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ORIGINAL ARTICLE

Influence of High Resolution Computed Tomography (HRCT) in Reviewing The Diagnosis of Chronic Obstructive Pulmonary Disease (COPD)

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a progressive disorder characterized by airflow limitation and an abnormal inflammatory response of the airways result in air way obstruction with little reversibility. It includes two conditions chronic bronchitis & emphysema. COPD is predicted to be the third worldwide cause of mortality by 2020¹.

Objectives: To assess the role of HRCT in identifying other conditions that might coexist with COPD like pulmonary fibrosis which may need to add other treatment modalities or even change the diagnosis.

Methods: study conducted in AlSader Medical City, Najaf province. 16 patients suffering from COPD. Pulmonary function test had been done to confirm diagnosis. FEV1/FVC ratio < 70% post bronchodilator. Then patients had Patients HRCT scan.

Results: The HRCT imaging study results showed eight patients had emphysematous changes, four patients had both emphysema and interstitial lung fibrosis, two patients with traction bronchiectasis, one patient had apical fibrosis, and another one had features of possible lung neoplasm.

Conclusion: HRCT scan has a significant role in identifying other lung conditions that might coexist with COPD. HRCT scan need to be considered in following up the patients with COPD. Lager studies need to be conducted and having a lung tissue biopsy would be helpful in cases where the diagnosis is difficult to make.

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INTRODUCTION

Cancer Chronic obstructive pulmonary disease (COPD) is one of the commonest respiratory conditions of adults in the developed world. It is a progressive airflow narrowing

with abnormal inflammatory response to external stimuli. Chronic obstructive pulmonary disease is a preventable disease, and this is very important issue as the

airway obstruction is characteristically partially reversible^{2,3}.

Chronic obstructive pulmonary disease is more common in men than women⁴, it affects about 5% of the population worldwide and it is possibly the third cause of death in 2012⁵, the number of deaths related to COPD is expected to be elevated due to increase rates of smoking in society especially in females and also the aging of the population⁶.

The chronic obstructive pulmonary disease is manifested mainly as two main clinical phenotypes chronic bronchitis and emphysema¹. In chronic bronchitis there is an inflammation with increased in mucus accumulation in pulmonary airways that can lead to limitation of airways diameter, emphysema causes damage to lung tissue that is necessary for the promotion of elasticity and recoil function of the lung⁷.

Smoking is the standard etiology of COPD. Other risk factors are environmental such as air pollution and dusts, previous respiratory infections in childhood, hereditary alpha-1 antitrypsin deficiency and low socioeconomic status⁸.

Criteria used in diagnosis of COPD:

- A. People above 35-40 years with long term exposure to tobacco or occupational dusts.
- B. Symptoms including chronic cough, productive cough for three months of two successive years or dyspnea on exertion.
- C. Spirometric results which show air flow limitation when the ratio of FEV1/FVC < 70% after inhalation of bronchodilators.
- D. Exclusion of other diseases that give reversible airway obstruction by spirometry and abnormal chest x-ray⁹.

HRCT Scan in Diagnosis of COPD: High resolution CT scan show the pathological changes which are related to chronic bronchitis and emphysema and give additional information about site, distribution and severity of these changes¹⁰. It will give the possibility to identifying and differentiation between three phenotypes of emphysema, centrilobular (upper lobe), panlobular (lower lobe), paraseptal (in the periphery of the lung tissue) and give the diagnosis of emphysema even in a symptomatic smoker with normal pulmonary function test^{11, 12}. It has been shown that the using of HRCT in patient with emphysema will help.

To choose the type of surgical treatment by localization the diseased parts of the lung that can be surgically resected (bullectomy, lung volume reduction surgery LVRS)^{13, 14}.

High resolution CT scan can also identify other possible pathologies that may be detected in COPD patients such as chronic infection, bronchiectasis, lung cancer, and interstitial lung disease^{15, 16}.

There is a recently defined entity called combined pulmonary fibrosis and emphysema syndrome (CPFE) in which HRCT scan play an important role for confirming the diagnosis. However, the researches on this entity are still deficit; and in meta-analysis of several papers on this

subject showed that patients with combined pulmonary fibrosis and emphysema had upper lobe emphysema and lung fibrosis in both lower lobes.

MATERIALS AND METHODS

The sample study conducted from January 2014 – November 2014. Patients included in this study were recruited from inpatients and outpatients at AL Sadr medical city.

Those patients diagnosed as COPD depending on :-

- 1-The age of the patient above 35 years old.
- 2- History of smoking with pack year between 20 and 40, some patients are ex- smoker.
- 3- Symptoms such as cough or productive cough with shortness of breath during exertion and clinical examination that supported by radiological (chest x-ray) findings.
- 4- Results of spirometry when the FEV1/FVC ratio < 70% post bronchodilator.

All patients were assessed during the stable state with their agreement, investigated by spirometry (Spiro lab 3 MIR, miniflowmeter) and high-resolution CT scan of the lung.

Exclusion Criteria: Patients with heart failure and those patients with history of overt pulmonary disease such as tuberculosis, bronchiectasis and malignancy have been excluded from the study.

Statistical Analysis: Statistical Package for Social Sciences (SPSS) was used for data entry and analysis with Fisher exact probability test. P- Value < 0.05 was consider as significant.

RESULTS

The total number of patients in this study are sixteen patients of two age groups: 10 patients between age 55 – 65 years, and 6 patients between 65 – 75 years. The analysis of pulmonary function tests to them showed that five patients had moderate obstruction, four patients with severe obstruction, and seven patients had both obstructive and restrictive patterns as describe in **Table 1**.

