

Case Study of HRCT Lung in Smokers

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Abstract

Aims and Objectives: To identify the different type of lung pathologies related to smoking and also to identify commonest pathology of lung related to smoking.

Material and Methods: Eighty five male patients were included in this study. The inclusion criteria were any respiratory complaints and history of smoking of one pack year (20 piece of cigarette per day for one year). History of smoking less than one pack year was not included. HRCT scan were done on this patients.

Results: In the age group of 20 to <40 years, the most common disease was 8 cases of bronchitis, followed by 5 cases of ILD, 2 cases of coexisting TB, and 1 case of emphysema. In the age group of 40 to <60 years, the most common disease ILD was seen in 20 cases, followed by 15 cases of bronchitis, 12 cases of emphysema, 5 cases of coexisting TB. In the age group of > 60 years, the most common disease was emphysema with 25 cases. It was followed by 21 cases of bronchitis, 18 cases of ILD, and 6 cases each of mass lesion and coexisting TB.

Conclusion: In our study we concluded there is an increased occurrence of each pathology, with increase in age and duration of smoking.

Keywords: Emphysema, Bronchitis, ILD, TB

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I. Introduction

The respiratory system start from the nose and upper airway to the alveolar surface of the lungs, where gas exchange occurs. Inhaled tobacco smoke moves from the mouth through the upper airway and reaching the alveoli. As the smoke moves more deeply into the respiratory tract, more soluble gases are adsorbed and particles are deposited in the airways and alveoli. The substantial doses of carcinogens and toxins delivered to these sites place smokers at risk for malignant and non-malignant diseases involving all components of the respiratory tract including the mouth. During the past few decades a huge body of knowledge has been gathered, increasing our awareness of tobacco-related diseases. Among these, COPD is the most serious global health issue, accounting for almost 30% of all mortality attributed to tobacco smoking. This figure was estimated from nearly two million deaths in 2005 and COPD is expected to advance from the fifth to the fourth leading cause of death by 2030[1, 2]. Cigarette smoke affects almost every aspect of health, including the cardiovascular system with increased risk of heart failure and stroke. These together with cancer and respiratory diseases account for most tobacco-related deaths world-wide[3–6]. Cigarette smoking is related to the development of several ILDs, including respiratory bronchiolitis ILD (RB-ILD), desquamative interstitial pneumonitis (DIP), pulmonary Langerhans cell histiocytosis (PLCH), and idiopathic pulmonary fibrosis (IPF). The recent refinement of the classification of the idiopathic interstitial pneumonias (IIPs) and the increasing use of high-resolution computed tomography (CT) to characterize the ILDs have lead to increased recognition and understanding of the SR-ILDs[7, 8]. In the absence of any obvious radiographic correlate of such subtle changes, there was a hiatus in the understanding of the pathogenecity and clinical aspects of cigarette smoking-induced lung disease. High resolution computed tomography (HRCT) has lifted the veil on many facets of smoking-related disease, notably the distribution and interplay between interstitial and emphysematous disease, airways changes, and longitudinal changes in the lungs of cigarette smokers[9, 10]. Tobacco smoking is the main contributor to lung cancer[11]. Cigarette smoke contains at least 73 known carcinogens[12]. Across the developed world, 90% of lung cancer deaths in men during the year 2000 were attributed to smoking[13]. Smoking accounts for about 85% of lung cancer cases[14].

II. Materials And Methods

Eighty five patients were included in this study, all male patients with age range 21 to 83 years and mean age of 53.4 years. The inclusion criteria was respiratory compliant and history of smoking of one pack year (20 piece of cigarette per day for one year). This study was conducted from March 2016 to August 2017 at our Department of Radiodiagnosis, Sree Balaji medical college and hospital, Chennai. HRCT scan were done on Hitachi Eclon multi slice CT scanner (Hitachi, USA).The CT protocols used for lungs study was as follows: Slice thickness: 0.625-1.25 mm, Scan time: 0.5-1 sec, kV: 120 , mAs: 100-200, collimation: 1.5-3 mm , Matrix size: 768 x 768 or the largest available , FOV: 35 cm , Reconstruction algorithm: high spatial frequency, Window: lung window.

