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The Validity of CXR in the Screening & Detection of Endobronchial Lung Cancer in Iraqi Patients

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ABSTRACT

The lung cancer is one of the commonest human kind cancer, the endobronchial variant is a relatively uncommon with a special presentation & diagnostic & therapeutic approach, the CXR is a cheap & widely available test the use too much in respiratory medicine ,Aim of the study To test the validity of CXR in detecting endobronchial lung cancer in comparison to chest CT with contrast & bronchoscopy &To correlate the CXR with the histological type & the staging of endobronchial lung cancer Patients & methods It is a cross sectional study include 37 patients with bronchogenic carcinoma , with written agreement to participate in the study & to do the procedure ,diagnosed by endobronchial bronchoscopical biopsy were included in the study from the period February 2018 to December 2019 most of them the bronchoscopy done as an outpatient procedure with local anaesthesia +/- light sedation , all the lesions were seen in the lumen during the bronchoscopy & the biopsies return back as bronchogenic cancer. All had CXR & CT which were collected & reviewed CXR were reviewed retrogradely by 1 radiologist & 1 pulmonologist with double blind pattern& classified as: Normal: no abnormality, Abnormal non CA: as fibrosis, COPD evidences, diffuse reticular shadow or Abnormal CA: mass, nodules, effusion, wide med., bony lesion. CTC were reviewed by 1 radiologist & 1 pulmonologist & classified as: CA or Non-CA. Smoker classified as Smoker: more than 100 cigarate / life or Non-smoker: < 100 cigarate / life Histological Types: as NSCLC or SCLC. TNM scoring for staging: N: depending upon CT chest with contrast +/- EBUS TBNA. The results show that the CXR is not a good screening or diagnostic test for endobronchial lung cancer especially in early stages.

Keywords: Endobronchial cancer, bronchogenic cancer, bronchoscopy, screening CXR

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INTRODUCTION

Lung cancer is one of the world's most common human Cancers, responsible for 1,59 million fatalities each year (1). It had one of the highest mortality rates of all tumors, with the majority (2/3) of cases detected at such a late stage where it is no longer possible to treat radically. The primary target of improved survival is early detection of pulmonary tumour. Patients with non-small cell lung cancer (NSCLC) at an operative level have more chance of survival than those with advanced stage diagnosis. Endo-bronchial lung cancer is defined as the growth raised form the bronchial lumen mainly and visible by the endobronchial scope, it is not so common and presents as a diverse pathological cause (1,2). Malignant diseases are more common and mostly originate from the surface epithelium. With the squamous cell carcinoma being the predominant variant in old persons. In other hand, carcinoid tumor represents the majority of this variant in younger age group. (3)

Causes of endobronchial tumor

Benign	Malignant
growth of mesenchymal source Hamartomas Lipomas Chondromas Primary lung leiomyomas Granular cell tumor Neurogenic tumors	growth of surface epithelial source Squamous cell carcinoma Adenocarcinoma Small cell carcinoma Large cell neuroendocrine carcinoma Carcinoid tumor

growth of submucosal gland scorce Mucous Gland Adenoma Pleomorphic Adenoma	growth of submucosal gland source Mucoepidermoid Carcinoma (MEC) Adenoid Cystic Carcinoma (ACC) Pulmonary acinic cell carcinoma
Growth of surface epithelial source Papillomas Solitary squamous papillomas	growth of mesenchymal source Primary pulmonary sarcomas Metastases restricted to the bronchus

Columnar cell papillomas Fibroepithelial polyps	
	Biphasic malignant tumors Pleomorphic carcinoma Carcinosarcoma Pulmonary blastomas
	Meselenous Lymphoma Malignant melanoma

Most patients with endobronchial tumors present with clinical features due to cough, chest pain, wheezing, hemoptysis, recurrent infection and weight loss. The presence of hemoptysis and obstructive pneumonia point to the possibility of intra-luminal invasion by the cancer and the need for more bronchoscopic and imaging study (4)

The 1st identification of symptomless patients with lung cancer in mostly done by performing CXR or computed tomography (CT) of the chest, pulmonary tumor may start to progress from early- stage to late-stage when missed on these tests, especially when long years lag between initial presentation & the radiological exams (5)

About 90% of missed pulmonary cancer is seen in chest x-rays, just 5% in CT scans and the additional 5% in the other imaging modalities (6).

