

AbstractID: 10981 Title: Respiratory Motion and Delivered dose accuracy for gated intensity-modulated SBRT for Lung Cancer

Purpose: Accuracy of delivered dose can be affected by the interplay between DMLC delivery and target motion in gated IMRT treatment. For gated intensity-modulated lung SBRT, this concern is even larger due to smaller target margins, fewer treatment fractions and higher dose rate (1000MU/minute). The purpose of this work is to investigate the dosimetric accuracy in the latter situation.

Method and Materials: Data from 5 lung patients treated with gated SBRT were retrospectively reviewed. For each patient the gating window was individually determined to keep residual motion <5 mm through analyzing the target motion based on 4DCT. Treatment plans were generated with 50% phase CT. PTVs were generated from CTVs with a 5mm margin. Based on the respiratory cycle, MU and dose rate, the DMLC leaf sequence for each beam was segmented into multiple sections, which corresponded to different respiratory phases within the gating window. The segmented DMLC leaf sections were then used to calculate dose distributions with corresponding 4DCT image set. The 4D composite dose distribution was obtained by accumulating the contributions from all phases within gating window using a deformable registration. The 4D dose distributions and DVHs for targets and critical organs were compared with the planned. The influences of the breathing period and dose rate were investigated.

Results: The results indicated, although PTV dose coverage can be significantly influenced by the interplay of the target motion and DMLC delivery, the difference in CTV dose coverage between the 4D composite and the planned results is not significant, typically less than 3%.

Conclusions: Interplay between target motion and DMLC-delivery has a clinically acceptable impact in delivered dose accuracy even for the high dose rate gated SBRT treatment. Other factors, such as target position shift due to the irregularity of patient's breathing, may be the main reasons affecting dose accuracy.