III. Results

Our study included 85 male patients with any respiratory complaint and having history of smoking of one pack year of one year or more. The mean age of our study population is 53.4years .We categorized them in three age groups as seen in Table 1.Out of 85 patients, 18of them had a smoking duration of 1 to 5 years of one pack year, 29 of them had a smoking duration of 6 to 10 years and 38of them had a duration of smoking for more than 10 years of one pack year(Table 2).Emphysema(Fig 1,2 & 3):Twenty-five cases of emphysema belonged to more than 60 years of age, 12 cases belonged to 40 to 60 years of age, only 1case of belonged to 20 to 39 years of age(Table 8). In table 3 we have shown the relations of duration of smoking of one pack year to frequency of centrilobular emphysema, paraseptal emphysema and involving both the emphysema. In our study we found that, the centrilobular, paraseptal and combined type had the highest frequency in those with history of smoking of one pack year of more than 10 years. Bronchitis (Fig 4 & 5): Age wise distribution is shown in the table 8. Out of 19 case of bronchiectasis, 1 case belonged to the category of 1 – 5 years duration of smoking of one pack year, 5 cases and 13 cases of bronchiectasis belongs to 5 – 10 years and > 10 years category respectively. Similarly, out of 25 cases of bronchial wall thickening, 3 cases falls under 1 – 5 years, 10 cases under 5 – 10 years duration and 12 cases under > 10 years of duration of smoking of one pack year.(Table 4)Interstitial lung disease (Fig 6 & 7):Out of 43 ILD cases, 5 cases falls under the age group of 20 to < 40 years, 20 cases falls under the age group of 40 to < 60 years and 18cases falls under the age group of > 60 years (table 8). Out of 38 cases of GGO, 2 cases belong to the category of 1 – 5 years duration of smoking of one pack year, 10 cases and 17 cases of GGO belonged to 5 – 10 years and > 10 years category respectively. Similarly, out of 16 cases of septal thickening, 2 cases falls under 1 – 5 years, 4 cases under 5 – 10 years duration and 10 cases under > 10 years of duration of smoking of one pack year. Likewise in 28 cases of interstitial nodules, 2 cases falls under the 1 - 5 years category, 10 cases under 5 – 10 years and 16 cases under > 10 years of smoking of one pack year (Table 5)

Coexistent Tuberculosis (Fig 8):Age wise distribution is shown in the table 8.Out of 85 study population, total number 13 cases were coexisted with tuberculosis of which 2 cases fall under the history of 1 – 5 years of smoking of one pack year, 5 cases under 5 – 10 years of smoking of one pack year and 6 cases of smoking > 10 years of one pack year (Table 6).Lung Cancer (Fig 9 & 10):Out of 85 study population, 5 cases of > 60 years age group were associated with mass lesion and all of them had history of smoking for more than 10 years of one pack year(table 7).Age group Prevalence(Table 8):In the age group of 20 to <40 years, the most common disease was 8 cases of bronchitis, followed by 5 cases of ILD, 2 cases of coexisting TB, and 1 case of emphysema. In the age group of 40 to <60 years, the most common disease ILD was seen in 20 cases, followed by 15 cases of bronchitis, 12 cases of emphysema, 5 cases of coexisting TB. In the age group of > 60 years, the most common disease was emphysema with 25 cases. It was followed by 21 cases of bronchitis, 18 cases of ILD, and 6 cases each of mass lesion and coexisting TB. Smoking duration: In this study, the occurrence of respective pathology increases with increased in the duration of smoking of one pack year which is shown in table 9.

Table 1: Age distribution with relation to frequency

Age category	Number	Percentage
20 - 39	18	21.2%
40 - 59	30	35.3%
60 & above	37	43.5%
Total	85	100.0%

Table 2: illustration of age distribution and duration of smoking of one pack year.

Age category	Duration of smoking of one pack year			Total
	1-5 yrs	6-10 yrs	>10 yrs	
20 - 39	15	3	0	18
40 - 59	2	20	8	30
60 & above	1	6	30	37
Total	18	29	38	85

Table 3: show the relation of duration of smoking of one pack year and emphysema.

Duration of smoking	Centrilobular emphysema	Paraseptal emphysema	Both
1-5 yrs	0	0	0
6-10 yrs	10	8	5
>10yrs	23	21	19

Table 4: Frequency of bronchiectasis and bronchial wall thickening according to duration of smoking of one pack year.

Duration	Bronchiectasis	Bronchial wall thickening
1-5 years	1	3
5-10 years	5	10
> 10 years	13	12
Total	19	25

Table 5: Frequency of GGO, septal thickening and interstitial nodules according to duration of smoking of one pack year.

