Purpose: We present an analysis of the variation in acceptable SBRT lung plans with beam parameters. A figure of merit encompassing standard metrics is used for analytical comparison to determine the optimum plan quality.

Methods: A set of optimization dose-volume constraints was formulated that consistently produced acceptable plans. Plans were normalized to deliver a prescription dose (PD) of 5000 cGy to 95% of the PTV volume. The Conformity Index (CI), Conformity Number (CN), and Gradient Index (GI), and mean GTV dose (MDgtv) were calculated. In SBRT hotspots near the target center are often deemed acceptable. The ratio MDgtv/PD is greater than 1.0 and larger values indicate that more dose is delivered where desired within the PTV. We combine the indices into a single figure of merit, FOM = (1/CI)*CN*(1/GI)*(MDgtv/PD), for which larger values indicate better plan quality dosimetrically. FOM values were normalized to 1.0 for the best plan.

Twenty four plans were calculated for 6X, 6X flattening filter free (FFF), 10X, and 10X FFF photon beams. The gantry arc rotations were 0º-180º (180arc), 135º-30º (255arc), and 181º-179º (360arc). The couch angle was either 0º (coplanar) or +/- 15º (non-coplanar).

Results: For the normal lung volume there was no significant variation in either mean dose or percent volume receiving 2000 cGy. However, the percent volume receiving 500 cGy varies significantly with energy and couch angle.

Ninety six plan quality indices were tabulated. Overall, the 6X FFF non-coplanar beam with a 255 degree arc gave the best the figure of merit; it was 6.5% higher than the nearest competitor largely due to superior conformality.

Conclusions: Individual plan quality indices were combined into a single figure of merit for various beam parameters that can be used to analytically select the optimum dosimetric plan.

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None