

AbstractID: 11656 Title: Potential for increased pneumonitis risk with IMRT as compared to 3D-CRT for patients receiving adjuvant chemotherapy: a radiobiological modeling study

Purpose: Some cytotoxic or molecular targeted drugs increase the risk of radiation therapy toxicity. It is assumed in routine treatment planning that there is no interaction between the radiation dose distribution and the addition of chemotherapy. Here we investigate if the ranking of competing radiation therapy plans with respect to the risk of radiation induced pneumonitis may change when combining radiation with chemotherapy.

Method and Materials: Eighteen non-small cell lung cancer (NSCLC) patients previously treated with helical tomotherapy were selected for a modeling study. Three treatment plans were generated for each patient, including: the delivered tomotherapy plan, a 3D conformal radiotherapy (3D-CRT) and a fixed field, intensity modulated radiotherapy (IMRT) plan. The effect of chemotherapy on the normal lung was modeled as an independent cell killing process by adding a uniform, chemotherapy equivalent background dose of radiation to the entire organ at risk. The pneumonitis risk of each plan was estimated using the functional damage (F-DAM) normal tissue complication (NTCP) model.

Results: In the case of radiation alone, NTCP values calculated using the F-DAM model predict lower toxicity with both IMRT techniques than with 3D-CRT. However, when a critical chemotherapy equivalent dose is exceeded, this ranking order is reversed and the modeling predicts greater toxicity with both IMRT techniques as compared to 3D-CRT. This critical dose is comparable to the chemotherapy equivalent dose derived from published clinical data.

Conclusion: The addition of chemotherapy can influence the optimal choice of radiotherapy technique if not taken into consideration during the treatment planning process. Understanding the interaction of chemotherapy and radiotherapy will improve our ability to predict and potentially minimize the individual risk of adverse effects.

Conflict of Interest : Some authors have a financial interest in TomoTherapy Inc.