Why the CXR can miss lung cancer?

The Factors that causing missed lung cancer on chest X-ray can be categorized into personal error, growth characteristics, and technical aspects. (7)

Personal error:

it is the biggest factor of misdiagnosis of lung cancer. It depends upon 3 main variables:

1- The experience of the reader & use of a proper scan system with good reading skills

2- The external factors as the use of proper viewer, correct distance from the film

3- The doctor mind set which can be influenced by working load & human fatigue, lack of clinical data & the improper risk state labeling

So, the types of error here can be (8):

- Detection error: do not detect the lesion
- Decision making error: the lesion regarded as normal or just a variant
- Loss of interest error as the reader stop searching when see the primary lesion this error can be attributed to two potential causes: when the exam is positive the reader stop looking to any other anomalies early and Concentrating on the "wrong" exam portion (7).

Growth characteristics:

It depends upon factors as (8)

1- Size: the smallest the size the more the missed in the CXR

2- Conspicuity it is the contrast between the lesion & the surrounding which depend mainly on the margins sharpness & the lesion density

3- Location more missing in the upper lobes & the hilum due to the anatomical noises & the blind areas in the CXR

Technical aspects

The technical aspects May play a role in the probability of missing pulmonary malignancy include the quality of Image and movement & positioning of the patient (7).

The Impact of misdiagnosis of lung cancer:

Effect on the staging & the cancer metastasis: as any delay in the diagnosis of a tumor can affect the early definite treatment intervention & may make the patient loss the chance to cure (9)

Medico-legal implications: one of the main reasons of malpractice actions against radiologists is mistake in the detection of a cancer. the second cause of legal litigation after tumor of the breast is Diagnostic errors in lung growth diagnosis (4), and by far the most common cause of malpractice suit against radiologists specialized on thorax imaging is failure to detect lung growth (42.5% of cases) (9)

AIM OF THE STUDY

1- To test the validity of CXR in detecting endobronchial lung cancer in comparison to chest CT with contrast & bronchoscopy

2- To correlate the CXR with the histological type & the staging of endobronchial lung cancer

PATIENTS AND METHODS

37 patients with bronchogenic carcinoma , with written agreement to participate in the study & to do the procedure ,diagnosed by endobronchial bronchoscopical biopsy were included in the study from the period February 2018 to December 2019 most of them the bronchoscopy done as an outpatient procedure with local anaesthesia +/- light sedation , all the lesions were seen in the lumen during the bronchoscopy & the biopsies return back as bronchogenic cancer.

Exclusion criteria:

1- Patients refusal to participate in the study

2- Extra-bronchial cancer

3- Non-bronchogenic cancer

4- Lost CXR & CT data of the patients

All had CXR & CT which were collected & reviewed
CXR were reviewed retrogradely by 1 radiologist & 1 pulmonologist with double blind pattern& classified as:
1- Normal: no abnormality
2- Abnormal non-CA: as fibrosis, COPD evidences, diffuse reticular shadow
3- Abnormal CA: mass, nodules, effusion, wide med., bony lesion
CTC were reviewed by 1 radiologist & 1 pulmonologist & classified as:
1- CA
2- Non-CA
Smoker classified as
1- Smoker: more than 100 cigarate / life
2- 2- Non-smoker: < 100 cigarate / life
Histological Types:
1- NSCLC
2- SCLC
TNM scoring for staging: N: depending upon CT chest with contrast +/- EBUS TBNA
Registered in the scientific plan of the Hammurabi medical college / university of Babylon with the acceptance of the ethical committee 2018-2019.

Data Analysis

Statistical analysis was carried out using SPSS version 23. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as (Mean ± SD). Fisher-exact tests was used to find the association between categorical variables. A *p*-value of ≤ 0.05 was considered as significant.

RESULTS

Table 1 shows distribution of patients according to sociodemographic characteristics including (age, gender and smoking habit). As expected, the male & the smokers are more involved.

