

Radiographic manifestations of inoperable primary bronchogenic carcinomaMiaad Abdul Hussein Ahmed¹, Shaymaa Mustafa Khalid Al-Hayali¹, Nasser Ghaly Yousif^{2*}**Abstract**

Bronchogenic carcinoma should be a topic of paramount importance to all who interpret chest radiographs because of its increasing incidence. For several decades the disease has been underestimated in the developing world. A prospective study was carried out on 52 patients (43 males, 9 females) with primary bronchogenic carcinoma at Oncology Teaching Hospital/Medical City-Baghdad from October 2016 to March 2017. All patients had standard plain chest radiographs (postero-anterior, and lateral views). Any abnormality detected was further studied with conventional tomography. The diagnosis was confirmed by histopathology examinations for all patients who were clinically evaluated by other methods of investigations. Most patients had more than one radiological feature which were mainly pulmonary masses, either hilar or peripheral or both at the same time. Other less common features were; mediastinal adenopathy (27%), atelectasis (25%) and pleural effusion (21%). Radiological signs that determine inoperability were evaluated together with other factors that were used as basic principles in the assessment of inoperability. From the total of fifty-two patients; 45 (86.5%) were inoperable radiologically and clinically, and also 4 patients (57%) out of the 7 who underwent thoracotomy were inoperable due to invasion and adhesion to the vessels and other vital structures. The chest radiograph is still important, cheap and available diagnostic procedure in lung cancer, and to decide further management.

Keywords: Bronchogenic carcinoma; Chest radiograph; Histopathology examinations; Incidence

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**Introduction**

Bronchogenic carcinoma should be a topic of paramount importance to all who interpret chest radiographs because of its increasing incidence. For several decades the disease has been underestimated in the developing world. This situation is, however, gradually changing and in some countries the true size of the problem becomes obvious. There is

little available information on lung cancer as a problem in Middle Eastern countries, and only very few series have been reported from Iraq. The paucity of accurate data makes it very difficult to assess the true size of the problem [1]. In Iraq, bronchogenic carcinoma is the commonest malignant tumor in men and the fifth most common in women [2]. It is a disease of over 50 years of age and should be considered in the differential diagnoses of lung lesions in that age group. The most important risk factor in the dramatic rise of the incidence of bronchogenic carcinoma is cigarette smoking. Other known causes and predisposing factors are mostly found in industrial processes involving nickel, arsenic, asbestos, chromium, uranium, and petroleum products [3]. The histological types of bronchogenic carcinoma are based on the classification of the World Health Organization that classifies these tumors into four Major types; Squamous cell carcinoma, small cell carcinoma [Oat cell), adenocarcinoma [including bronchial alveolar cell carcinoma] and large cell carcinoma [4]. Lung cancer spreads by direct extension proximally and distally along the bronchus of origin and may reach the trachea at the level of the carina. It also grows into the lung parenchyma, from where it may reach the mediastinum or pleura. The latter event may result in seedings in both pleural layers and extension into the chest wall and diaphragm. Pleural effusion is very common under these circumstances [5]. Sometimes a fistula between bronchus and pleural space develops. Spread to pericardial space result in pericardial effusion [6]. Invasion of blood vessels is very common, and lymph node metastases occur first in the hilar region, then in the mediastinal and lower cervical [supraclavicular] groups, and less commonly to the axillary and sub-diaphragmatic sites [5]. Distant metastases are more common in the liver, other areas of lung, adrenals, bone kidneys and central nervous system [7,8]. Less common sites include the gastrointestinal tract, pancreas, thyroid, spleen, pituitary gland, skin and skeletal muscles [9,10]. the presence of distant metastases at the time of initial diagnosis is particularly high in small cell carcinoma [11].

Methodology

This prospective study was conducted on patients with established diagnosis of primary bronchogenic carcinoma at the Oncology Teaching Hospital/Medical City-Baghdad, between from October 2016 to March 2017 (6 months). Fifty-two patients had standard

chest x-ray (postero-anterior and lateral views). Any Abnormality detected was further studied with conventional tomography. Out of these patients, only 7 patients [13%] underwent thoracotomy. Three patients 43% had resection in the form of pneumonectomy (2 patients, 66.6 % as definitive surgery, and lobectomy, 1 patient, 33.3 % as a palliative surgery), and in the remaining 4 patients 57% the lesion was found to be unresectable as in Table 1. The diagnosis of bronchogenic carcinoma was based on positive cytological and histopathological examination by different methods of investigations including; bronchoscopy [for bronchial wash cytology and bronchial biopsy], pleural effusion cytology, needle biopsy, biopsy from distant metastases [e.g. cervical or axillary lymph nodes] and opened lung biopsy. Some of the patients were investigated by more than one technique. All the patients were clinically evaluated by history, physical examination, Echocardiography, pulmonary function tests, hematological and biochemical laboratory investigations, sputum for acid fast bacilli and abdominal ultrasonic studies.

