



RESEARCH ARTICLE
EARLY CASES OF COPD- A CLINICAL EXPERIENCE

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ARTICLE INFO

Article History:

Received 13th, December, 2013

Received in revised form 23th, December, 2013

Accepted 12th, January, 2014

Published online 28th, January, 2014

Key words:

COPD, GOLD, EMPHYSEMA, SMOKING

ABSTRACT

Introduction

Chronic obstructive pulmonary disease (COPD) is a name coined for the diseases that were previously known as chronic bronchitis and emphysema and is the most common chronic lung disease in the world. Identification of cigarette smoking is the most commonly encountered risk factor for COPD. In this study we share our experience of patients of COPD in terms of clinical characteristics, association with smoking and prevalence of emphysema

Material and methods

This prospective study was done in Department of TB and Respiratory disease JNMC, AMU, Aligarh for a period of two years on 50 patients of early cases of COPD diagnosed on the basis of GOLD criteria.

Results

Males were seen to be predominantly affected. Maximum numbers of patients were in the age group of 61-70 that is 19 patients (38%). 48% had mild and 52% had moderate disease. 21% of mild disease patients had emphysema while 57% of moderate disease patients had emphysema. 80% of patients with emphysema were smokers. Out of these smoker emphysema patients 82% had moderate disease while 18% had mild disease. Most common type of emphysema was centriacinar in smokers while non-smokers had equal distribution of centriacinar and panacinar emphysema. Upper lobe was the most common lobe involved in patients with emphysema in both mild and moderate disease patients

Conclusion

COPD is predominantly a disease of males. Smoking is seen in majority of these patients. Centriacinar emphysema is most common emphysema

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INTRODUCTION

COPD is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases⁽¹⁾. In a simplified way, obstructive airflow limitation leads to air-trapping with subsequent hyperinflation and later destruction of the lung parenchyma. It is caused by a mixture of airway obstruction (Chronic bronchitis) and parenchymal destruction (emphysema), the relative contributions of which are variable. The British Medical Research Council (BMRC) defined chronic bronchitis as "daily productive cough for at least three consecutive months for more than two successive years"⁽²⁾. American Thoracic Society (ATS) in 1962 defined emphysema as an "anatomic alteration of the lung characterized by an abnormal enlargement of the air spaces distal to the terminal, non-respiratory bronchiole, accompanied by destructive changes of the alveolar walls"⁽³⁾.

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) recently defined COPD as "a common preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious

particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patient"⁽⁴⁾. Spirometry is essential for diagnosis and provides useful description of severity of pathological changes in COPD. GOLD defines COPD as a post-bronchodilator ratio of forced expiratory volume in one second to forced vital capacity (FEV1/FVC) of < 0.7 ⁽⁵⁾. GOLD (2007 update)⁽⁶⁾ guidelines divides COPD into Mild, Moderate, Severe and Very Severe on the basis of spirometric findings. Mild and moderate cases are called as early cases of COPD. During the early stage of the disease; conventional spirometry may reveal no abnormality as the earliest changes in COPD affect the alveolar walls and small airways. Hence noteworthy disease must be present at the level of peripheral airways; to be detected on conventional pulmonary function tests. HRCT is a promising method for evaluation of the inflammatory condition of the airway in COPD.

The development of COPD is multifactorial and the risk factors of COPD include genetic and environmental factors. The interplay of these factors is important in the development of COPD. Alpha1-antitrypsin deficiency is an established genetic cause of COPD especially in the young and it has been reported that 1-antitrypsin deficiency occurs in 1-2 per cent of individuals with COPD⁽⁷⁾. The major risk factor for the development of chronic obstructive

