Purpose: To verify the adequacy of dose delivery in stereotactic body radiotherapy (SBRT) of lung tumor and demonstrate the feasibility of reducing toxicity by revision of treatment margins and prescription isodose lines.

Methods: Gross tumor volume (GTV) and others organs were manually segmented by the physician and planning target volume (PTV) was automatically generated in planning computed tomography (pCT) and cone-beam CT (CBCT) images. These contours were transferred from CBCT to the pCT image, after rigid-registration. Planned and delivered doses to GTV, PTV and other organs were compared. To study reduction in normal tissue dose (NTD), multiple PTVs were generated using smaller margins around the GTV and a dose-volume constraint of 95% of prescription dose (Rx) irradiating at least 95% of PTV volume was targeted. An alternate strategy of revising the prescription isodose line was also employed. NTD was measured using volumes of the various isodose lines.

Results: In this retrospective study on ten primary lung cancer SBRT patients, the mean dose to the GTV and PTV were lower than planned dose by 1% and 2%, respectively. The mean dose delivered to GTV exceeded the Rx by 19%, proving adequate dosimetric coverage. While reducing treatment margins, the block margins had to be opened up such that the field aperture was almost a constant, in order to meet target dosimetric coverage. Prescribing to lower isodose lines (as % of maximum dose) allowed for reduction in NTD, especially in small tumors and small margins.

Conclusions: The feasibility of independent verification of radiation dose delivered by utilizing CBCT imaging system has been demonstrated. NTD could not be changed with tumor margin reduction, but by lowering the prescription isodose line in a stereotactic-like prescription technique.

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None