

AbstractID: 5501 Title: Analysis of Radiation-Induced Pneumonitis in Lung Cancer Patients

**Purpose:** To study clinical, physiological, biological and dose-volume factors in lung cancer patients who developed symptomatic radiation-induced pneumonitis (RP).

**Method and Materials:** Data from two-hundred patients with non-small cell lung cancer who received 3D conformal radiotherapy (RT) treatment were analyzed using an in-house developed MATLAB-based analysis tool, EUCLID. The effect of 52 clinical, physiological and biological factors, as well as dosimetric variables extracted from the lung dose-volume histogram (DVH) was analyzed using univariate and multivariate approaches.

**Results:** Thirty nine patients (19%) developed RP. In the univariate analysis, the forced expiratory volume in 1 second (FEV1) post-treatment, normal tissue complication probability (NTCP), mean lung dose, history of smoking, level of TGF- $\beta$  post-treatment and nodal stage were associated with RP ( $p$ -range 0.001-0.033). When considering the percentage of volume of lung receiving more than a specified dose, we found that 60 Gy (V60) yields the strongest correlation with RP ( $p=0.0001$ ). In the multivariate analysis, a logistic regression analysis was performed using different sets of uncorrelated variables. The predictive power of the model was quantified using the area under the Receiver-Operating Characteristic (ROC) curve. The best result was obtained with V30, FEV1, age, time of chemotherapy (before, after or concurrent with RT) and Lobe (location of tumor inside the lung). The area under the curve for these variables was 0.85. While only the regression coefficients of V30 and FEV1 determined a correlation with RP with a  $p$ -value less than 0.05, the exclusion of the other three variables led to a lower area under the curve.

**Conclusion:** V30 and FEV1 were the best predictors of symptomatic RP after external beam RT for lung cancer. Multivariate analysis showed that other clinical factors that are not individually strongly associated with RT can be included in a regression model to increase the predictive power of that model.