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Poor Pulmonary Function is Not Associated with Increased Rates of Toxicity or Decreased Overall Survival After Stereotactic Body Radiotherapy for Early Stage Non-Small Cell Lung Cancer: Results of a Multi-institutional Analysis

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Purpose/Objective(s)

Stereotactic body radiotherapy (SBRT) is considered as the treatment of choice for stage I non-small cell lung cancer (NSCLC) in medically inoperable patients. It was the purpose of this study to evaluate whether pretreatment pulmonary function is predictive for survival and toxicity after SBRT.

Materials/Methods

Between 1998 and 2009, 411 patients were treated with SBRT for 434 targets of cT1 -cT3 cN0 NSCLC at five international radiotherapy departments. Median age of the patients was 74 years ranging between 42 and 92. Median tumor diameter was 2.4cm with a maximum tumor size of 8.5cm. Patients were treated with various fractionation schemas of median 3 treatment fractions (range 1 to 15) and a median total dose of 54Gy (20Gy to 64Gy). All treatments had in common that daily volumetric image guidance for verification of the target position and online correction of set-up errors and baseline shifts was performed for all patients.

Results

Data of pre-treatment pulmonary function tests (PFT) were available for 83% (FEV1 absolute and predicted), 65% (DLCO predicted) and 37% (DLCO actual) of the patients and median interval between PFT and start of SBRT was 35 days. Median pretreatment actual FEV1 was 1.4l (0.43l to 4.4l) and predicted FEV1 was 65% (21% to 286%). Median actual DLCO was 11.7 CO/mmHg/min (3.4 CO/mmHg/min to 24.2 CO/mmHg/min) and median predicted DLCO was 53% (10% to 103%). Pretreatment pulmonary function was significantly different between the five institutions: median FEV1 was 1.6l and 1.2l in the institutions with best and worst pulmonary function. Median follow-up was 12 months; follow-up was longer than 2 years in 23% of the patients. Two-year overall survival (OS) was 64% for all patients and pneumonitis grade >=II was observed in 6%. Using log-rank test, actual and predicted DLCO as well as actual FEV1 were significantly correlated with OS. Two-year OS was 47% and 74% for patients with DLCO maximum 9.7 CO/mmHg/min and more than 9.7 CO/mmHg/min, respectively (p=0.002); two-years OS was 44% and 64% for patients with FEV1 maximum 0.95l and more than 0.95l, respectively (p=0.01). In the multivariate analysis, this correlation between PFT overall survival did not remain statistically significant. No correlation between pretreatment PFT and pneumonitis grade >=II was observed.

Conclusion

Pretreatment pulmonary function was significantly different between the five institutions. Poor pulmonary function did not result in increased rates of toxicity or decreased overall survival after image guided SBRT. Poor pulmonary function within the range reported in this study should therefore not be a contraindication for SBRT.