

AbstractID: 10801 Title: Severe inter-fractional anatomic changes and their dosimetric impact in abdominal irradiation, an indication for adaptive re-planning

Purpose: To study the dosimetric impact of inter-fractional anatomic changes in the abdominal region during the course of radiation therapy and to determine the frequency of adaptive re-planning.

Methods and material: Daily CT images acquired for selected abdominal cancer patients treated on a helical Tomotherapy unit were analyzed. The targets and organs at risk (OAR), such as kidneys, liver, cord and stomach, were delineated based on daily CT registered with the planning CT. The 3D dose distribution and dose volume histograms (DVHs) delivered to the patient on the day were reconstructed based on the CT of the day and the shifts performed (verification dose) using the Planned Adaptive software in the Tomotherapy planning system. The daily patient anatomy including body weight and locations, volumes and shapes of targets and OARs, as well as dose volume parameters including DVHs, maximum, minimum and mean doses and equivalent uniform dose (EUD) were compared to those from the planning CT.

Results: Significant inter-fractional anatomic changes were observed for a patient with severe weight loss. In this patient with a suprarenal tumor, significant weight loss was observed during the second week (day 8) of radiotherapy, which led to 6.2%, 10.3% and 7% increases in maximum doses for PTV, the cord and unspecified tissue, respectively, from their values in the original plan. Compared to the original plan, the EUD changed by 24.6%, 11.3% and 14.6% respectively, for the right kidney, liver and stomach. In a cholangiocarcinoma case, dramatically organ volumetric and/or geometric changes for the liver and stomach were observed, resulting in changes in EUD of 16%, 22% and 46% for the liver, stomach and left-kidney, respectively.

Conclusion: Dramatic inter-fractional anatomic changes in abdominal region, which can result in significant dosimetric impact and therefore, should be accounted for by an adaptive strategy, such as re-planning.