Table 1: The Distribution of patients according to sociodemographic characteristics

Sociodemographic Characteristics (n=37)		
Age (years)	62.92 ± 10.15	(45-81)
Gender **Male**	 20	 54.1%
Female	17	45.9%
Total	37	100.0%
Smoking habit **Smoker: > 100 cigarette / life** **Non-smoker: < 100 cigarette / life**	 33 4	 89.2% 10.8%
Total	37	100.0%

Figure 1 shows the distribution of patients with bronchogenic carcinoma diagnosed by biopsy according to type of tumor including (non-small cell lung cancer and small cell lung cancer). highest percentage (73.0%) of patients presented with non-small cell lung cancer

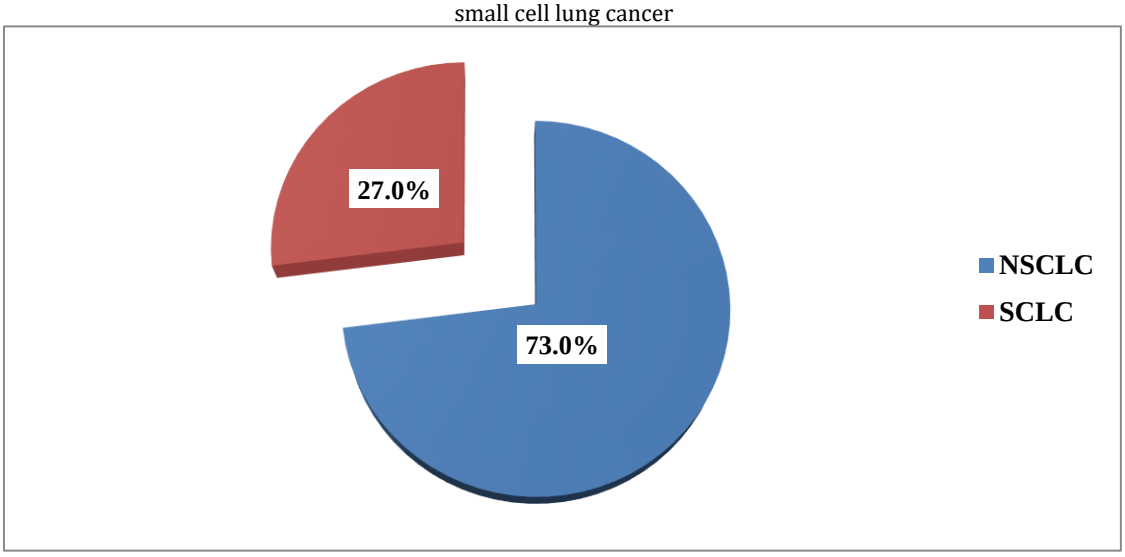

Figure 1: Distribution of patients according to type of tumor

Figure 2 shows distribution of patients with bronchogenic carcinoma according to chest X-ray findings including (normal X-ray, abnormal non CA (as fibrosis, COPD evidences, diffuse reticular shadow) and abnormal CA (mass, nodules, effusion, wide med., bony lesion). Highest percentage (75.7%, n=28) of patients presented with abnormal CA. as shown only 75.7% of biopsy proved patients have findings consistent with cancer on CXR

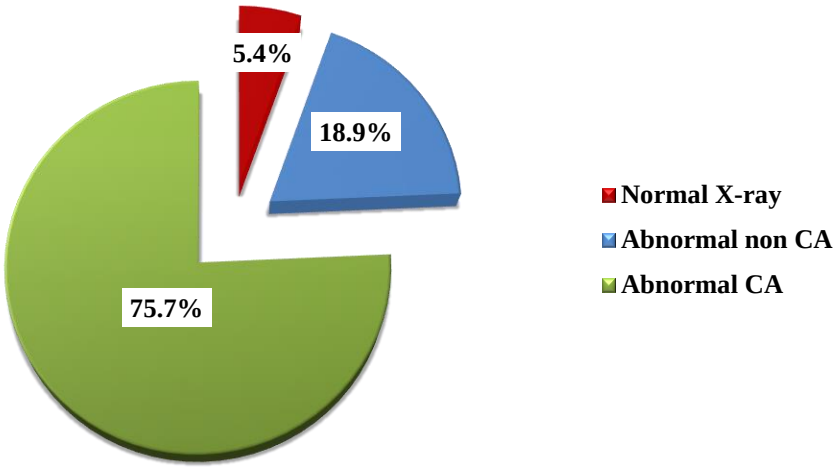

Figure 2: Distribution of patients according to chest X-ray findings

Figure 3 shows the distribution of patients with bronchogenic carcinoma according to chest CT contrast findings including (abnormal CA and abnormal non-CA. Highest percentage (94.6%, n=35) of patients presented with abnormal CA results by CTC. It is almost always abnormal but only 94.6 were consistent with cancer

