Influence of High resolution computed tomography (HRCT) in reviewing the diagnosis of chronic obstructive pulmonary disease (COPD): A study of 16 male patients

Ammar Jabbar Majeed 1 *, Falah Abdulhasan Deli 2 , Samet Elias Kasim 3

1 FICMS, DM, MBChB, Dept of Medicine, Faculty of Medicine, University of Kufa, Iraq, E mail: ammarjabbar48@gmail.com
2 FICMS, DM, Dept of Medicine, Faculty of Medicine, University of Kufa, Iraq, E mail: alhasnawi@uokufa.edu.iq
3 FICMS, MBChB, Dept of Medicine, Faculty of Medicine, University of Kufa, Iraq, E mail: samete.almoula@uokufa.edu.iq
Asaad Shukur, DM

*Corresponding author: Ammar Jabbar, E mail: ammarjabbar48@gmail.com

Abstract

Background: Chronic obstructive pulmonary disease (COPD) is manifested mainly as two main clinical phenotypes chronic bronchitis and emphysema. It is characterized by the presence of poorly reversible airflow obstruction; the presence of other histopathological changes may contribute to the poor response to treatment in many patients.

Aim of study: To detect additional changes that involves the lung tissue such as interstitial lung fibrosis in COPD patient.

Patients and Methods: This cross-sectional study was carried out on (16) male patients diagnosed with COPD. All patients were during the stable state, and investigated by spirometry and HRCT.

Results: Eight patients had emphysema, four had emphysema and lung fibrosis, two had traction bronchiectasis, one with apical fibrosis and another with possible lung neoplasm, four patients (out of seven) who had obstructive and restrictive pattern on spirometry had interstitial changes compared to two (out of nine of those with obstructive pattern only).

Conclusions and Recommendations: HRCT scan is an important diagnostic tool to detect other pulmonary changes that can occur in patients with COPD. Larger studies are needed and obtaining histopathological assessment for these patients.

Keywords: COPD, HRCT, respiratory condition

How to cite this article: Majeed AJ, Deli FA, Kasim SE (2020): Influence of high resolution computed tomography (HRCT) in reviewing the diagnosis of chronic obstruction pulmonary disease (COPD): A study of 16 male patients, Ann Trop Med & Public Health; 23(S12): SP231241. DOI: http://doi.org/10.36295/ASRO.2020.231241

Introduction

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. The chronic obstructive pulmonary disease is manifested mainly as two main clinical phenotypes chronic bronchitis and emphysema (1). 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 women (4), it affects about 5% of the population worldwide and it is possibly the third cause of death in 2012 (5), 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 population (6). 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 lung (7). 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 status (8).

Criteria used in diagnosis of COPD

People above 35-40 years with long term exposure to tobacco or occupational dusts
Symptoms including chronic cough, productive cough for three months of two successive years or dyspnea on exertion.
Spirometric results which show airflow limitation when the ratio of FEV1/FVC < 70% after inhalation of bronchodilators.

Exclusion of other diseases that give reversible airway obstruction by spirometry and abnormal chest x-ray (9)

**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 changes. It will give the possibility to identifying and differentiation between three phenotypes of emphysema, centrilobular (upper lobe), pan lobular (lower lobe), parietal (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. It was also identified that the pulmonary hypertension was the most common complication and the principal determinant of reduced survival in these patients. The understanding pathophysiology of this syndrome will change the therapeutic opinion as our management is directed mainly on airway obstruction; were in many occasions the response is observed to be non-satisfactory (18).

**Patients 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. These patients were diagnosed as COPD depending on

1- The age of the patient above 45 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 obtained for CT scanning of the chest by written consensus, investigated by spirometry (Spiro lab 3 MIR, mini flow meter) 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), version 21 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 (55 - 65 and 66 - 75 years), table (1). 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 described in table (2). 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 3.

**Table (1): Age group of the patients in the study**

<table>
<thead>
<tr>
<th>Age of the patient (years)</th>
<th>Number of the patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 – 65</td>
<td>10</td>
</tr>
<tr>
<td>66 - 75</td>
<td>6</td>
</tr>
</tbody>
</table>

**Table (2): Results of spirometry on 16 patients with chronic obstructive pulmonary disease**

<table>
<thead>
<tr>
<th>Spirometry results</th>
<th>Number of the patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>moderate obstruction</td>
<td>5</td>
</tr>
<tr>
<td>severe obstruction</td>
<td>4</td>
</tr>
<tr>
<td>obstruction and restriction</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table (3): HRCT features noted in (16) patients with chronic obstructive pulmonary disease (COPD)**

<table>
<thead>
<tr>
<th>HRCT findings</th>
<th>Number of the patients</th>
</tr>
</thead>
</table>

---

The patterns of spirometry and their represented features on HRCT to patients in the study showed that patients with obstruction (mild-moderate) was six with emphysema, two patients had both emphysema and additional interstitial lung fibrosis on HRCT. Patients that had both obstruction and restriction patterns on spirometry were two with emphysematous changes; two patients had emphysema and interstitial pulmonary fibrosis; and two patients with traction bronchiectasis as described in Table 4.

Table (4): Patterns of pulmonary function test in (16) patients with COPD and their represented features on HRCT

<table>
<thead>
<tr>
<th>Spirometry</th>
<th>Emphysema (only)</th>
<th>Emphysema and interstitial lung fibrosis</th>
<th>Traction Bronchiectasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruction (9)</td>
<td>6</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Obstruction and restriction (7)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

(P-value = 0.58651533)

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 an essential tool for evaluation process because of cost and risk of exposure to radiation, however clinical assessment combined with baseline and post bronchodilator 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 sequelae (17). It was clearly observed that the correlation between spirometry 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 were 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), 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.

**Conclusions**

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

**References**


(3) GOLD COPD. From the global strategy for the diagnosis, management and prevention of copd, global initiative for chronic obstructive lung disease (gold)2011, 2011