Duration	GGO	Septal thickening	Interstitial Nodules
1-5 years	2	2	2
5-10 years	10	4	10
> 10 years	17	10	16
Total	38	16	28

Table 6: Smoking and TB

Duration	Coexistent TB present	No Coexistent TB	Total
1-5 years	2	16	18
5-10 years	5	24	29
> 10 years	6	32	38
Total	13	72	85

Table 7: Smoking associated with mass lesion.

Duration	Mass lesions
1-5 years	0
5-10 years	0
> 10 years	6
Total	6

Table 8: Study finding according to age group.

DISEASES	20 - < 40	40 - < 60	>60
Emphysema	1	12	25
Interstitial lung disease	5	20	18
Consolidation	3	6	12
Mass lesions	0	0	6
Coexistent TB	2	5	6
Bronchitis	8	15	21

Table 9: Relation of smoking duration of one pack year and diseases

PACK YEARS	Emphysema	BRONCHITIS	ILD	Mass lesions	Coexistent TB
1-5 yrs	0	3	4	0	2
6-10 yrs	13	10	17	0	5
>10yrs	25	11	22	6	6



Fig 1:Centrilobular emphysema

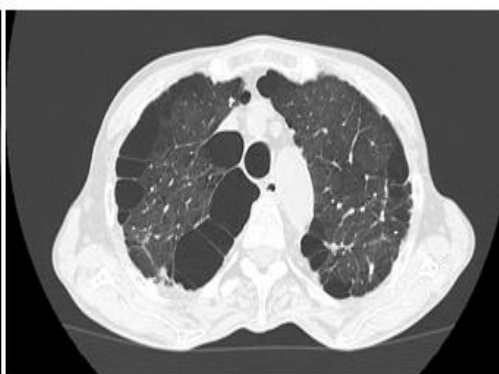


Fig 2: Paraseptal emphysema



Fig 3:Centrilobular and paraseptal emphysema

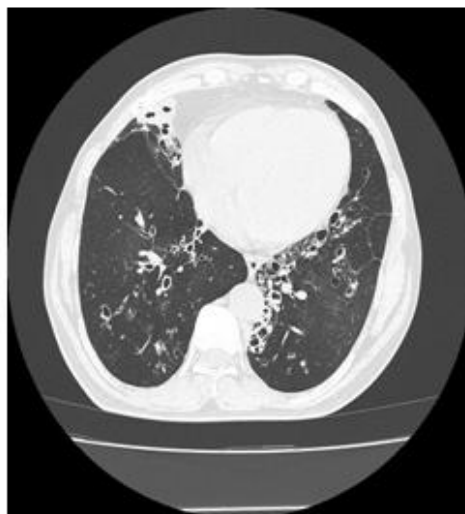


Fig 4 :Bronchial wall thickening

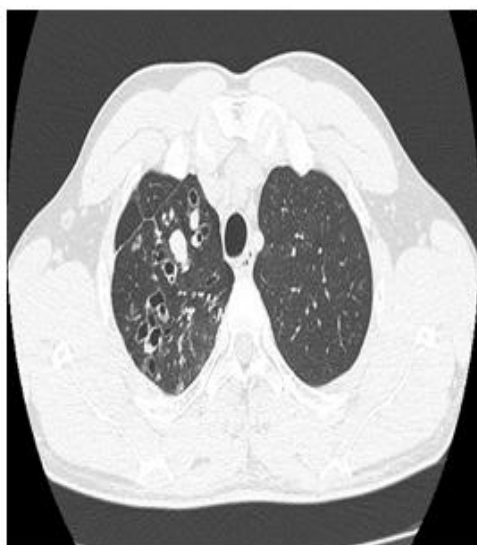


Fig 5 :Bronchiectasis



Fig 6 :Ground glass opacity



Fig 7 :Septal thickening

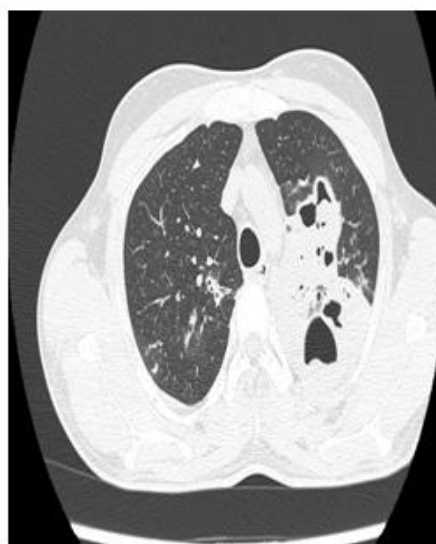


Fig 8 :Tuberculosis



Fig 9 :Lung cancer



Fig 10 : Lung cancer

IV. Discussion

In this study comprising of patients from 21 years up to 83 years of age, the most commonly affected age group was more than 60 years (44%). Out of 85 cases, 45 % of them had a history of smoking of one pack year for more than 10 years, 35 % of them were between 6 to 10 years of smoking and 21 % of them were 1 to 5 years of smoking. Out of 85 cases, 12 of them had normal lung study and 73 of them had abnormal findings. Out of 12 normal study 75 % of them belonged to 20 to < 40 age group, remaining 25 % belonged to 40 to < 60 age group and 0 % from > 60 % age group. In this study, in the age group of 20 to <40, we found that bronchitis, had the highest occurrence rate which contributed about 42 % and emphysema contributing only 5 % of cases. Similarly in the age group of 40 < 60 bronchitis contributed about 26 % and emphysema contributed 21% of the diseases whereas in the age group of > 60, emphysema had the highest occurrence 28 % followed by bronchitis (24 %). We found 5 cases of lung mass, which was only seen in the age group of > 60 years and those with history of smoking one pack year for more than 10 years (Table 8 & 9). This data matches with the literature (David Alveson, 2008)[10]. Nalamala Baskara Rao et al in 2015 showed that 17(53%) out of 32 subjects had CT evidence of emphysema. The incidence of emphysema increased with increasing age and pack years. Comparing with our study we got 25(36 %) cases of emphysema who had smoking history of one pack year for more than 10 year in the age group of > 60 years. And it also showed the risk of incidence of emphysema with increasing age and durations of smoking of one