Radiological Patterns of Bronchogenic Carcinoma in a Sample of Iraqi Patients

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Abstract

Background: Bronchogenic carcinoma considered as one of the most common malignant diseases that affects both sexes. The radiological profile of bronchogenic cancer can prove to be of great assistance in a management of this disease.

Objectives: The current study aimed to assess a radiological profile for bronchogenic carcinoma in a sample of Iraqi patients.

Methods: A cross sectional study that comprised a total of 100 patients affected with bronchogenic cancer in Al-Imamain Al-Kadhimain Medical City, Baghdad, Iraq, from the 1st of January to 31st of July 2020. Clinical characteristics, diagnostic modalities, the site of the tumor within the lung, radiological findings, and the histopathologic type of cancer, were recorded.

Results: The subjects consisted of 100 patients affected with bronchogenic carcinoma, 70% are males and 30% are females, the mean age was 62.26±10.8 years. Also, 59% were ex\current smokers. Site of the tumor according to CT scan was 44% in the left lung, 40% in the right lung, and 16% bilaterally. The most common histopathological type was squamous cell carcinoma, accounting for 44% of patients; the second type is adenocarcinoma (39%). The radiological findings showed 53% of the cases, the cancer was seen as a mass on imaging, while in 35% a solitary nodule was found

Conclusions: Lung mass and lung nodules are the most common radiological findings in bronchogenic carcinoma. There was no significant association between the radiological finding, site of lesion, and histopathological type.

Keywords: Bronchogenic carcinoma; Chest imaging; Computed Tomography; Iraqi patients, radiological Patterns.

Introduction

The burden of bronchogenic carcinoma is still a very great affliction, especially in the developing countries. Bronchogenic carcinoma is the most frequently occurring type of malignant disease, which that found in 2022. About 2.5 million new cases were reported, which represent one case in every eight cases of cancers all over the world (i.e., 12.4% of all cases of cancers all over the world). The second was breast cancer in females (i.e., 11.6%) (1,2). The 5-year survival rate after diagnosis of bronchogenic carcinoma remains low because of the advanced stage at diagnosis (3).

Many studies showed that tobacco smoking is considered one of the main causes of all histopathological types of lung cancers, including many research studies that have been carried out since the 1950s that showed the carcinogenic effects of smoking on the lung (4). Furthermore, the environmental factors, which include radon exposure, ionising radiation, air pollution, diet, and hereditary predisposition, are associated with the increasing incidence of lung cancer (5).

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Lung cancers are classified into small cell lung cancer and non-small cell lung cancer (SCLC and NSCLC) types. The non-small cell cancer includes squamous, adenocarcinoma, and large cell carcinoma. The incidence of NSCLC in women and nonsmoking patients has increased (6). Some of the studies that were done in India showed that adenocarcinoma is the most common histopathological type of lung cancer, unlike squamous cell cancer (SCC), which was previously more common (6). About less than 50% of patients may report alarming symptoms six months before being diagnosed with lung cancer. The significant predictive value was reported among patients who had dyspnea, hoarseness of voice, appetite loss and current heavy smoking (7).

Chest X-ray (CXR) is the first imaging to be done in the suspected lung cancer. For further evaluation, CT of chest and upper abdomen (that includes adrenal glands) with contrast is recommended. Positron emission tomography with CT (PET-CT) may be indicated in patients without signs of metastasis on CT who are admitted for curative treatment (8,9). Normal chest X-ray does not rule out the diagnosis of lung cancer, this because about 20% - 25% of the

patient have normal chest X-rays (10,11) The primary tumor shows a wide spectrum of imaging appearances on CT chest, non-small cell lung cancers can be centrally located masses, invading the mediastinal structures, or peripherally situated lesions that invade the chest wall. Tumortumors can have margins which are smooth, lobulated, or irregular and speculated. They can be uniformly solid or can have central necrosis and cavitation (12).

The primary tumor gives a wide spectrum of imaging appearances. For NSCLCs may be centrally located masses that can invade the mediastinal structures; however, they may also be peripherally situated and can invade the chest wall. The margins of tumors can be smooth, lobulated, or irregular, and speculated. They may be uniformly solid, with central necrosis and may have cavitation (13).Thus, the current study aimed to assess the radiological profile of bronchogenic carcinoma in a sample of Iraqi patients.

Patients and Methods
Study Design
A cross-sectional study that included a total of 100 patients suffering from bronchogenic cancer who were attending the oncology department, in Al-Imamain Al-Kadhimain Medical City,Baghdad, Iraq, in the period from the 1st of January to the 31st of July 2020.

Inclusion Criteria: These were patients with bronchogenic cancer, who were confirmed by CT scan, PET/CT scan, pleural fluid aspiration, cytology, or fine needle aspiration and biopsy.

