

Lung cancer and aortic aneurysms: evidence for an inherent linkage

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Background

- While its incidence has continued to decline, lung cancer remains the leading cause of cancer-related deaths.^{1,2}
- Lung cancer has long been associated with smoking as a major contributing risk factor.³
- Smoking has also been found to be the leading modifiable risk factor for aortic aneurysms (AA).^{4,5}
- There has been a documented association between AA and COPD,⁶ suggesting that there may be innate underlying factors predisposing patients to both pulmonary and arterial disease.
- There is significant overlap in the populations screened for lung cancer and AAA:

LUNG CANCER SCREENING CRITERIA	AAA SCREENING CRITERIA
Patients must be:	Patients must be:
-55-80 years old	-Male
-Currently smoke or have quit in the past 15 years	-65-75 years old
-Have at least a 30 pack-year history	-Have a smoking history

Source: USPSTF Screening recommendations. 2018.

Long Hypothesis (PICO criteria)

- Because smoking is a common risk factor for both lung cancer and aortic aneurysms, and there has been a documented association between AAA and other lung disease, patients with lung cancer may possess a higher prevalence of AAA compared to age- and risk-factor matched controls.
- If so, might changes in screening strategies prevent morbidity and mortality from AAA?

Methods

- The Lung Cancer Program database was used to query for patients diagnosed with lung cancer within the past 15 years who also had PET-CT imaging with fusion pictures.
- Demographic and risk factor data was obtained.
- Patients' original whole-body PET-CT scans were re-read for measurements of the aorta.
- A group of controls matched for age and sex was obtained for comparison.*
- *These are patients that had CT scans of the chest and abdomen during ED visits for trauma without a history of cancer
- Patients with metastatic lung cancer were excluded from analysis.

Results

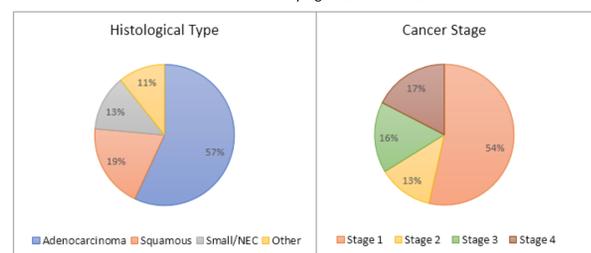
- A total of 814 patients were included in the study (47% male, 53% female).
- Ninety patients (11.1%) had evidence of AAA, compared to a prevalence of 2% in the control group (p = 0.0023).
 - 12% had aneurysms that required treatment*
- Patients with a history of smoking were more likely than non-smokers to have a AAA (11.9% vs 2.2%, p = 0.0021).
- A majority of AAA patients (76.6%) had early stage lung cancer (1 or 2).
- Women in this patient population had a strikingly high prevalence of AAA (5.3%).

	LC (814)	Control (100)	p-value
Male sex	47%	50%	0.577
Age (mean)	68	64	0.72
Smoking hx	89%	100%	0.001
AAA	11.10%	2%	0.004

Logistic Regression Analysis*

	Exp(B)	p-value
Sex (Male)	3.705	<.001
Age	1.07	<.001
Smoking (PY)	1.01	0.004
HTN	2.3	0.02

*only significant variables shown here



Conclusion and Limitations

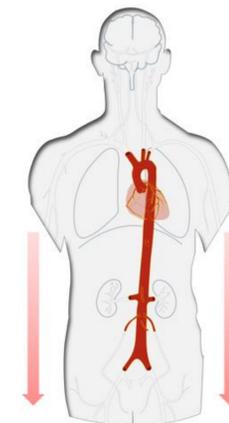
- Patients with lung cancer have a high prevalence of AAA (~11%).
- Smokers are more likely than non-smokers to have AAA, insinuating that lung cancer and AAA affect similar patient populations.
- This data may help lead to changes in AAA screening that can reduce morbidity and mortality from AAA.
- Limitations of this study include patients being from a single medical center, suboptimal sample size (which interfered with subgroup analysis), and the retrospective nature of the study.

Future Direction

- Further prospective studies should focus on examining the survival benefit of screening for AAA at the same time as lung cancer screening.
- If a reduction in mortality is shown in such studies, changes in screening guidelines should be made to include screening for AAA in populations not currently screened, which includes women and non-smokers.
- Simultaneous screening for lung cancer and AAA can easily be achieved by extending the low-dose CT scan into the abdomen.**

Further Readings/Citations

- U.S. Cancer Statistics Working Group (2017). United States Cancer Statistics: 1999-2014 Incidence and Mortality Web-based Report. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute.
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Background: Lung cancer and aortic aneurysms possess multiple shared risk factors including increasing age and smoking history. While there are screening guidelines in place for both conditions, they vary in methodology (low-dose chest CT scan vs abdominal ultrasound) despite having significant overlap in the patient populations screened. The focus of this study involved demonstrating a close connection between the patient populations of both lung cancer and aortic aneurysms in order to suggest a change in the process in which we screen for these conditions.

Methods: After obtaining IRB approval, ICD codes were used to query the SBUH patient database for all patients diagnosed with lung cancer within the past 15 years. Data regarding demographics and various risk factors was obtained, and patients' original whole-body PET-CT scans were re-read for measurements of the thoracic and abdominal aorta. A group of age- and risk factor-matched controls with CT scans done for reasons other than cancer surveillance was obtained for use in descriptive statistics.

Results: A total of 814 patients with lung cancer were included in the study. A total of 90 patients (11.1%) had either a thoracic or abdominal aortic aneurysm (AAA) measuring > 3.0 cm found on baseline PET-CT scan, compared to 2% in the control group (p = .0052). A majority of these aneurysms (75%) were of the infrarenal abdominal aorta. Of all patients with aneurysms, 12% had aneurysms that required treatment (size > 5.5 cm for AAA or evidence of previous surgical intervention). Additionally, 74% of patients with aneurysms had early-stage lung cancer (stages 1 or 2).

Conclusion: Patients with lung cancer have a higher prevalence of aortic aneurysms compared to age- and risk factor-matched controls. Because of the risk factors shared between these two diseases, patients at risk of lung cancer are also at an inherently increased risk of developing AAA. In patients with lung cancer that also had aortic aneurysms, most were diagnosed as having stage 1 or 2 cancer, suggesting that these patients would likely see a mortality benefit from aneurysm repair. Thus, we recommend it may be beneficial to utilize the low-dose CT scan used to screen for lung cancer to simultaneously screen for AAA by extending the scan through the abdomen.