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Histopathological and CT Imaging Correlation of Various Primary Lung Carcinoma

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Abstract: ***Aim****: To analyze chest radiographic patterns of different histopathologically confirmed cases of lung cancer. This current series is compared with historic published data.*
Design: *Retrospective, using a tumor registry.We studied three hundred forty-five patients with newly diagnosed lung cancers presenting between October 1990 and August 1992.*
Methods: *Radiographs were interpreted by two radiologists blinded to cell type. Our results were compared statistically to published data from Mayo Clinic patients in the 1950s and 1960s.*
Results: *(1) Adenocarcinoma: Decreased presentation as a peripheral tumor in current series (49%) compared with historic control at Mayo (72%); (2) squamous cell: increased presentation as peripheral tumor in current series (43%) compared with historic control (31%); and (3) no statistically significant difference between adenocarcinoma (49%) and squamous (43%) for a presentation as a peripheral mass, or between adenocarcinoma (46%) and squamous (52%) for central origin in the current series of cases.*
Conclusion: *As adenocarcinoma has increased in relative frequency among lung cancers, the percent of cases with peripheral primary tumors is decreased while central tumors have increased. Squamous carcinoma has had a relative increase in peripheral mass presentation. There is now no significant difference between these two cell types in percent presenting as a peripheral mass or central tumor on chest radiograph.*
Keywords: *Lung cancer, Chest CT, Histopathological reports, Statistics, Adenocarcinoma*

I. Introduction

Lung carcinoma is the most common fatal malignancy in both men and women.

Risk Factors: Tobacco(cigarette smoke) is the most common cause(90%) of all cases, Occupational exposure : among which the most common is asbestose exposure, COPD and Genetic predisposition. Median age for presentation is 70 yrs, while it is rare under 30 yrs of age.

Most Common Symptoms : Chest pain, Wheezing, Fatigue, Loss of appetite, Continuous cough, Coughing up blood and Shortness of breath. [4]

The main objective of this study is to analyze chest radiographic patterns of different histopathologically confirmed cases of lung cancer , as there are times when both CT imaging & hisopatholigcal reports do not correlate.

We studied three hundred forty-five patients with newly diagnosed lung cancers presenting between October 1990 and August 1992. Radiographs were interpreted by two radiologists blinded to cell type. Our results were compared statistically to published data from Mayo Clinic patients in the 1950s and 1960s. Results show that now, there is no significant difference between these two cell types in percent presenting as a peripheral mass or central tumor on chest radiograph.[5]

II. Material And Methods

Retrospective study of 50 patients with pathologically proven lung carcinoma was done. Patient assessed for various CT characteristics like- location, internal cavitations, necrosis & calcification, mediastinal invasion, mediastinal lymphadenopathy, metastasis, pleural effusion and collapse-consollidation.

Exclusion criteria: Patient already treated for lung carcinoma, Patient diagnosed lung carcinoma other than adenocarcinoma, squamous cell carcinoma, large cell carcinoma and small cell carcinoma. Mucoepidermoid carcinoma.

III. Results

Table 1: Distribution Of Various Histopathological Types Of Primary Lung Cancers By Percentage

Pathological type	Number of cases	Percentage(%)
Adenocarcinoma	21	42
Squamous cell Ca.	16	32
Small cell Ca.	9	18
Large cell Ca.	4	8

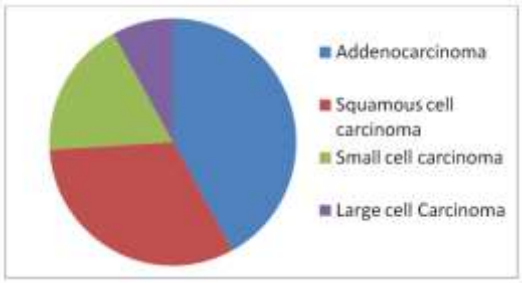

Fig 1 : Distribution Of Various Histopathological Types Of Primary Lung Cancers By Percentage

Table 2 : Comparison Of Adenocarcinoma And Other Lung Carcinoma According To Central And Peripheral Location

Pathological type	Centrally loated lesion	Peripherally located lesion	Total
Adenocarcinoma	6(28.6%)	15(71.4%)	21
Other lung carcinoma	18(62.1%)	11(37.9%)	29
	24	26	50

Chi square: 5.476 p-value: 0.019 (p value<0.05)

Table 3 : Comparison Of Squamous Cell Carcinoma And Other Lung Carcinoma According To Central And Peripheral Location

Pathological type	Centrally located lesions	Peripherally located lesions	Total
Squamous cell Ca.	12(75%)	4(25%)	16
Other lung carcinoma	12(35.3%)	22(64.7%)	34
	24	26	50

Chi square: 6.872 p-value: 0.008 (p value<0.05)

Central location of squamous cell carcinoma and peripheral location of adenocarcinoma was found significantly statistically associated with p value of 0.008 and 0.019 respectively, which means central location of lung carcinoma favours squamous cell carcinoma and peripheral location favours adenocarcinoma.

