

### Purpose:

SBRT has been reported to result in excellent local control in stage I non-small-cell lung cancer (NSCLC) using 3D-CRT. However, toxicity could be significant for lesions located centrally/superiorly and the delivery time for each fraction takes about 35-40 minutes. In order to minimize the normal tissue dose and the risk of the intra-fractional motion, VMAT plans generated by our in-house developed automated inverse planning (AIP) method are studied and compared to 3D-CRT plans for SBRT to treat NSCLC.

### Methods and materials:

Treatment plans for 11 patients with central or superior stage I NSCLC treated by 3D-CRT SBRT were selected for this study. The central/superior tumors are those located within 2cm from the bronchial tree, esophagus, heart, major vessels, trachea or brachial plexus but 1cm away from the spinal cord. All the patients underwent 4D CT simulation, and daily CT-on-rail guided CT. The AIP algorithm was implemented as a plug-in of Pinnacle (9.100) and therefore all the plans generated were deliverable plans which could be directly employed to treat patients. The prescribed dose was 50 Gy in 4 fractions to the target volume. Iso-dose line distributions and dose volume histograms for both plans were compared also. Maximum tolerable dose (MTD) was defined as the preset critical-structure dose-volume constraints.

### Results:

With the similar target coverage, the clinical plans for only 7 patients satisfied all the MTD constrains, whereas the AIP-generated VMAT plans did for all the patients. The VMAT plans remarkably reduced the dose to nearly all the critical structures and resulted in approximately 37% more monitor units but could be delivered with 8 minutes.

### Conclusion:

Compared to 3D-CRT, VMAT with AIP method for SBRT has superior plan quality, excellent delivery efficiency and exceptional plan consistency. It is the preferred modality to treat the patients with NSCLC located centrally/superiorly.