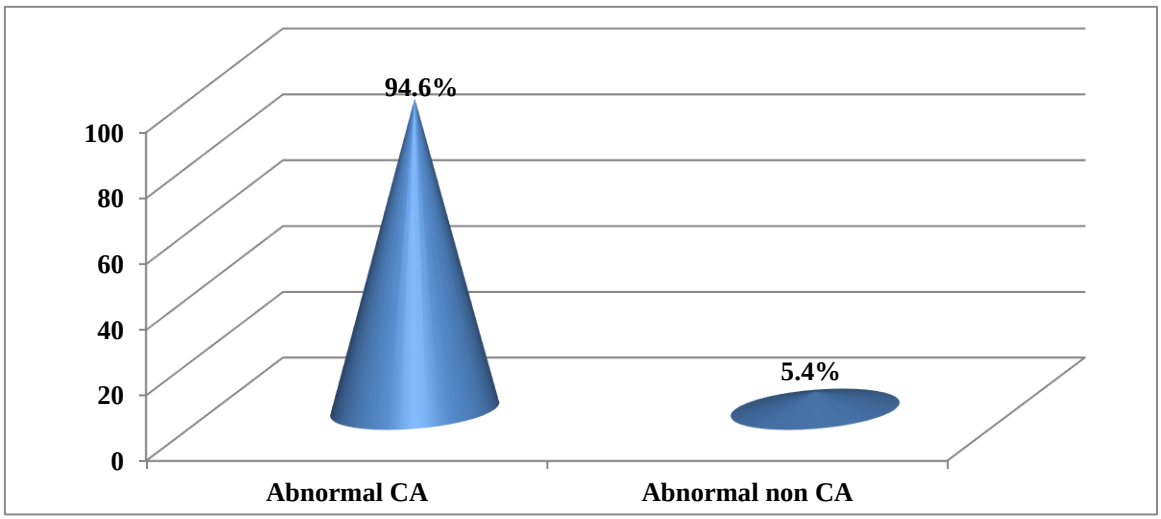

Figure 3: Distribution of patients according to CTC findings

Table 2 shows distribution of patients according to TNM scoring including (age, gender and smoking habit). The majority of patients show advanced local dis. But no distant metastasis

Table 2: The Distribution of patients according to TNM scoring

Study variables	N	%
T		
1	6	16.2%
2	14	37.9%
3	12	32.4%
4	5	13.5%
Total	37	100.0%
N		
0	2	5.4%
1	2	5.4%
2	18	48.6%
3	15	40.6%
Total	37	100.0%
M		
0	31	83.8%
1	6	16.2%
Total	37	100.0%

Table 3 shows the association between Chest X-ray finding including (normal X-ray, abnormal non CA (as fibrosis, COPD evidences, diffuse reticular shadow) and abnormal CA (mass, nodules, effusion, wide med., bony lesion) and TNM scoring system. There was significant association between CXR findings and N patients, while there was no significant association between CXR findings and T and M but the 2 patients with normal XCR both in early stage which mean that CXR is not a good tool for detection of early diseases .

