AbstractID: 4771 Title: Geometric Considerations for Optimizing Beam Directions for IMAT Treatment of Lung Cancer with Mediastinum Nodal Irradiation

Purpose: Based on geometric considerations, we optimized beam directions and arc ranges for intensity-modulated arc therapy (IMAT) to maximize the sparing of lung and spinal cord while treating the mediastinum nodes and gross disease.

Methods and Materials: A phantom with multiple planning target volumes (PTV) and lung with varying geometric shapes was created on Pinnacle 7.6c (Philips Medical Systems). A spinal cord was placed posteriorly. Mean lung and maximum cord dose were obtained for the various geometries for AP/PA and IMAT fields that were designed to spare the cord. We combined AP/PA and IMAT fields in order to achieve an optimal plan for each geometry, and seek correlations between patient geometry and their optimal relative weights. This combination of AP/PA and the IMAT fields were used to treat a patient in 2004 diagnosed with non-small cell lung cancer with concurrent chemotherapy.

Results: For a circular PTV in the phantom, the mean lung dose varied for AP/PA between 50% and 29% of the mean PTV dose, depending on the lung geometry, and for IMAT, between 50% and 46%. The maximum cord dose was 107% for AP/PA versus 33% for IMAT. Optimized composite plan of AP/PA and IMAT were created for each phantom geometry, balancing PTV dose, lung and cord tolerance. For the patient plan, the prescription dose was 60Gy, and the composite AP/PA-IMAT plan gave a maximum cord dose of 45Gy with mean lung dose =16.1Gy and V_{20Gy} =23%. Patient completed treatment and had no acute or late lung or spinal cord toxicities.

Conclusions: IMAT was found to be useful in sparing the cord but not the lung, while AP/PA maximizes lung sparing but not the cord. A combination of AP/PA and IMAT provides an optimal class solution for treatment of lung cancer where mediastinum nodal irradiation is indicated.