pack year. This research shows the relation between CT findings and duration of smoking. In the duration of smoking of >10 years of one pack year, our study population showed emphysema (36%), chronic bronchitis (16%) and lung cancer (7%)(Figure 31) This matches with (Yasunaga k et al. 2013) but slightly lower percentage of emphysema in our study. In our study we also observed that patients who had 1 – 5 years history of smoking of one pack years did not show any evidence of emphysema where as bronchitis were seen in 3 cases (table 10). Cigarette smoking is a recognized risk factor for the development of interstitial lung disease (ILD). There is strong evidence supporting a causal role for cigarette smoking in the development of respiratory bronchiolitis ILD (RB-ILD), desquamative interstitial pneumonitis (DIP), and pulmonary Langerhans cell histiocytosis (PLCH)[15].

Chakrabarti et al, showed that there is 8% to 19% prevalence of interstitial lung disease (ILD) in chronic smokers who were unaware that they had a lung disorder. In our study the prevalence was 32 to 45 %. In our study population, ILD contributed 45 %, 38% and 32 % with duration of smoking 1 to 5 years, 6 to 10 years and > 10 of one pack year respectively[16]. In the study of Katzenstein et al, RB ILD, DIP, PLCH was commonly from 3rd to 5th decade of life where as in our study population the ILD contributed to 26 %, 34% and 20 % of cases in the age group of 20 to <40 years, 40 < 60 years and > 60 years respectively. The most affected age group was 40 to < 60 years age group. The occurrence increased with increased of duration of smoke of one pack year (table 9)[17]. Talha Saad et al, studied showed that the proportion of cigarette smoking was 54.6% in TB cases. In our study we found only 13 (15%) cases which were coexisting with TB. The difference between of their study and our study was that their targeted population comprised of patients was history of smoking and suspected TB. In our study population, out of 85 cases, 6(6%) cases showed lung cancer whose age group belonged to > 60 years and history of smoking of one pack year for than 10 years. This data matches with the study of Yasunaga k et al.

V. Conclusion

The present study included 85 patients who came with any respiratory complaint and history of smoking of more than one pack year.

The most common pathologies associated with the smoking in our study were COPD which consists of bronchitis and emphysema, followed by interstitial lung disease, coexistent tuberculosis and lastly lung mass.

Bronchitis had highest occurrence among the age group of 20 to < 40 years.

ILD had the highest occurrence among the age group of 40 to < 60 years.

Emphysema had the highest among the age group of > 60 years.

There was an increased occurrence of each pathology, with increase in age and duration of smoking.

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