Exclusion Criteria: Patients with incomplete data (as those who lost their CT scan). And those who refused to participate in the study.

Ethical consideration: Written consent from each patient was taken before starting study with explaining the aim of this study. Every patient had the complete right to withdraw at any time from the study. Patients were assured that their data were confidential, secured and will be used for research purposes only.

Data Collection: Patients' demographic features, which include age, sex, history of smoking, and the diagnostic modalities, site of tumor within the lung, radiological findings, and histopathology type of cancer, were recorded. From the CT scan, the location of the tumor was determined. For diagnostic modality, CT scan, transbronchial biopsy, pleural fluid aspiration, PET/CT scan, sputum cytology, bronchoalveolar lavage and transthoracic aspiration

Statistical Analysis: Statistical analyses of the data were done with SPSS software (SPSS 21.0 for Windows, IBM, Chicago, IL, USA). Normality of the data was checked by using the Kolmogorov-Smirnov test. The distributed data are normally and non-normally distributed, and the categorical variables, all expressed as mean ±standard deviation, median, and frequencies, respectively. The categorical variables were presented as counts and percentages, and the comparisons were conducted using Fisher's exact test. *P* value $P \leq 0.05$ was statistically significant.

Results
The mean age for the patients was 62.26±10.8years (range 28–88 years). Male patients accounted for more than two-thirds (70%) of the patients, while a history of smoking (either ex- or current) was in 59% of the patients (Table 1).

Table 1: Demographic Characteristics of the Patients (No.100)

Variables	Value
Age, years	
Mean ± SD	62.26±10.8
Range	28-88
Gender	
Male	70(70%)
Female	30(30%)
Smoking	
Never	41(41%)
Ex/current	59(59%)

The age group of 51–65 years was the most common, accounting for 45% of all patients followed by the age group of >65 years (40%), (Table 2).

Table 2: Age groups of the patients

Age groups	No.(%)
≤50	15(15%)
51–65	45(45%)
>65	40(40%)

Seven diagnostic modalities were used for the detection of bronchogenic cancer. All patients (100%) had undergone the CT scan examination, which is the most common diagnostic modality. However, other diagnostic modalities were not the same for all patients; transbronchial biopsy was performed in 73% of patients followed by pleural effusion (23%) and PET/CT scan (20%).
Sputum cytology, Bronchoalveolar lavage (BAL), and transthoracic aspiration were only 4%, 4%, 3% respectively, (Table 3).

Table3: Diagnostic Modalities

Diagnostic modality	Frequency	%
CT scan	100	100
Transbronchial biopsy	73	73
Pleural fluid aspiration	23	23
PET/CT scan	20	20
Sputum cytology	4	4
Bronchoalveolar lavage	4	4
Transthoracic aspiration	3	3

According to the CT scan, right and left lung lesions were reported in 44% and 40% of the cases respectively, while bilateral lesions were found in 16% of the patients, (Figure 1).
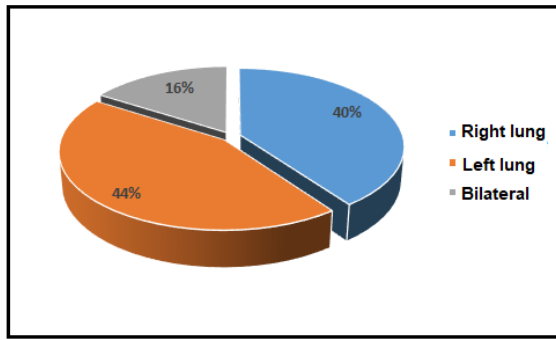
Figure 1: Site of the lesion according to CT scan reports

Three main radiological findings were reported, the most common of which was lung mass with pleural effusion (PE) (53%), and the presence of nodules in the lung (35%). Hilar mass was reported in only 8% of the patients, (Table 4).

Table4: Radiological findings

Findings	Frequency	Percentage
Lung mass with pleural effusion	53	53%
Nodule	35	35%
Hilar mass	8	8%
Others∗	4	4%

