Pulmonary Function Trends Following Modern Radiotherapy: Association of Subacute PFT Decline with CTC Provider Assessment and Late PFT Change

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Purpose/Objectives

- The correlation between subacute pulmonary function test (PFT) decline and Common Terminology for Adverse Events (CTCAE) toxicity grade is not well characterized.
- The relationship between subacute PFT decline and long term PFT decline is unknown.
- In this report, we determine predictors of CTCAE pulmonary toxicity including subacute PFT decline and correlate subacute PFT change with long term PFT decline.

Materials/Methods

- Between 05/2008 and 10/2015, lung cancer patients treated with definitive-intent IMRT with baseline and serial post-radiation pulmonary function tests (PFTS) were identified.
- Baseline patient characteristics, treatment details, and subacute and late toxicities were recorded.
- Post-treatment PFTs were normalized by patient to baseline PFTs and the relative declines were reported in < 6 month and >12 month time intervals, which were the time intervals representative of the subacute (pneumonitis) and chronic (fibrotic) settings, respectively.
- Univariate and multivariate modeling was used to determine predictors of CTCAE grade ≥ 2 RP and to correlate subacute PFT change with long term PFT decline.

Results

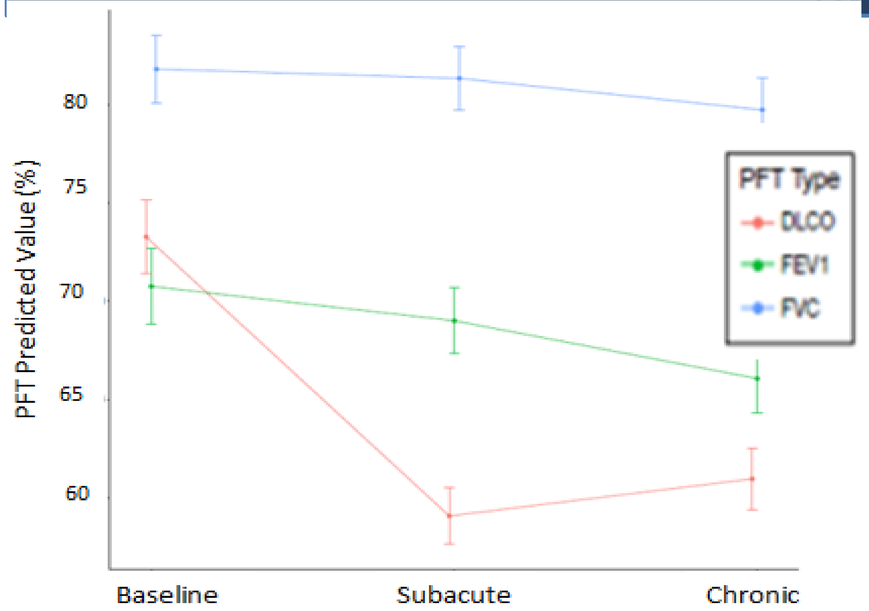

Figure 1: Longitudinal PFT outcomes for overall cohort: FEV1 and FVC demonstrate mild decline and DLCO declined more steeply with some improvement in chronic phase. Values represent mean values with standard error bars.

Variable	Odds ratio (RP = 10.8%)	P-value
Race		
Caucasian	Ref	-
African American	0.16	0.08
Other	0.6	0.6
BMI	1.07	0.07
Decrease DLCO*	1.05	0.02
Decrease FEV1*	1.03	0.05
Decrease FVC*	1.04	0.03

Table 1: Univariate analysis for grade ≥ 2 RP: * = subacute. Only significant or trending variables displayed. Odds ratio >1 represents increased risk of RP. BMI and subacute DLCO, FEV1, and FVC decline correlated with RP while African American race was protective. Additional variables tested include: Age, smoking history, COPD, tumor location by lobe and laterality, TNM stages, histology, dose prescription, GTV volume, lung-GTV volume, V20 lung, V10 lung, V05 lung, and mean lung dose.

Variable	Odds ratio (RP=10.8%)	P-value
African American	0.05	0.06
Middle lobe	74.8	0.05
Decrease DLCO*	1.08	0.01
Decrease FEV1*	1.03	0.06
Decrease FVC*	1.04	0.07

Table 2: Multivariate analysis for RP: * = subacute. Significant or trending variables displayed. Odds Ratio >1 represents increased risk of RP. Subacute PFT decline remained significant or trended toward increased risk of RP. Middle lobe tumors (compared to upper lobe) predicted for RP while African American race was protective.

Variable	Coefficient	P-value
Late DLCO		
Middle lobe	24.8	0.03
Lower lobe	9.19	0.06
Decrease DLCO*	0.78	<0.001
Late FEV1		
Decrease FEV1*	0.88	<0.001
Late FVC		
Decrease FVC*	0.80	<0.001

Table 3: Multivariate analysis for Late PFT change: * = subacute. Significant or trending variables displayed. Coefficient explanation example: For middle lobe tumors (compared to upper lobe) there is a 24.8 point decrease in mean percent predicted DLCO in chronic setting. Subacute PFT decline strongly predicted for late PFT decline. Additional predictors of late DLCO decline were middle and lower lobe tumors.

Conclusions

- Subacute PFT decline was associated with CTCAE grade ≥ 2 RP
- An additional predictor of RP was middle lobe tumors while African American race was protective.
- Subacute PFT decline is an independent predictor for sustained PFT decline greater than 12 months following therapy.
- Additional predictors of late DLCO decline were middle and lower lobe tumors.