

AbstractID: 8176 Title: Impact of Respiratory Gating Using 4DCT on TCP, NTCP, TI, and UTCP in Patients with Thoracic Malignancies

Objective: To evaluate the tumor control probability (TCP), normal tissue complication probability (NTCP), therapeutic index (TI) and uncomplicated tumor control probability (UTCP) from the Dosimetry of 4DCT gated treatment plans as compared to traditional non-gated treatment plans.

Methods: Ten patients underwent treatment planning. Gated CT images were obtained at full inspiration, full expiration and at 25th, 50th and 75th percentile of respiration. For non-gated plans, planning target volume (PTV) included an all around 1 cm margin for tumor motion and 0.5 cm for set-up error. For gated plans, tumor volumes of individual CT images were superimposed with a 0.5 cm margin for set-up error. The prescription dose was 60-70 Gy with 2 Gy per fraction. Dose Volume Histograms were generated for PTV and normal tissues in each treatment plan. Gated and non-gated plans were compared based on TCP, NTCP, TI and UTCP.

Results: TCP was higher for gated plans irrespective of $\alpha/\beta = 5$ or 10. Specifically, for $\alpha/\beta = 5$, $SF_2 = 0.4$, TCP was 99.44% and 90.21% for gated versus 94.48% and 67.82%, for non gated plans with CCD of 10M and 220 M, respectively. NTCPs for lung, esophagus, heart and spinal cord were 7.96%, 5.23%, 1.66% and 0.38% with gating versus 26%, 8.25%, 9.36% and 0.52% without gating. Gated plans resulted in higher TIs for lung, esophagus, heart, and spinal cord by a factor > 3.4 , 1.6, 5.9, and 1.4 respectively. The differences in UTCPs between gated and non gated plans were greater than 27% irrespective of α/β and CCD, for SF_2 of 0.1 to 0.4.

Conclusions: 4DCT respiratory gating allows reduced radiation field with lower doses to normal tissue and hence higher therapeutic gain.