∗Including two cases of tracheal deviation and two cases of rib erosion

Squamous Cell Carcinoma (SCC) was the most common histopathological type of bronchogenic cancers, accounting for 44% of the patients, followed by adenocarcinoma (39%). Less common histopathological types included small cell carcinoma (9%), undifferentiated cell carcinoma (6%), and finally large cell carcinoma (2%) as demonstrated in (Figure 2):
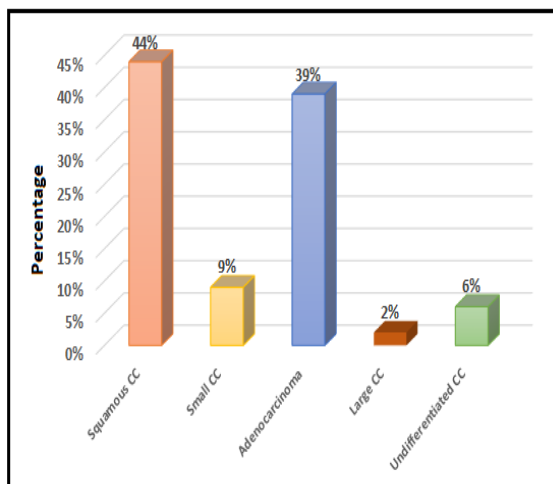

Figure 2: Histopathological types of bronchogenic cancer

Tracheal deviation and rib erosion were more frequent in small CC (22.22%) than in other types with a significant difference. Although lung mass with pleural effusion was more frequent in SCC (61.36%) than other types, while nodules were more common in large/undifferentiated CC (50%) than other types, (Table 5).

Table 5: Association of radiological findings with histopathological type

Findings	SCC (n=44)	Small CC (n=9)	Adeno (n= 39)	Large/ undifferentiated CC (n=8)	P-value
Lung mass and PE	27 (61.3%)	3(33.33%)	19(48.72%)	4(50%)	0.400
Nodule	11(25%)	3(33.33%)	17(43.59)	4(50%)	0.261
Hillar mass	5(11.36%)	1(11.11%)	2(5.13%)	0(0%)	0.588
Others	1(2.27%)	2(22.22%)	1(2.56%)	0(0.00%)	0.005

Right lung involvement was more common in Squamous CC (50%) than in other types, but with no significant differences. Similarly, left lung involvement was more common in small CC (55.55%) than other types, but with no significant differences, (Table 6).

Table 6: Association of lesion site with histopathological type

Site of the lesion	Squamous CC(n= 44)	Small CC (n=9)	Adeno (n= 39)	Large/ undifferentiated CC (n=8)	P-value
Right lung	22(50%)	4(44.4%)	11(28.21%)	3(37.5%)	0.390
Left lung	15(34.09%)	5(55.5%)	20(51.28%)	4(50%)	
Bilateral	7(15.91%)	0(0.00%)	8(20.51%)	1(12.5%)	

Discussion

In the current study, the mean age was 62.26 years, which is comparable to the study by Anant *et al.*(14) where the mean age was 59 years. Bronchogenic CA predominantly affect males with a percentage reaching 70%. This result agreed with the Senthil *et al.* study (15), which showed that the lung cancer rate was 75% in males and 25% in females. Also, in the Alberto *et al.* (16) study, males were more than females (74.3% vs. 25.7%, respectively). This gender difference may be related to smoking incidence in males being higher than in females (17). In this study, 41 (41%) were never smokers, and 59 (59%) were ex/current smokers. In the Bharate *et al.* (18) study, 53.4% of patients were non-smokers and 46.6%) were smokers (current or former).

According to the present study, the most common bronchogenic cancer was squamous cell carcinoma, followed by adenocarcinoma. This was in agreement with other studies in Iraq (19) in which SCC was 50.25% followed by adenocarcinoma 43.12%. Many studies also revealed that SSC was the most common type (20,21,22). However, Akhil *et al.* (23) showed adenocarcinoma was the most common histological subtype, and SCC was the second most common subtype among Indian patients. Other studies indicated that adenocarcinoma was the commonest type in both females and males (24).

In this study, the site of the tumor was 40% on the left, 40% on the right, and 10% bilateral. In the Prabha *et al.* (25) study, the sites were more on the right than the left (29 vs. 21) lungs of the patients, respectively, with no patient having a bilateral involvement. This difference may be due to differences in several cases in our study of 100 patients, while in other studies, there were 50 patients. In the current study, with regard to the radiological features, lung mass with pleural effusion, followed by nodules, were the most common features which are present in all histopathologic types of bronchogenic cancers; however, there were no significant associations. Rawat *et al.* (26) reported that mass and collapse consolidation were the commonest radiological findings of Indian patients with bronchogenic cancer. In Gharraf *et al.* (27) study in Egyptian patients with bronchogenic carcinoma, which correlated the features on CT scan with histopathological subtypes, pleural effusion was present at different percentages in all histopathologic types of bronchogenic cancer, and the highest was in adenocarcinoma. In the study of Chakrabortty *et al.* (28), also, pleural effusion was also highest in adenocarcinoma. By contrast, cavitation was not reported in the current study; the presence of cavitary lesions in lung cancer may be related to gender, smoking status, or histopathological type (29).