Table 4 : Percentage Distribution Of Tumors By Internal Calcification

Pathological type	Number of cases	Lesions With internal calcification	Percentage(%)
Adenocarcinoma	21	3	14.28
Squamous cell Ca.	16	3	18.75
Small cell Ca.	9	2	22.22
Large cell Ca.	4	0	0

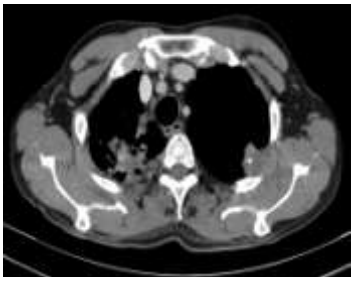

Fig. 2: Lung Carcinoma with internal calcification

Table 5 :Percentage Distribution Of Tumors By Internal Necrosis

Pathological type	Number of cases	Lesions with internal necrosis	Percentage(%)
Adenocarcinoma	21	12	57.14
Squamous cell Ca.	16	9	56.25
Small cell Ca.	9	5	55.55
Large cell Ca.	4	3	75

Fig. 3: Lung Carcinoma with internal necrosis

Internal Calcifications and Necrosis:

None of the tumors were statistically significantly associated with internal calcifications and internal necrosis.

Table 6 : Percentage Distribution Of Tumors By Internal Cavitations

Pathological type	Number of cases	Lesions with internal cavitations	Percentage(%)
Adenocarcinoma	21	3	14.28
Squamous cell Ca.	16	6	37.5
Small cell Ca.	9	1	11.11
Large cell Ca.	4	0	0

Fig. 4: Lung Carcinoma with internal cavitations

Internal Cavitations:

When cavitations in squamous cell carcinoma were compared to cavitations in other lung carcinomas, the difference was found to be significant (p value= 0.03), which means that cavitations is more common in squamous cell carcinoma than other lung carcinomas.

Table 7 : Percentage Distribution Of Tumors By Mediastinal Lymphadenopathy

Pathological type	Number of cases	Lesions with mediastinal LAP	Percentage(%)
Adenocarcinoma	21	12	57.14
Squamous cell Ca.	16	7	43.75
Small cell Ca.	9	7	77.77
Large cell Ca.	4	3	75

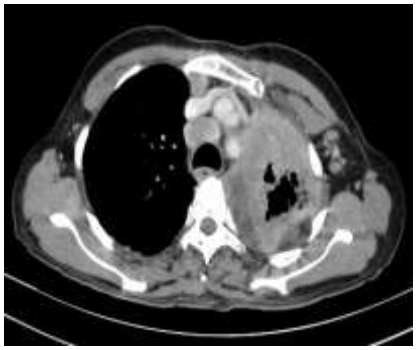

Fig. 5: Lung Carcinoma with mediastinal lymphadenopathy

Table 8 : Percentage Distribution Of Tumors By Mediastinal Invasion

Pathological type	Number of cases	Lesions with mediastinal invasion	Percentage(%)
Adenocarcinoma	21	4	19.04
Squamous cell Ca.	16	9	56.25
Small cell Ca.	9	4	44.44
Large cell Ca.	4	0	0

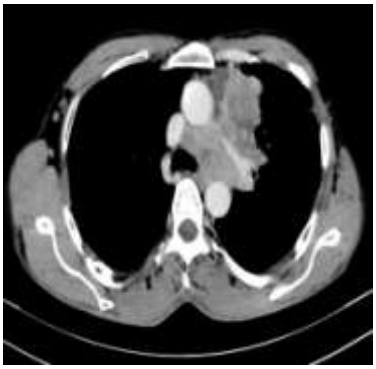

Fig. 6: Lung Carcinoma with mediastinal invasion

Mediastinal Lymphadenopathy And Mediastinal Invasion:

None of the tumors were significantly associated with mediastinal lymphadenopathy and mediastinal invasion. Mediastinal lymphadenopathy was more common in small cell carcinoma, however was not statistically significant (p value=0.18). Mediastinal invasion/involvement was more common in squamous cell carcinoma, due to its central location, however it was not statistically significant (p value=0.68).

Table 9 : Percentage Distribution Of Tumors By Pleural Effusion

Pathological type	Number of cases	Lesions with pleural effusion	Percentage(%)
Adenocarcinoma	21	6	28.57
Squamous cell Ca.	16	3	18.75
Small cell Ca.	9	4	44.44
Large cell Ca.	4	1	25

Fig. 7: Lung Carcinoma with pleural effusion

Pleural Effusion:

Pleural effusion is common in the adenocarcinoma and small cell carcinoma due to their early metastatic characteristic. However, pleural effusion is not statistically associated with any of the subtypes of lung carcinoma and pleural effusion, itself is a nonspecific finding.

Table 10 : Percentage Distribution Of Tumors By Collapse-Consolidation

Pathological type	Number of cases	Lesions with collapse-consolidation	Percentage(%)
Adenocarcinoma	21	8	38.09
Squamous cell Ca.	16	9	56.25
Small cell Ca.	9	5	55.55
Large cell Ca.	4	0	0

Fig. 7: Lung Carcinoma with collapse and consolidation

Collapse and Consolidation:

None of the tumors were statistically significantly associated with collapse and consolidation.