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pulmonary disease (COPD) is the inhalation of toxic gases and particles that are primarily—but not exclusively—generated in tobacco smoke. Other important environmental factors associated with COPD are outdoor air pollution, occupational exposure to dusts and fumes, biomass smoke inhalation, exposure to second-hand smoke and previous tuberculosis⁽⁸⁾. The population-attributable fraction for smoking as a cause of COPD ranged from 9.7 to 97.9 per cent⁽⁸⁾. In the susceptible smoker, important genetic, environmental, immunologic, and mechanical factors interact and modulate this small airway inflammation, ultimately leading to the pathologic lesion of emphysema. In this paper we present clinical characteristics, smoking associations and emphysematous changes of 50 patients with early COPD

MATERIAL AND METHODS

This study was done on 50 patients of COPD from Jan 2008 to Jan 2010 in the department of Tuberculosis and Respiratory diseases, JN Medical College, Aligarh Muslim University. Thorough clinical history was taken and detailed clinical examination was carried out. Diagnosis of COPD was done on the basis of Clinical features and Spirometry. All patient underwent physiologic evaluation that included measurement of the forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), FEV1/FVC ratio, peak expiratory flow rate, (PEFR) using a Spirometer (P.K Morgan LTD, Kent England) using published predicted values. The patients showing FEV1/FVC less than 0.7 were selected for further study. Bronchodilator reversibility testing was done to differentiate irreversible airflow obstruction of COPD from reversible airflow obstruction of asthma. Chronic Obstructive Lung Disease (GOLD) criteria. (2007 UPDATE) was used to categorize COPD into Mild and Moderate. Mild cases were those who had FEV1 > and or equal to 80%. Moderate cases were those who had FEV1 between 50 to 80%. All patients underwent CT scans of the chest with a spiral CT scanner in high resolution mode (HRCT) .The extend of emphysema was graded as minimal, moderate and severe. Minimal has 0-5% of involvement of lung, moderate has 5-30% involvement of lung while severe has >30% involvement of lung. Extend of disease on both sides was added and then mean was taken which was the final extend of disease.

Inclusion criteria

- History of dyspnoea, chronic cough or sputum production and /or history of exposure to risk factors for the disease
- Early cases (Mild and Moderate) of COPD diagnosed on the basis of Spirometry
- Patients with post bronchodilator increase in FEV1<12%.

Exclusion criteria

- ❖ An increase in FEV1 >12% or 200 ml, 10-15 minutes after inhaled salbutamol in a dose of 400 microgram was considered reversible obstruction and such patients were excluded from the study
- ❖ Severe and Very Severe COPD
- ❖ Recent respiratory tract infection in preceding six weeks
- Any other significant medical or surgical disease

Observations and results

Out of 50 cases, 36(72%) were males, 14(28%) were females. Male to female ratio in the study was 5:2. Age of the patients in the study group varied from 40 to 70 yrs. No patient was less than

40 yrs of age. Maximum numbers of patients were found in the age group of 61 to 70 years and maximum numbers of males and females were also seen in the same age group (Table-1). The mean age was 58 years. Out of 50 patients maximum(25) patients had onset of disease between 41-50yrs followed by 15 patients who had onset of disease between 30-40 years and 10 patients who had onset of disease between 51-60 years and none of the patients had onset above 61 years. The onset of disease was taken into consideration on the basis of symptoms of cough with expectoration and dyspnoea.

Table 1 Age wise distribution of cases

Age groups	males	females	Total	Percent
40- 50	10	4	14	28
51-60	12	5	17	34
61-70	14	5	19	38

Out of 50 patients, 24 patients (48%) had mild COPD with FEV1>or = to 80% and 26 patients (52%) had moderate COPD with FEV1 50%-80%. Out of 14 patients in the age group of 40-50yrs, 6 had mild and 8 had moderate COPD. Out of the 17 patients in age group 51-60, 9 had mild and 8 had moderate COPD. Out of 19 patients in the age group 61-70 yrs, 9 had mild and 10 had moderate COPD .This shows that there was no effect of age on severity of the disease the p-value was 0.83 which is not significant.