The results of HRCT showed eight patients of the total number had emphysematous changes, four patients had both emphysema and interstitial lung fibrosis, two patients with traction bronchiectasis, one patient had apical fibrosis, and there was only one patient had features of possible lung neoplasm on HRCT scan as in **Table 2**.

Table 1: Results of spirometry on 16 patients with chronic obstructive pulmonary disease.

Spirometry results	Number of the patients
Moderate obstruction	5
Severe obstruction	4
Obstruction and restriction	7

Table 2: HRCT features noted in 16 patients with chronic obstructive pulmonary disease (COPD).

HRCT findings	Number of the patients
Emphysema	8
Emphysema and interstitial	4
Lung fibrosis	2
Traction bronchiectasis	1
Apical Fibrosis	1

As regards the HRCT findings in comparison to pulmonary function test. Six patients with emphysematous finding had obstructive pattern of PFT while two had a obstructive and restrictive. Two of the patients who had both emphysematous and interstitial lung fibrosis showed an obstructive pattern of lung function and the other two had obstructive and restrictive pattern. Patients with traction bronchiectasis has obstructive and restrictive pulmonary function tests. The patient with possible diagnosis of lung cancer showed obstructive and restrictive lung function while the obstructive feature were evident in the patient with apical fibrosis as shown in Table 3

Table 3: Patterns of pulmonary function test in 16 patients with COPD and there represented features on HRCT.

HRCT findings	Spirometry	
	Obstruction	Obstruction and restriction
Emphysema	6	2
Emphysema and interstitial lung fibrosis	2	2
Traction bronchiectasis	0	2
Apical fibrosis	1	0
Possible neoplasim	0	1

P value= 0.58

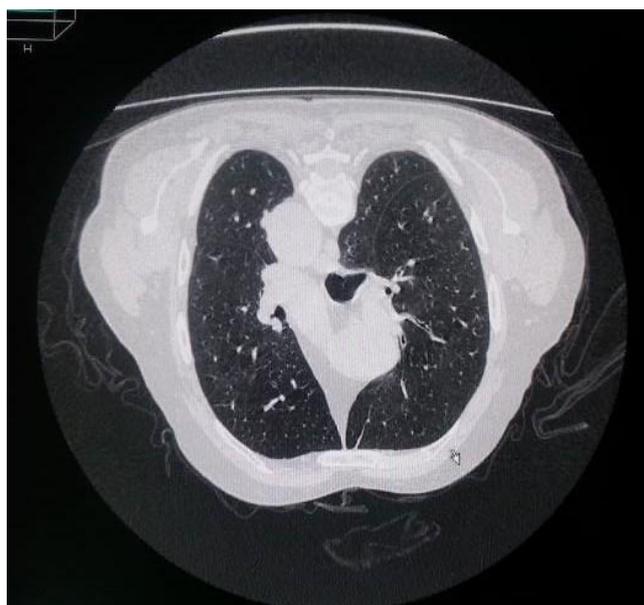


Figure 1: High resolution CT in patient with chronic obstructive pulmonary disease.

DISCUSSION

Patients with diagnosis of COPD have a cardinal symptom which is exertional shortness of breath and it is not correlated neither with the results of pulmonary function test nor HRCT, at present time the diagnosis, management and prevention of COPD do not consider HRCT and their findings as essential tool for evaluation process because of cost and risk of exposure to radiation, however clinical assessment combined with baseline and post bronchodilation study with spirometry may be deficient in elucidating the possible changes of COPD specially the occurrence of interstitial pulmonary changes, these changes although are not characteristic of obstructive airway; may add more impairment on lung function with possible long term sequels¹⁷.

It was clearly observed that the correlation between spirometric findings and the changes observed on HRCT scan wasn't always clear and consistent, in this study; the interstitial pulmonary changes (interstitial lung fibrosis) and traction bronchiectasis were observed more frequent in patients expressing restrictive changes on spirometry, however the difference wasn't significant statistically possibly because of the sample size. This finding may stress the importance of doing HRCT scan for the patients with COPD specially those patients with restrictive pattern on spirometry. Moreover in sixteen patients of this study; two patients had unexpected findings of possible neoplasm and apical fibrosis.

The presence of interstitial pulmonary fibrosis in addition to the already existing pathology, emphysema, in patients with COPD was traditionally.

regarded as two separate diseases, however the combination of both processes was characterized as well as defined recently as syndrome termed combined pulmonary fibrosis and emphysema syndrome (CPFE), the prevalence of CPFE had been estimated to occur in less than 10% of cases of diffuse interstitial lung disease, most of the studies were done on middle aged and elderly male chronically heavy smokers, where expectedly COPD does occur more frequently in, and the presence of both obstructive and interstitial lung involvement was consistent with the occurrence of more severe clinical presentation^{18, 19}, surprisingly in this study more frequent interstitial changes were observed in this small sample of the male patients, the possibility of atmospheric and occupational impact must not be overlooked and further researches may be needed with this respect. Also other risk factors for exacerbations need to be address as continuous irritations may cause permanent damage and changes to lung tissue like vitamin D deficiency²⁰; Specially in Iraq we have a high incidence rate of Vitamin D deficiency even among healthy individuals²¹.

CONCLUSIONS

HRCT scan is an important diagnostic tool to detect other additional pulmonary changes that can occur in patients with COPD, specially interstitial changes.

RECOMMENDATIONS

- 1-Larger studies are needed, with careful analysis of possible additional risk factors, environmental and occupational.
- 2-Obtaining histopathological assessment for these patients.

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