

**Purpose:** To evaluate normal tissue dose reduction in step-and-shoot intensity-modulated radiation therapy (IMRT) on the Varian 2100 platform by tracking the multileaf collimator (MLC) apertures with the accelerator jaws.

**Methods:** Clinical radiation treatment plans for 10 thoracic, 3 pediatric and 3 head and neck patients were converted to plans with the jaws tracking each segment's MLC apertures and compared to the original plans in a commercial radiation treatment planning system (TPS). Each segment was then renormalized to account for the change in collimator scatter to obtain target coverage within 1% of that in the original plan. Reduction in normal tissue dose was evaluated in the new plan by using the parameters V5, V10, and V20 in the cumulative dose-volume histogram for the following structures: total lung minus GTV (gross target volume), heart, esophagus, spinal cord, liver, parotids, and brainstem. In order to validate the accuracy of our beam model, MLC transmission measurements were made and compared to those predicted by the TPS.

**Results:** The greatest change between the original plan and new plan occurred at lower dose levels. The reduction in V20 was never more than 6.3% and was typically less than 1% for all patients. The reduction in V5 was 16.7% maximum and was typically less than 3% for all patients. The variation in normal tissue dose reduction was not predictable, and we found no clear parameters that indicated which patients would benefit most from jaw tracking. Our TPS model of MLC transmission agreed with measurements with absolute transmission differences of less than 0.1 % and thus uncertainties in the model did not contribute significantly to the uncertainty in the dose determination.

**Conclusion:** The amount of dose reduction achieved by collimating the jaws around each MLC aperture in step and shoot IMRT is probably not clinically significant.