Table 11 : Percentage Distribution Of Tumors By Adrenal Metastasis

Pathological type	Number of cases	Lesions with adrenal metastasis	Percentage(%)
Adenocarcinoma	21	3	14.28
Squamous cell Ca.	16	1	6.25
Small cell Ca.	9	4	44.44
Large cell Ca.	4	1	25

Table 12 : Percentage Distribution Of Tumors By Liver Metastasis

Pathological type	Number of cases	Lesions with liver metastasis	Percentage(%)
Adenocarcinoma	21	4	19.04
Squamous cell Ca.	16	2	12.5
Small cell Ca.	9	4	44.44
Large cell Ca.	4	2	50

Table 13 : Percentage Distribution Of Tumors By Bone Metastasis

Pathological type	Number of cases	Lesions with bone mets	Percentage(%)
Adenocarcinoma	21	2	9.52
Squamous cell Ca.	16	1	6.25
Small cell Ca.	9	1	11.11
Large cell Ca.	4	0	0

Table 14 : Percentage Distribution Of Tumors By Lung Metastasis

Pathological type	Number of cases	Lesions with lung metastasis	Percentage(%)
Adenocarcinoma	21	5	23.80
Squamous cell Ca.	16	2	12.5
Small cell Ca.	9	4	44.44
Large cell Ca.	4	1	25

Metastasis: As compared to other cell types of lung carcinoma, there was significant statistical association(p value=0.02) noted between adrenal metastasis and small cell carcinoma, which means adrenal metastasis more commonly associated with small cell carcinoma.

Metastasis to the liver, bone and lung were not significantly statistically associated with any of the pathological cell types of lung carcinoma. Small cell carcinoma is most disseminated lung carcinoma at presentation.

IV. Discussion

Screening for lung cancer is hoped to reduce mortality from this common tumor, which is characterized by a dismal overall survival, relatively well defined risk groups (mainly heavy cigarette smokers and workers exposed to asbestos) and a lack of early symptoms. In the past studies, using sputum cytology and chest radiography have failed to demonstrate any reduction in lung cancer mortality through screening. Then, general recommendations to screen individuals at risk of lung cancer with low-dose CT was made.[1]

CT has recently been used in mass screening for lung cancer. Small cancers have been identified, but the growth characteristics of these lesions are not fully understood. Results of the study showed that annual mass screening CT for 3 successive years resulted in the identification of a large number of slowly growing adenocarcinomas that were not visible on chest radiographs.[2]

In a study of the lobar distribution of tumors in 250 consecutive cases of primary bronchial cancer, it was noted that 130 of the tumors originated in the upper lobes, 11 in the right middle lobe and 49 in the lower lobes. Some 40 originated in the main bronchi and most of the remainder were either "hilar" or unspecified in anatomic location. There was no apparent correlation of the lobar site of these tumors with the lobar location of childhood pneumonic lesions as observed in another group of patients in the same hospital.[3]

The presence of symptoms and findings were in general related to disease stage but bore little relationship to cell type.[4]

Two hundred thirty-six surgically resected small peripheral adenocarcinomas were reviewed using a simple histologic classification of six types based on tumor growth patterns. In this study, Type A (localized bronchioloalveolar carcinoma [LBAC]) revealed replacement growth of alveolar-lining epithelial cells with a relatively thin stroma. In type B (LBAC with foci of structural collapse of alveoli), fibrotic foci due to alveolar collapse were observed in tumors of LBAC. Type C (LBAC with foci of active fibroblastic proliferation) was the largest group in this study and foci of active fibroblastic proliferation were evident. Type D (poorly differentiated adenocarcinoma), type E (tubular adenocarcinoma) and type F (papillary adenocarcinoma with a compressive growth pattern) showed compressive and expanding growth. Types A and B showed no lymph node metastasis and the most favorable prognosis (100% 5-year survival) of the six types. Histologic types A and B are thought to be in situ peripheral adenocarcinoma, whereas type C appears to be an advanced stage of types A and B. Conversely, types D, E, and F are small advanced adenocarcinomas with a less favorable prognosis.[6]

Current imaging for bronchogenic carcinoma makes use of plain chest radiographs, CT, MRI, and nuclear medicine. Most studies are designed to detect anatomic abnormalities, leading to some problems in sensitivity and especially specificity. In the future, imaging may be directed more at tumor biology (molecular and genetic targets) and perhaps then will have a greater impact on this devastating disease.[7]

V. Conclusion

Central location favours Squamous Cell Carcinoma and Peripheral location favours Adenocarcinoma.
Cavitaion is more commonly associated with Squamous Cell Carcinoma.
Adrenal metastasis at presentation is most commonly associated with Small cell Carcinoma.
All other characteristics such as mediastinal invasion, mediastinal lymphadenopathy, metastasis elsewhere, pleural effusion, internal calcifications and necrosis, do not have significant association with any of the pathological cell types.

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