Table 3: Association between Chest X-ray finding and TNM scoring among study patients

Study variables	Chest X-ray finding			Total	P-value
	Normal	Non-CA	CA		
T					
1	2 (100.0)	2 (28.6)	2 (7.1)	6 (16.2)	0.077 f
2	0 (0.0)	3 (42.9)	11 (39.3)	14 (37.8)	
3	0 (0.0)	2 (28.6)	10 (35.7)	12 (32.5)	
4	0 (0.0)	0 (0.0)	5 (17.9)	5 (13.5)	
Total	2 (100.0)	7 (100.0)	28 (100.0)	37 (100.0)	
N					
0	0 (0.0)	2 (28.6)	0 (0.0)	2 (5.4)	**< 0.001* f**
1	2 (100.0)	0 (0.0)	0 (0.0)	2 (5.4)	
2	0 (0.0)	1 (14.3)	17 (60.7)	18 (48.6)	
3	0 (0.0)	4 (57.1)	11 (39.3)	15 (40.5)	
Total	2 (100.0)	7 (100.0)	28 (100.0)	37 (100.0)	
M					
0	2 (100.0)	5 (71.4)	24 (85.7)	31 (83.8)	0.704 f
1	0 (0.0)	2 (28.6)	4 (14.3)	6 (16.2)	
Total	2 (100.0)	7 (100.0)	28 (100.0)	37 (100.0)	

*p value ≤ 0.05 was significant. f: Fisher-exact test.

Table 4 shows the association between CT contrast finding including (abnormal non-CA (as fibrosis, COPD evidences, diffuse reticular shadow) and abnormal CA (mass, nodules, effusion, wide med., bony lesion) and TNM scoring system. There was significant association between CT contrast finding and T and N, while There was no significant association between CT contrast finding and M. so, the CT with contrast can detect the diseases earlier than CXR.

Table 4: Association between CT contrast finding and TNM scoring among study patients

Study variables	CT contrast finding		Total	P-value
	CA	Non-CA		
T				
1	4 (11.4)	2 (100.0)	6 (16.2)	**0.038* f**
2	14 (40.0)	0 (0.0)	14 (37.8)	
3	12 (34.3)	0 (0.0)	12 (32.5)	
4	5 (14.3)	0 (0.0)	5 (13.5)	
Total	35 (100.0)	2 (100.0)	37 (100.0)	
N				
0	0 (0.0)	2 (100.0)	2 (5.4)	**0.003* f**
1	2 (5.7)	0 (0.0)	2 (5.4)	
2	18 (51.4)	0 (0.0)	18 (48.6)	
3	15 (42.9)	0 (0.0)	15 (40.5)	
Total	35 (100.0)	2 (100.0)	37 (100.0)	
M				
0	29 (82.9)	2 (100.0)	31 (83.8)	1.000 f
1	6 (17.1)	0 (0.0)	6 (16.2)	
Total	35 (100.0)	2 (100.0)	37 (100.0)	

*p value ≤ 0.05 was significant. f: Fisher-exact test.

DISCUSSION

The study done on 37 patients with endobronchial lung cancer to assess the validity of CXR in detecting the growth The majority are above the age of 55 years with more male & smokers & this is compatible with most of papers & textbooks as the disease is smoking related & need exposure time with more at more risk.(1,3) The type of the bronchogenic cancer mostly is NSCLC as expected as it is the more common histological type .(10)But the diseases are not so advanced in the TNM staging & this is against the fact that is bronchogenic cancer an aggressive cancer with early local & distant metastasis this may be due to small sample size & the restriction to the endobronchial type not all bronchogenic cancer patients.(11)

The CXR is not a good screening & diagnostic tool as in 75% only of cases show finding consistent with cancer & this is consistent with most of other studies because of personal, lesional or techniqial factors as mention in the introduction. (12)

The CT of the chest with contrast show much better as no normal reported for all patients with cancer & this is compatible with the studies as it show more details with

less blind areas & always is seen with more concentration with spending more time but the risk of radiation & contrast complication is more in addition it is not available as the CXR.(13) Regarding the stage the CXR is more toward cancer findings in more advanced disease whcih mean it is not a good screening & detecting tool for early disease & this is go with more studies as it is not recommended as screening tool for bronchogenic cancer in general but seen more in endobronchial variant.(14)

CONCLUSION

1- The CXR is a cheap & available test but of low screening & diagnostic ability for endobronchial lung cancer
2- Ct of chest with contrast show better detection rate for endobronchial lung cancer although the gold standard still the bronchoscopy
3- The CXR reported as normal more in less advanced case which mean not good tool in the early stages

RECOMMENDATION

1- Further study to compare the CXR & CT with more advanced radiology modalities as PET 2- More prospective study for study the effect of delayed CXR diagnosis with the radical intervention for endobronchial lung cancer

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