Abstract ID: 18453  Title: Comparison of Planned Dose Distribution Vs. Delivered Dose Distribution for Both IMRT and Proton Therapy Using Weekly Repeat 4DCT Data Sets

Purpose:

To evaluate treatment deviations and the impact of treatment modality in the presence of breathing motion and anatomical changes during the course of lung cancer radiotherapy.

Methods:

Two non-small cell lung cancer patients were enrolled in a randomized clinical trial to compare IMRT and proton therapy. To rigorously evaluate the impact of motion and anatomical changes, we used a 5D dose accumulation approach to sum dose distributions from phase-to-phase and week-to-week to the reference (end-expiration) phase of the original planning 4DCT data set. Six to eight weekly 4DCT data sets that consisted of 10 breathing phases were acquired during the treatment course. The original plan was re-calculated for each phase and deformably mapped to the reference phase to compare the delivered dose distribution with the planned dose distribution of both the IMRT plan and the proton plan for each patient. DVHs derived from delivered dose distribution were compared to that from the planned dose distribution.

Results:

The delivered dose showed 3% and 2% increase in the dose to the CTV for IMRT and proton plan respectively. Target coverage remained acceptable despite tumor shrinkage from 29% to 49%. The doses to normal structures, such as lung and heart, increased more in the proton plan than in the IMRT plan. The V20 of the total lung volume increased by 4% and 6% from the delivered dose compared to the planned dose for IMRT and proton plan, respectively.

Conclusions:

The results showed sufficient target coverage was maintained for both modalities. Increases in lung dose were observed in both modalities, but more in the proton arm, perhaps due to weight loss and tumor shrinkage. Adaptive proton therapy strategy is recommended to minimize normal tissue doses.

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No conflict of interest.