Original Article

Radiological and Clinicopathological Findings in Large Case Series study of Lung Cancer in Erbil City/Iraq

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Abstract

Background: Lung cancer (LC) is the most common fatal malignant neoplasm worldwide, especially in developing countries. **Objective:** The objective of this study was to evaluate the correlation between radiological and clinicopathological findings of the LC. **Materials and Methods:** A retrospective study was performed on 446 patients in Erbil city/Iraq from January of 2014 to December of 2016. **Results:** The mean (± standard deviation) age at diagnosis was 65.21 (±10.9) for males versus 62.1 (±9.98) years for females. Most cases of squamous cell carcinoma and small-cell carcinoma were current or ex-smokers, whereas adenocarcinoma was common in passive and never smokers. The right lung was affected more than the left lung ($P < 0.05$). The most common histological subtypes in the right upper lobe were adenocarcinoma and small-cell carcinoma, whereas the left upper lobe was affected mostly by squamous cell carcinoma ($P < 0.001$). Adenocarcinoma commonly presented with peripheral mass, whereas hilar ± central mass was common in small-cell carcinoma and squamous cell carcinoma. Cavitation was seen mainly in squamous cell carcinoma ($P < 0.001$). **Conclusions:** LC is a disease of old age presenting at late stage. Smoking remains the major cause of LC. Despite increasing the frequency of adenocarcinoma still it is not more common than squamous cell carcinoma as seen in developed countries. Adenocarcinoma is predominant in never and passive smokers. The right lung is affected more than the left lung. Adenocarcinoma and small-cell carcinoma affect the right upper lobe, whereas squamous cell carcinoma affects the left upper lobe. Further studies are necessary to confirm or refute the side and lobe preference by LC.

Keywords: Lobe, lung cancer, radiological results, smoking

Introduction

Lung cancer (LC) is the most common fatal malignant neoplasm worldwide.[1]

It is usually presented with an advanced disease and accounts for more cancer deaths than any other cancer.[2] LC is predominantly a disease of older people. The most common age of presentation is between the age group of 75 and 79 years, and 85% of registrations occur in people over the age of 60 years and 60% of registrations in people over the age of 70 years. The male-to-female LC incidence ratio is approximately 1.5:1.[3]

A number of lifestyle and environmental factors have been associated with the development of LC, of which cigarette smoking is the most important risk factor which accounts for approximately 80%–90% of all LCs.[4] LC occurring among never smokers is believed to be different from that occurring among smokers, and this hypothesis is supported by differences in the molecular profile seen in the two groups.[5]

The staging should proceed with the aim of identifying patients who can be treated with curative intent as much as possible while minimizing expensive and invasive testing. The staging classifications of the American Joint Committee on Cancer for non-small-cell LC (NSCLC) and SCLC now both follow the tumor-node-metastasis system.[6]

In general, LCs present slightly more often on the right than the left side and in the upper than in the lower lobes.[7] About 40% of the chest radiographic appearances of LC are related to

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Access this article online

Quick Response Code:

Website:
www.medjbabylon.org

DOI:
10.4103/MJBL.MJBL_86_18

the central tumors causing airway obstruction with secondary atelectasis and consolidation.[8]

Overall, 40% of patients with LC present with distant metastatic disease at presentation, 30% present with locally advanced disease (Stage IIIA/IIIB), whereas only the remaining 24%–30% present in either Stage I or Stage II.[9]

In most cases, the overall management of LC dependent on staging and patient performance status involves a combination of chemotherapy, radiation, bronchoscopic intervention, and surgery. The role of targeted therapies in NSCLC is growing rapidly.[4,10] Because there are few studies analyzing the importance of histopathological patterns on radiological presentation of LC, this study aimed to evaluate the correlation between radiological and clinicopathological findings of the LC.

MATERIALS AND METHODS

This retrospective case series study was performed on 446 patients using a hospital tumor registry of both Rizgary Teaching Hospital and Nanakali Hospital in Erbil city of Iraqi Kurdistan Region. Medical records from patients' files were reviewed, and variables such as age, gender, smoking status, presenting symptoms, primary anatomical site, computed tomography (CT) scan findings, stages, and histopathological findings were studied from January 2014 to December 2016.

