Examination of Genetic Alterations in Young Lung Cancer Patients From the Lung Cancer Registry

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BACKGROUND

- Lung cancer is the leading cause of new cancers and cancer deaths in the United States. Past SEER reports have shown an increased incidence of lung cancer in individuals at younger ages.
- Associations have also been shown with certain genetic mutations, such as ALK, EGFR and PDL1, but the results have been mixed due to multiple confounding factors, such as smoking status, sex, race, etc. More research in this area is, therefore, needed in order to identify risk factors in this population
- The purpose of this report is to examine associations between specific genetic mutations, such as ALK, EGFR and PDL1, and young onset lung cancer (age≤50), as well as other demographic, clinical and socioeconomic factors.

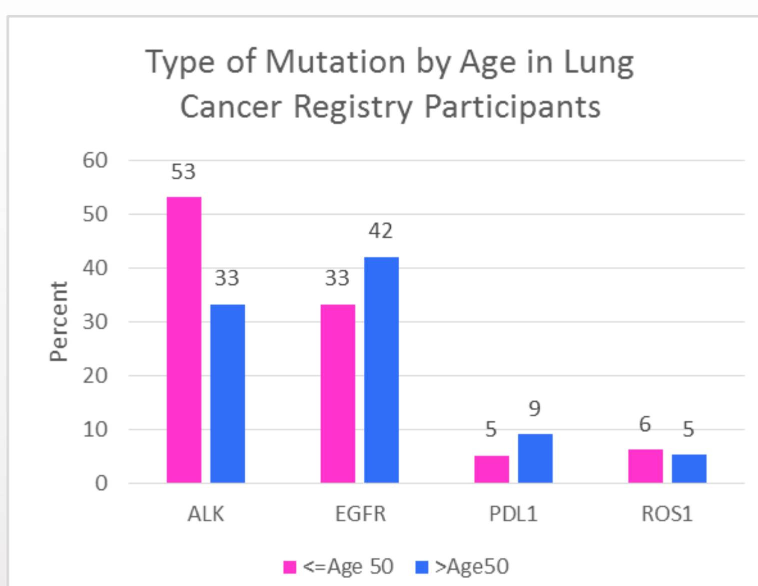
METHODS

- The Addario Lung Cancer Foundation and other sponsors (see below) have implemented the Lung Cancer Registry which provided patient-reported demographic and clinical information for 1,105 lung cancer cases for this analysis.
- Data were analyzed using multiple logistic regression models to examine associations between genetic alterations (ALK, ROS1, EGFR, and PDL1) and young lung (age≤50), as well as other factors, including sex, race, education, insurance, marital status, histology, stage at diagnosis and smoking.
- Odds ratios (ORs) from multiple logistic regression models were used to assess associations between genetic mutations and potential confounders by age among lung cancer registry participants.

RESULTS

Demographic/Clinical Characteristics of Participants

	Age≤50 n (%) 295(26.7)	Age>50 n (%) 810(73.3)	Total n (%) 1,105
Gender			
Male	77(26.0)	211(26.0)	288(26.0)
Female	218(74.0)	599(74.0)	817(74.0)
Race			
White	222(75.8)	714(90.6)	936(86.6)
Black	10(3.4)	17(2.2)	27(2.5)
Other	63(20.8)	59(7.2)	118(8.6)
Marital Status			
Married	175(79.2)	354(75.0)	529(76.3)
Not married	46(20.8)	118(25.0)	164(23.7)
Educ			
High School	59(27.1)	187(39.9)	246(35.8)
College/Grad Prof	159(72.9)	282(60.1)	441(64.2)
Insurance			
Private	181(74.7)	440(62.3)	621(63.6)
Medicare	24(9.9)	186(26.3)	210(21.5)
Other Public	37(15.4)	80(11.4)	117(12.3)
Stage			
Early (I, II)	23(8.9)	141(20.1)	164(17.1)
Late (III, IV)	237(91.2)	560(79.9)	797(82.9)
Histology			
Adenocarcinoma	220(80.0)	557(73.1)	777(74.9)
Non-adenocarcinoma	55(20.0)	707(26.9)	762 (25.1)



Logistic Regression Models For Selected Mutations by Age Group

ALK

Multivariate	OR(95% CI)
Age (≤50 vs >50)	1.78 (1.18, 2.66)
Gender (female vs male)	0.80 (0.52, 1.23)
Race (non-white vs white)	1.27 (0.73, 2.19)
Marital Status (married)	1.58 (0.95, 2.64)
Insurance (private vs public)	1.14 (0.76, 1.72)
Stage (late vs early)	2.93 (1.02, 1.08)
Histology (adeno vs non-adeno)	1.96 (1.17, 3.33)
Smoking (ever vs never)	2.86 (1.89, 4.32)

EGFR

Multivariate	OR(95% CI)
Age (≤50 vs >50)	0.76 (0.48, 1.22)
Gender (female vs male)	0.69 (0.41, 1.15)
Race (non-white vs white)	0.62 (0.35 1.09)
Marital Status (married)	0.92 (0.54, 1.56)
Insurance (private vs public)	1.30 (0.82, 2.07)
Stage (late vs early)	1.85 (0.90, 3.01)
Histology (adeno vs non-adeno)	1.66 (0.92, 3.33)
Smoking (ever vs never)	2.22 (1.38, 4.37)

PDL1

Multivariate	OR(95% CI)
Age (≤50 vs >50)	1.22 (0.73, 2.05)
Gender (female vs male)	0.48 (0.29, 0.79)
Race (white vs non-white)	1.09 (0.53, 2.22)
Marital Status (married)	0.90 (0.50, 1.65)
Insurance (private vs public)	1.13 (0.68, 1.88)
Stage (late vs early)	4.05 (1.42, 11.59)
Histology (adeno vs non-adeno)	0.85 (0.48, 1.53)
Smoking (ever vs never)	0.83 (0.49, 1.40)

SUMMARY

- Of 1,105 registry participants with lung cancer, about 27% were ≤age 50. Of those ≤age 50, 74% were female, 76% were white, and over 70% were married and/or had college degrees. Over 90% were diagnosed at late stage and 80% had adenocarcinoma compared to 80% and 73% of those over age 50, respectively. Approximately 75% of those ≤age 50 were privately insured compared to 63% of those >age 50.
- Logistic regression analyses for selected mutations by age revealed a 78% greater odds of having an ALK mutation for those under age 50 vs over 50, adjusting for covariate factors. No significant differences by age group were found for other mutations, however.
- Increased odds of ALK and EGFR were 2- and 3-fold, respectively, for smokers. Similar increases in odds of ALK were also seen for late stage and adenocarcinoma. Late stage also showed a 4-fold increased odds of PDL-1, but female gender showed almost 50% lower odds of PDL-1.
- No significant differences were found for insurance, which served as a proxy for socioeconomic status.

CONCLUSIONS

- Overall the results of this lung cancer registry analysis shed new light on predictive factors of genetic alterations for lung cancer. Differences by age were observed for the ALK mutation, and smoking showed strong associations for both ALK and EGFR. Past studies have shown strong associations between smoking and EGFR.
- The PDL1 and ALK results by stage and histology indicate increased expression during tumor progression and aggravation of immunosuppression in the microenvironment. The results on lower odds of PDL1 for females were also of interest and should be further explored.
- This study did not reveal any evidence of disparities by race or socioeconomic status, but the majority of the respondents were white and highly educated. Therefore, future studies in larger and more diverse populations are needed to further examine these differences.