Table 2 Smokers and Nonsmokers

Age group	No of patients	Smoker	Percentage	Non smoker	Percentage
40- 50	14	11	78.5	3	21.4
51-60	17	15	88.2	2	11.76
61-70	19	16	84.2	3	15.3
TOTAL	50	42	84	8	16

Out of 50 patients, 42(84%) were smokers and 8(16%) were non smokers. Smokers comprised of 78% of patients in the age group of 40-50 while 88.2% of patients in the age group of 51-60 and 84 % of patients in the age group of 61-70 were smokers. (Table 2) Out of 24 patients with mild COPD, 20(83%) were smokers and out of 26 moderate COPD patients 22(85%) were smokers. Non-smokers comprised of 17 and 15 of patients in mild and moderate COPD.(Table-3)

Table 3 Correlation between smoking and severity of COPD

Smoking status	Mild		Moderate		Total
	No of patients	Percent	No of patients	Percent	
Smokers	20	83	22	85	42
Non smokers	4	17	4	15	8
total	24		26		50

Sex distribution of patients with mild and moderate COPD in Smokers and non-smokers is shown in table 4. Out of 50 patients, 20patients (40%) has evidence of emphysema on HRCT .Out of 24 patients with mild disease only 5 (21%) had evidence of emphysema. Out of 26 moderate disease patients 15 patients (57%) had evidence of emphysema on HRCT. The emphysema increased from 21% in mild COPD to 57% in moderate COPD. The increase in frequency is statistically significant. (table-5) Most of the patients 16 (80%). with emphysema were smokers while only 4 patients (20%) were non-smokers. 3 smokers with mild disease had emphysema while 13 smokers with moderate disease had emphysema. Male smokers with emphysema with mild disease were seen in 18% of smokers with mild emphysema while 57% of smokers with emphysema were males with moderate disease.

Table 4 Sex distribution of patients with mild and moderate COPD in Smokers and non-smokers

Age group	Total no of patients	Mild disease				Moderate disease			
		Smoker		non-smokers		smoker		non-smoker	
		Male	Female	Male	Female	Male	female	Male	Female
40- 50	14	3	1	1	1	5	2	1	0
51-60	17	8	0	0	1	3	4	1	0
61-70	19	7	1	0	1	6	2	1	1
total	50	18	2	1	3	14	8	3	1

Male and female non-smokers in both mild and moderate group were 25% each of non-smokers with emphysema (table 6). The most common emphysema which was found in maximum number of patients in mild disease and moderate group was centriacinar followed by panacinar. None of the patient had paraseptal emphysema in mild group while three male smokers had paraseptal emphysema in moderate group. In non smokers centrilobular and Panlobular were the most common emphysema seen (Table 7).

Table 5 Age wise distribution of patients with emphysema

Age group	Total no of patients with mild disease	Mild disease patients with emphysema	Total no of patients with mod disease	Mod disease patients with emphysema
40- 50	6	1	8	3
51-60	9	3	8	8
61-70	9	1	10	4
71-80	0	0	0	0
Total	24	5 (21%)	26	15 (57%)

Minimal emphysema was seen in 80% of patients with mild COPD while 60% of patients with moderate disease had severe emphysema. The extend of emphysema increased from none of patients with severe emphysema in mild to 60% of patients with severe emphysema in moderate disease. This increase in incidence of severe emphysema in moderate disease was *statistically significant*. Upper lobe was the most commonly involved lobe in patients with emphysema followed by middle lobe. The upper lobe was involved in 60% of patients with emphysema in mild disease group while 67% of patients with emphysema in moderate group had involvement of upper lobe. (table8)

Table 6 Emphysema in smokers and non smokers

Severity	No of patients with emphysema							
	Smokers(16) (80%)				Non-smokers (4) (20%)			
	Male	Perc. of smokers with emphysema	Female	Perc. of smokers with emphysema	Male	Perc. of non-smokers with emphysema	Female	Perc. of non-smokers with emphysema
Mild (5 patients)	3	18	0	0	1	25	1	25
Moderate(15 patients)	9	57	4	25	1	25	1	25

