods should be considered to reduce the uncertainties of dose delivery when motion amplitude is large.