Results

The study comprises 43 male 83 % and 9 female 17 % patients, with a male to female ratio of 4.7:1. The youngest was 38 years and the oldest was 77 years. Age distribution is presented in Figure 1. Primary bronchogenic carcinoma presented with many radiological features, these are shown in Figure 2. Most common presentation was a hilar mass 71% next is peripheral mass 40%. Mediastinal adenopathy, atelectasis and pleural effusion having nearly equal incidence of 27%, 25%, and 21% respectively. Most of patients had more than one radiological feature at presentation. The majority of cases of bronchogenic carcinoma is squamous cell carcinoma, next common cell type is small cell carcinoma Table 2. Hilar mass was the most common presentation in squamous cell carcinoma which was the commonest cell type of all other radiological features of bronchogenic carcinoma Table 3. Hilar masses, which may be due to hilar lymph node enlargement or to a central tumor that is superimposed on the hilar region; are either unilateral or bilateral which represent different stages of the disease as the tumor may spread to the ipsilateral side of hilar lymph nodes or to the contralateral side also, which is a sign of unresectability stage N3. In this study 23 cases 62% of hilar masses were unilateral and 14 cases 38% were bilateral Table 4. Same thing is for

mediastinal lymph nodes, which they are shown as paratracheal lymph nodes either unilateral in 10 cases 71% mainly right side paratracheal lymph nodes 90% or bilateral which was present in 4 cases 29 %.

Table 1.

Patients with clinically and radiologically operable lesions

Type of operation	No.	%
Respectable	3	43
Pneumonectomy	2	28.638
Lobectomy	1	14.32
Unrespectable	4	57
Total	7	100

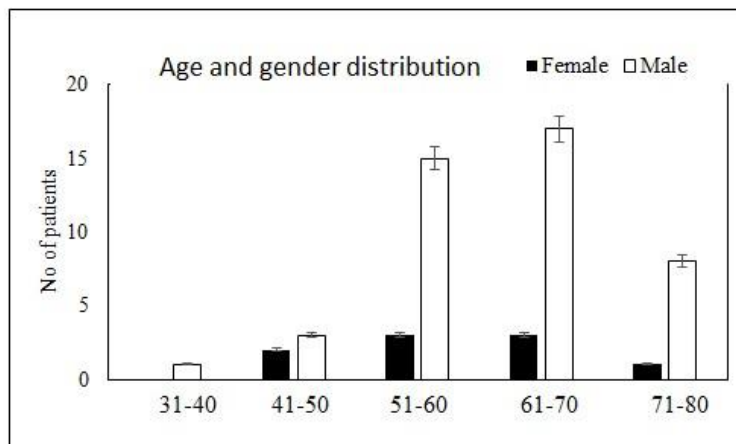


Figure 1

Age and gender distribution

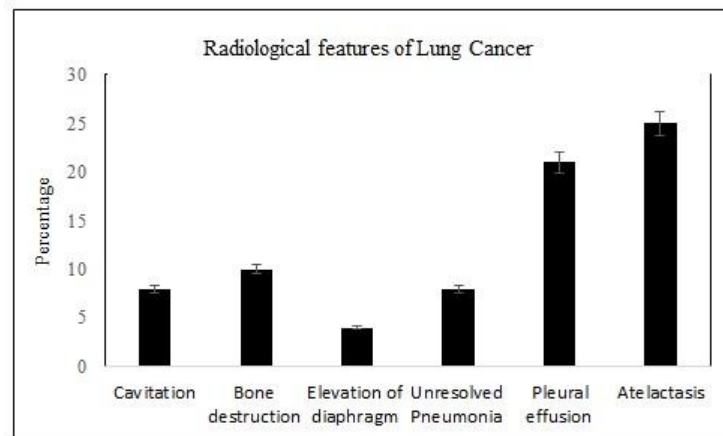


Figure 2

Radiological features of Lung Cancer

Table 2

Incidence of histological cell types among patients in the study

Cell type	No.	%
Squamous cell Ca	34	65
Small cell Ca	9	17
Adenocarcinoma	6	12
Large cell Ca	3	6
Total	52	100

Table 3

Details of hilar masses

Hilly mass	No.	%
Unilateral	23	62
Bilateral	14	38
Total	37	100

Table 4

Mediastinal adenopathy as paratracheal adenopathy.

Mediastinal adenopathy	No.	%
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Unilateral	10	71
Bilateral	4	29
Total	14	100

Discussion

The study though limited because of the small number of patients included but shows some interesting results. Graham in 1933 wrote "unless some entirely new general principles in the treatment of carcinoma is devised, surgery is the only method that can offer any hope".¹⁵ This fact remains true and the preferred treatment of bronchial carcinoma at present is still surgical resection. Unfortunately, less than one third of all patients are considered to be operable, the other two thirds or more are not candidates for resection when they seek medical advice, or when a diagnosis has been established. Of all those who are in the fortunate group and are subjected for thoracotomy, 60 % have an operation which can be regarded as having removed all of obvious tumor, about 20 % have palliative operation when removal cannot be regarded as complete, and the other 20 % are found to have lesions which are not resectable [14]. In this study we found 45 patients 86.5 % are clinically and radiologically inoperable, and this is a high percentage of unresectability which is due to many factors that determine the resectability rate, these factors are used as basic principles in the assessment of inoperability and are:

The clinical evaluation of the patient's condition.