Table 7 No of patients with different types of emphysema in Smokers (16) and non-smokers (4)

Emphysema	Mild		Moderate	
	Smokers	Non-smokers	Smokers	Non-smokers'
Centriacinar	2	1	6	1
Panacinar	1	1	4	1
Paraseptal	0	0	3	0

Table 8 No of patients with extend of emphysema

Extent of emphysema	No of emphysema patients with mild COPD(5)	No of emphysema patients with moderate COPD(15)
MINIMAL EMPHYSEMA (>0% -5%)	4 (80%)	2 (13%)
MODERATE EMPHYSEMA (>5% - 30%)	1 (20%)	4 (27%)
SEVERE EMPHYSEMA (>30%)	0	9 (60%)

Involvement of different lobes of lungs in patients having CT evidence of emphysema

Lobes of lung	No of patients with Mild disease	Moderate disease	Percentage of patients with emphysema(20)
upper	3	10	65
middle	1	3	20
lower	1	2	15

DISCUSSION

The present study included patients who were attending outpatients at our institute, where the clinical features and chest radiographs were suggestive of chronic airflow obstruction and the spirometry revealed irreversible or partly-reversible airflow obstruction indicative of COPD. Further sub typing of COPD as emphysema, chronic bronchitis or peripheral airways disease is not confidently possible through these conventional methods. Our maximum patients were above 50 years.

Our findings are in conformity with the findings of *Oswald et.al*⁽⁹⁾ who also reported the maximum incidence of chronic obstructive pulmonary disease in the middle decade of life. *Kishore et. al*⁽¹⁰⁾ have also reported the mean age of patients of COPD as 49.17+16.5 yrs. Males outnumbered females in this study. Many workers have reported that disease is more predominant in males than females. Many workers have reported that disease is more predominant in males than females⁽⁹⁾. Our male to female ratio was 5:2. *Mitchell and Filley*⁽¹¹⁾ has reported M; F ratio of 5:1. Maximum number of COPD patients had their age at onset of disease in between 41-50 years, *Guleria . et. al*⁽¹²⁾ have reported similar findings in their study where the maximum number of patients were having their age at onset of disease between 40-70

years. There was no correlation between age of the patient and severity of COPD. Severity of COPD depends upon smoking status, treatment taken, continued exposure to risk factors and co morbid illness, however because the process of aging does affect lung volume, the use of this fixed ratio may result in over diagnosis of COPD in the elderly especially in mild disease. Most of the COPD patients were smokers. 83% of mild disease patients were smokers while 85% of moderate disease patients were smokers. 10 out of 14 females were smokers, out of 4 nonsmokers females three had mild disease while only one had moderate disease. Out of 19 males who had mild disease 18 were smokers. Out of 17 males with moderate disease 14 were smokers.

Our data shows Cigarette smoking was seen in most of the patients (both males and females) with both mild and moderate disease. Cigarette smoking is the most commonly encountered risk factor for COPD. However it is not the only one as there is consistent evidence from epidemiological studies that non smokers may also develop chronic air flow obstruction as seen in 8 of our patients. The earliest morphologic evidence of changes in the airways associated with chronic cigarette smoking is in the small airways⁽¹³⁾. Fletcher and Peto R⁽¹⁴⁾ supported the concept that chronic cigarette smoking is indeed the major cause of chronic bronchitis and emphysema. Cessation of smoking definitely improves pulmonary function and decreases the prevalence of respiratory symptoms. Higgins⁽¹⁵⁾ found that the prevalence of persistent cough and sputum was higher in smokers than in non smokers among a random sample in vale of Glamorgan. The putative inorganic dust in cigarette smoke is aluminium silicate or kaolinite, a common component of clay soils. Kaolinite has been recovered in the alveolar macrophages of smokers and has been reported as a constituent of tobacco products. The origin of kaolinite in tobacco products remains unknown, and possible potential sources are proposed. On inhalation, kaolinite deposition in the distal lung may promote macrophage accumulation within the terminal airways leading to a respiratory bronchiolitis⁽¹⁶⁾