Regarding the association of lesion site with histopathological type, right lung involvement was more common in squamous CC (50%) than any other type, but small, adeno-, and large/undifferentiated cancers were more in the left site, with no statistically significant difference. Several potential rationales could explain this difference between right and left side lung cancer. First, the anatomic structures of the left and right lungs are not identical. The pulmonary arteries, veins, and main bronchi are arranged differently in the left and right pulmonary hilum. Second, right and left lung cancers might have distinct gene mutation features (30).In the study of Adnan *et al.* (31) in Iraq, SCC was more common in both left and right lungs; however, the number of patients in the latter's study was 49 patients only. In the study of Prabha *et al.* (25), squamous, adeno-, large/undifferentiated cancers were more in the right lung, while small cell cancer was more in the left lung, also with minimal differences between the two sites. In the study of Jia *et al.* (32), there were 53,496 patients who had right side, and 36,911 patients who had left side in non-small cell lung cancer NSCLC; the latter study had a much larger number of patients compared with our study. This big study did not show any difference in survival outcome according to the tumor location at any stage. In the Senthil *et al.* (15) study, the right lung was involved in (65%, *n*=67) of cases, which is higher than left lung involvement in (35% *n*=36) of patients. There was no statistically significant association between lung cancer types and the lobe that was involved (*P* value 0.132).

Limitations
of this study included the number of patients was relatively small, and a single-center study.

Conclusion:
The radiological profile of bronchogenic carcinoma among the selected Iraqi patients showed that lung mass and lung nodules were the most common radiological findings in bronchogenic carcinoma. There was no significant association between the radiological findings, the site of lesion, and histopathological type.

Conflicts of Interest: None.
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Authors' declaration:
We confirm that all the Figures and Tables in the manuscript belong to the current study. Besides, the figures and images, which do not belong to the current study, have been given permission for re-publication attached to the manuscript. Authors sign on ethical considerations.
Approval-Ethical Clearance: The project was approved by the local ethical committee in Al-Imamain Al-Kadhimain Medical City, Baghdad, Iraq according to the code number (2994) on (15/ 12/ 2019).

Authors' contributions:
Study conception & design: (Haider N. Dawood & Mohammed I. Sameen). **Literature search:** (Mohammed I. Sameen). **Data acquisition:** (Mohammed I. Sameen). **Data analysis & interpretation:** (Haider N. Dawood & Mohammed I. Sameen). **Manuscript preparation:** (Haider N. Dawood). **Manuscript editing & review:** (Mudher Al-Khairalla).

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الانماط الشعاعية لسرطان الرئة لدى عينة من المرضى العراقيين

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الخلاصة
خلفية الدراسة: سرطان الشعب الهوائية هو واحد من الأمراض الأكثر شيوعا في كل من الذكور والإناث. يمكن أن يساعد المظهر الإشعاعي لسرطان القصبات الهوائية في إدارة المرض.
الهدف من البحث: تقييم الملامح الشعاعية لسرطان الشعب الهوائية في عينة من المرضى العراقيين .

طرائق العمل: شملت هذه الدراسة المقطعية تشمل ما مجموعه 100 مريض بسرطان الشعب الهوائية. تم تسجيل الخصائص السريرية للمريض ، بما في ذلك العمر والجنس وحالة التدخين والاعراض السريرية وطرق التشخيص وموقع الورم داخل الرئة والنتائج الإشعاعية والنوع النسيجي المرضي .

النتائج: 100 مريض مصاب بسرطان الشعب الهوائية، 70% ذكور و30% إناث، متوسط العمر 62.26 سنة. 59% كانوا مدخنين حاليين او سابقين. 44% في الرئة اليسرى، 40% في الرئة اليمنى و16% في الرئتين . كان سرطان الخلايا الحرشفية هو النوع النسيجي المرضي الأكثر شيوعًا حيث يمثل 44٪ من المرضى، يليه السرطان الغدي (39٪). أظهرت النتائج الإشعاعية أن 53% من المرضى لديهم كتلة و35% لديهم عقيدات. لم يكن هناك ارتباط كبير بين النتائج الشعاعية والنوع النسيجي المرضي. كما لم يكن هناك ارتباط احصائي مهم بين موقع المرض في الرئة ونوع الأنسجة المرضية.
الاستنتاجات: وجود كتلة في الرئة وعقيدات الرئة هي النتائج الإشعاعية الأكثر شيوعا في سرطان اشعب الهوائية، ولم يكن هناك ارتباط احصائي كبير بين النتائج الإشعاعية وموقع موقع المرض في الرئة ونوع الأنسجة المرضية
الكلمات المفتاحية: الانماط الشعاعية, التصوير المقطعي المحوسب, المرضى العراقيين, تصوير الصدر, سرطان القصبات

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