Reports of chest CT (64 slices) with contrast (iohexol intravascular injection) reports of all patients were reviewed, and radiological findings were classified according to the side, lobe, central mass, peripheral mass, cavitary mass, mediastinal mass, collapse, consolidation, and pulmonary nodule of tumor involvement or complication of the tumor. Inclusion criteria included any patient from Erbil city with confirmed LC by histopathology, whereas any patient from other cities or incomplete records was excluded from the study.

Statistical Analysis: The statistical calculations were performed using Statistical Package for the Social Sciences version 23 (SPSS 23, IBM Company, Chicago, USA). In cross tables, the Chi-square test was used. Fisher's exact test was used when the Chi-square test was inappropriate. $P \leq 0.05$ was considered statistically significant.

RESULTS

In this retrospective study, medical records of 446 (334 males and 112 females) patients with LC during January 2014 to December 2016 were reviewed. The mean (± standard deviation [SD]) age at diagnosis for all patients was 65.2 (±10.75) years, whereas it was 65.21 (±10.9) for males versus 62.1 (±9.98) for females. Most of the patients [364 (81.6%)] among both genders were presented between the age group of 50 and 79 years as shown in Table 1.

We found that the right lung was affected more by LC in general than the left lung, and the difference was statistically significant by Pearson's Chi-square ($P < 0.05$) [Table 2].

Table 1: Distribution of patients according to the age and gender

Age range	Sex		Total, n (%)
	Male, n (%)	Female, n (%)	
30-39	6 (1.8)	1 (0.9)	7 (1.6)
40-49	21 (6.3)	14 (12.5)	35 (7.8)
50-59	69 (20.7)	26 (23.2)	95 (21.3)
60-69	136 (40.7)	50 (44.6)	186 (41.7)
70-79	66 (19.8)	17 (15.2)	83 (18.6)
80-89	35 (10.5)	4 (3.6)	39 (8.7)
90-99	1 (0.3)	0 (0.0)	1 (0.2)
Total	334 (100)	112 (100)	446 (100)

The most common histological subtypes in the right upper lobe were both adenocarcinoma and small-cell carcinoma, whereas the subtype in the left upper lobe was squamous cell carcinoma and that in the right middle lobe was large-cell carcinoma.

The difference was statistically significant by Pearson's Chi-square ($P < 0.001$) as shown in Table 3.

Although the most common radiologic finding in squamous cell carcinoma was hilar ± central mass, about 23 (13.5%) cases of them were presented by cavitary lesion. The difference was statistically significant by Fisher's exact test ($P < 0.001$) as shown in Table 4.

The most common histopathological cell types are both squamous cell carcinoma 171 (38.3%) and adenocarcinoma 170 (38.1%), as seen in Figure 1.

We obviously found that all histological patterns presented at late stages, for example, 126 (74.1%) cases of adenocarcinoma, 20 (71.4%) of large-cell carcinoma, and 96 (56.1%) of squamous cell carcinoma presented at Stage IV, whereas 62 (80.5%) of small-cell carcinoma presented by extensive stage as shown in Figure 2.

Most cases of squamous cell carcinoma and small-cell carcinoma were current or ex-smokers, whereas most cases of adenocarcinoma were passive and never smokers as shown in Figure 3.

DISCUSSION

In this retrospective study, the age distribution showed that 364 (81.6%) of 446 patients were presented between the age group of 50 and 79 years. The mean (±SD) age at diagnosis for males was 65.2 (±10.75) years, whereas it was 62.1 (±9.98) for females, which were slightly higher when compared with other studies.[11,12] This might be explained by increasing life span in developing countries like Iraq. The results also were supported by several authors worldwide.[13-15]

The male (74.9%)-to-female (25.1%) ratio was about 3:1, similar to studies done in Iraq and Egypt, which might reflect the lower smoking rate and industrial and environmental pollutant exposures among females in these countries.[12,13,16]

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Table 2: Right or left side distribution among different histologic types of lung cancer

Lung	Histological diagnosis				Total
	Adenocarcinoma	Squamous cell carcinoma	Large-cell carcinoma	Small-cell carcinoma	
Right	112 (65.9)	87 (50.9)	18 (64.3)	53 (68.8)	270 (60.5)
Left	58 (34.1)	84 (49.1)	10 (35.7)	24 (31.2)	176 (39.5)
Total	170 (100)	171 (100)	28 (100)	77 (100)	446 (100)