Emphysema was seen on HRCT in 40% of patients, 15 patients with moderate disease while 5 patients with mild disease. It was seen in 21% of patients with mild disease and in 57% of patients with moderate disease. 80% of patients with emphysema were smokers while 20% were non-smokers. 70% of emphysema patients were males while only 30% were females. 19 of smokers with emphysema were males with mild disease. 56% of smokers with emphysema were males with moderate disease. Smoking is the most important risk factor for emphysema. In terms of percentage of patients with emphysema our study is somewhat similar to C O'Brien et. al⁽¹⁷⁾ who in 110 patients of COPD aged 40–80 found emphysema in 51% of patients. Gianna Camiciottoli et. al⁽¹⁸⁾ in their study on 1,406 subjects in the age group 55–69 who had smoked at least 20packs/year found Emphysema in 26.6%) subjects and more frequent in men than in women.

The prevalence of emphysema we found in mild disease is also close to those of 24% (16/67), 25% (20/80) and 34% (9/26) reported in smaller series of smokers who underwent thin slice sequential CT at standard dose and in whom emphysema was visually assessed and in a large study of lung cancer screening with low-dose CT in Spain in which a 29% prevalence of visually assessed emphysema was found in 1,166 former and current smokers of at least 40 years of age⁽¹⁸⁾. Nawa et. al⁽¹⁹⁾ reported a prevalence of 11.2% (686/6,144) in men of 50–69 years of age, including non-smokers examined with low-dose spiral CT 60% of

emphysema patients with moderate disease had severe emphysema, while 80% of emphysema patients with mild disease had minimal emphysema and 0% had severe emphysema. The prevalence of severe emphysema increased from 0% to 60% from mild to moderate COPD. This increase in prevalence was statistically significant. Our study in this respect is in accordance with M. Pescarolo et.al⁽²⁰⁾ who in a study of 43 patients of COPD found a significant correlation between CT emphysema extent and GOLD stages. Our studies had near similar inclusion criteria's. Centriacinar emphysema was the most common variety.

Centriacinar emphysema was present in 2 smoking patients with mild disease and 6 smoking patients with moderate disease. Smoking is usually associated with centriacinar emphysema, the emphysematous subtype predominantly observed in our patient. However, we also observed panacinar emphysema in significant numbers, because as the process of centriacinar emphysema which advances the focal lesions becomes confluent, it may appear panacinar emphysema. Emphysema was confined to the upper lobes in most cases (65 %). All three types of emphysema had *upper lobe predominance* – a cardinal feature of smoking-induced emphysema. Upper lobe predominance is seen in other studies like in a study by Gupta P P et. al⁽²¹⁾. on High-resolution computed tomography features in patients with chronic obstructive pulmonary disease on 40 male patients with COPD (age 40 years or older) and with a significant smoking history (20 pack-years or more) and also in a study by C O'Brien et.al⁽¹⁷⁾. in 110 patients aged 40–80 years who had presented to their general practitioner with an acute exacerbation of COPD.

CONCLUSION

COPD is a disease of elderly seen in patients above 50 years of age. Clinical features, conventional radiography and spirometry aids in the diagnosis but sub typing of COPD as emphysema, chronic bronchitis or peripheral airways disease is not confidently possible through these conventional method Spirometry helps in categorizing it into mild, moderate, severe and very severe. There is no correlation between age of the patient and severity of COPD. Major risk factor is cigarette smoking. Emphysema is seen in about half of these patients, centriacinar being the most common.

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