Findings in the preoperative diagnostic procedures.

The recognition of the cell type of the tumor.

If there are no contraindications, the determination of the type of operation depends on the staging of the disease.

In clinical evaluation of patient's condition, marked impairment of ventilatory function from whatever cause, marked pulmonary hypertension, recent myocardial infarction, uncontrolled heart failure and old age are considered contraindications to surgical intervention [14]. In our study more than half of the patients, 29 patients 55 % Figure 1, are old age above the age of 60, and most of them had poor ventilatory function, uncontrolled hypertension and diabetes mellitus and they were not fit for operation. The

following findings in the preoperative diagnostic procedures are utilized as evidence of inoperability. A massive involvement of intra-thoracic structures as atelectasis of an entire lung as seen by plain x-ray of the chest indicate non resectability. Contralateral hilar and mediastinal lymph nodes involvement as confirmed by tomographic studies, a positive needle biopsy or cytology from pleural effusion indicates inoperability, paradoxical movement of the diaphragm as seen by fluoroscopic examination indicating phrenic nerve involvement and this is considered a relative contraindication to surgery [14]. In our study different radiological features indicate inoperability and proved by different methods of investigations. Atelectasis was found in 13 patients 25 %, figure 2 and table 3; 3 patients of them 23 % had total lung collapse, the remaining 10 patients 77 % had different lobar collapse. Out of the 37 patients 71% having hilar masses, and 14 patients 27% having mediastinal lymphadenopathy Figure 2, Table 3, we had 14 patients 38% and 4 patients 29% having contralateral hilar or mediastinal lymphadenopathy respectively. This mean that nearly about one third of patients having advanced age (TNM at their first presentation and this indicate inoperability). We had 11 patients 21% with pleural effusion detected by chest radiograph and confirmed by pleural effusion cytology which also indicated as late stage of the disease (T4). Two patients 4% in our study presented with elevation of the diaphragm which is considered when the right hemidiaphragm is at higher level than the left by more than 2.5 cm. and when the left hemidiaphragm is at equal or higher level than the right 16 This is confirmed by fluoroscopy as having paradoxical movement which indicate phrenic nerve involvement. Five patients 10% presented with bone destruction as rib erosion which was associated with an apical or subapical mass, 3 of them 60% was associated with palpable scalene and axillary lymph nodes proved by biopsy to have malignant involvement. Also associated with flornier's syndrome at the same side of lesion (Pancost's syndrome). Regarding the recognition of the cell type of the tumor, the detection of Oat cell carcinoma during cytological examination of sputum or by positive wash, brush or biopsy demonstrated by bronchoscopy are signs of non resectability. In our study, the most common cell type encountered was the squamous cell carcinoma 65%, and the next one was the small [Oat] cell carcinoma 17%, Table 2. We are left with 7 patients who were clinically and radiologically operable, most of them were of the middle age group and they were relatively of good general condition and presented

with peripheral masses and ipsilateral hilar enlargement, they underwent thoracotomy for further evaluation of the condition and to determine the type of operation depending upon the staging of the disease. From these patients, 3(43%) had resection in the form of the pneumonectomy (2 patients 66.6 %; as definitive surgery and lobectomy for one patient, 33.3% as palliative surgery). The remaining 4 patients 57% were found to have lesions not resectable Table 1. This is also high percentage of inoperability due to invasion of contralateral mediastinal lymph nodes or direct invasion of the sternum, or adhesion to the aorta and pulmonary vessels, or to the pericardium and the diaphragm which are difficult to be detected preoperatively by the standard chest radiograph. From the above, the increased proportion of inoperability among our patients is mainly due to late medical consultation (when the disease reaching advanced stages), delayed recognition of the disease and poor general condition. We have not yet undertaken preoperative mediastinal staging as a routine procedure and it is unlikely that we are alone in this respect. In most centers, preoperative T.N.M. staging become a routine procedure. Mediastinal involvement is assessed by non-invasive advanced radiological imaging techniques like CT scan and MRI [17,18] by which the operability of the tumors may be assessed and the proximity of vessels and other vital structures to the tumor mass may be determined [19]. They are also the methods of choice for diagnosis of suspected cerebral or hepatic metastasis, while the isotope scanning is the first method to be used in cases of skeletal metastases [1].

Inconclusions; because of the biological nature of the disease, as well as late clinical and radiological manifestations, a high percentage of patients are found to be inoperable at the time of consultation or diagnosis. Chest radiograph is still an important, cheap and available procedure employed in the diagnosis and in determining the signs of inoperability of bronchogenic carcinoma and to assess the stage of the disease, although to a lesser sensitivity than the more advanced imaging modalities.

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