Table 3: Distribution of affected lung lobes among different histological pattern of lung cancer

Lobe	Histologic diagnosis				Total
	Adenocarcinoma (%)	Squamous cellcarcinoma (%)	Large-cell carcinoma (%)	Small-cell carcinoma (%)	
RUL	79 (46.5)	47 (27.5)	7 (25.0)	39 (50.6)	172 (38.6)
RML	0 (0.0)	12 (7.0)	9 (32.1)	5 (6.5)	26 (5.8)
RLL	31 (18.2)	29 (17.0)	2 (7.1)	8 (10.4)	70 (15.7)
LUL	37 (21.8)	59 (34.5)	7 (25.0)	15 (19.5)	118 (26.5)
LLL	23 (13.5)	24 (14.0)	3 (10.7)	10 (13.0)	60 (13.5)
Total	170 (100)	171 (100)	28 (100)	77 (100)	446 (100)

RUL: Right upper lobe, RML: Right middle lobe, RLL: Right lower lobe, LUL: Left upper lobe, LLL: Left lower lobe

Table 4: Radiological patterns in different histologic subtypes of lung cancer

Radiological patterns	Histologic diagnosis			
	Adenocarcinoma (%)	Squamous cell carcinoma (%)	Large-cell carcinoma (%)	Small-cell carcinoma (%)
Pulmonary nodule	8 (4.7)	4 (2.3)	5 (17.9)	1 (1.3)
Cavitation	14 (8.2)	23 (13.5)	1 (3.6)	4 (5.2)
Consolidation	22 (12.9)	14 (8.2)	1 (3.6)	0 (0.0)
Ground glass appearance	13 (7.6)	8 (4.7)	0 (0.0)	5 (6.5)
Hilar±central mass	21 (12.4)	53 (31.0)	10 (35.7)	24 (31.2)
Mediastinal mass	14 (8.2)	37 (21.6)	4 (14.3)	19 (24.7)
Collapse	13 (7.6)	20 (11.7)	4 (14.3)	4 (5.2)
Peripheral solid mass	65 (38.2)	12 (7.0)	3 (10.7)	20 (26.0)
Total	170 (100)	171 (100)	28 (100)	77 (100)
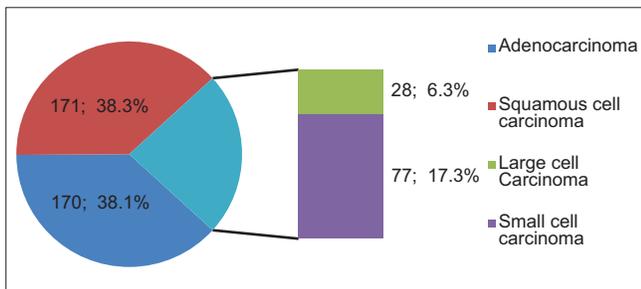
Figure 1: Percentage of different histopathological cell types

Figure 2: Frequency of different stages among different histological pattern at presentation

Regarding smoking, about 91.9% of patients were current smokers or had history of previous smoking exposure (ex-smoker and passive smoker) among all pathologic types as proved previously in many studies.[17,18] Adenocarcinoma was the most common among never smokers (77.8%) and passive smokers (71%); these results were similar to that reported in another study.[19]

In this study, the rates of both squamous cell carcinoma [171 (38.3%)] and adenocarcinoma [170 (38.1%)], the most common histopathological cell types, were similar to
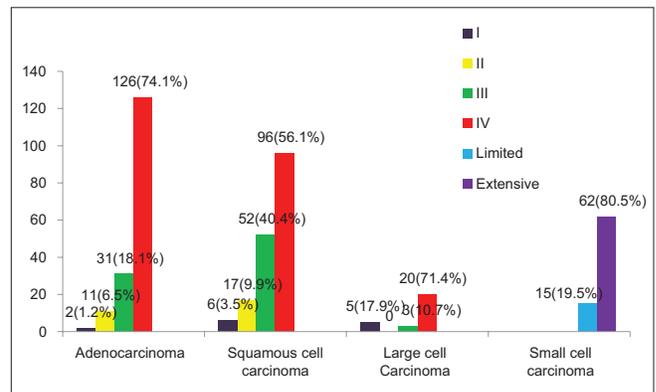
each other, followed by small-cell carcinoma [77 (17.3%)] and large-cell carcinoma [28 (6.3%)]. The incidence of adenocarcinoma increased but still not more than squamous cell carcinoma like in many developed countries which accounts for almost half of all LCs.[20]
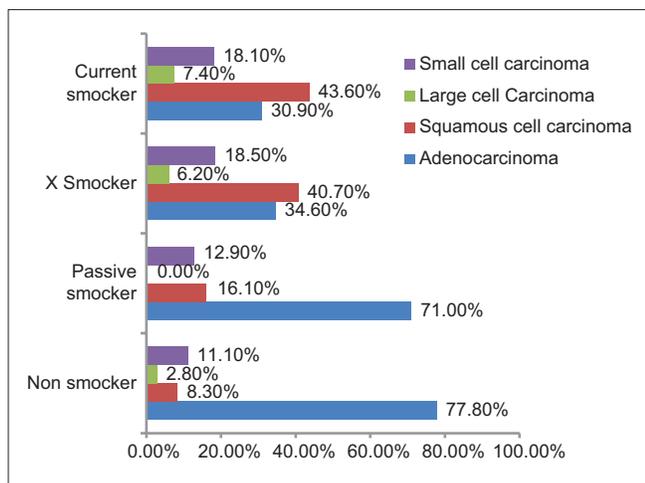
Figure 3: Frequency of different histopathological cell types in relation to smoking status

The increase in the incidence might be associated with the switch from nonfiltered to filtered cigarettes, and the depth of inhalation had been altered.[21] Shallow inhalation of smoke from unfiltered strong cigarettes resulting in deposition chemical carcinogen in central airways may lead to squamous cell carcinomas, whereas smoke from filtered milder cigarettes may be more deeply inhaled, resulting in peripherally deposited carcinogens and may lead to adenocarcinoma. Furthermore, reducing the nicotine level may lead to deeper inhalation.[22]

The changes in cigarette composition reduced the carcinogenic polycyclic aromatic hydrocarbons, which is regarded as inducers of squamous cell carcinomas, while increasing the risk of adenocarcinoma by increasing tobacco-specific N-nitrosamines.[23]

Other possible explanations may be due to better diagnosis of adenocarcinoma using mucin stains and immunohistochemical staining for diagnosis.[24]

Radiologicaly, the results of this study found that the right lung was affected more than the left lung, and the difference was statistically significant by Pearson's Chi-square ($P < 0.05$). The most common histological subtypes in the right upper lobe were adenocarcinoma and small-cell carcinoma, whereas the left upper lobe was affected mostly by squamous cell carcinoma, and the difference was statistically significant by Pearson's Chi-square ($P < 0.001$). Our results were similar to other studies.[7,25]

Although the causes for side preferences among histologic types were unexplained, there are some possible explanations for upper lobe preferences such as the persistence of toxins and carcinogens for longer times in the upper lobes due to the relative lower ventilation or lower efficiency of lymphatic depuration which also may be due to less efficient delivery of food derivatives or protective substances via circulation to the upper lobes.

Peripheral solid lung mass was the most common radiological picture in adenocarcinoma, as it occurred in 65 (38.2%)

of cases, whereas the most common finding in small-cell carcinoma and squamous cell carcinoma was hilar ± central mass. Cavitary lesions were present in 23 (13.5%) of the cases with squamous cell carcinoma. These results were also confirmed by several authors.[11,12]

We obviously found that all histological patterns presented at late stages, for example, adenocarcinoma (74.1%), large-cell carcinoma (71.4%), and squamous cell carcinoma (56.1%) presented at Stage IV probably, whereas 80.5% of small-cell carcinoma presented at extensive stage probably due to delay in diagnosis or disease aggressiveness.[26]

CONCLUSIONS

LC is a disease of old age presenting at late stage. Smoking remains the major cause of LC. Despite increasing the frequency of adenocarcinoma still it is not more common than squamous cell carcinoma as seen in developed countries. Adenocarcinoma is predominant in never and passive smokers. The right lung was affected more than the left lung. Adenocarcinoma and small-cell carcinoma affect the right upper lobe, whereas squamous cell carcinoma affects the left upper lobe.

Recommendation

Further studies are necessary to confirm or refute the side and lobe preference by LC.

Acknowledgment

Financial support and sponsorship

Conflicts of interest
There are no conflicts of interest.

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