ORIGINAL RESEARCH

Insight into a new Diagnostic tool (HRCT) in diagnosis of Interstitial Lung Diseases among Smokers

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Abstract

Introduction:A chest radiograph, although being a rather insensitive diagnostic tool, is nevertheless the most common radiological method used to screen individuals who are clinically suspected. Because of the lack of specificity of the term 'reticulonodular pattern,' a chest X-ray may fail to accurately identify many conditions, causing them to go undetected. Hence study was planned to assess the usefulness of HRCT in diagnosis of Interstitial Lung Diseases among Smokers

Materials and method: Simple random sampling method was used to select the sample and allocate according to the inclusive and exclusive criteria. A detailed history, complete physical examination and routine & appropriate investigations were done for all patients.

Result:RB-ILD was the most common diagnosis among smokers (48 percent), which is consistent with the fact that a connection to smoking has previously been established. The NSIP was the second most prevalent (20 percent), and the UIP was the third most prevalent (16 percent). There was a decrease in the number of cases of DIP and Early ILD.

Conclusion: On the contrary hand, smoking appears to offer some protection against sarcoidosis, organizing pneumonia, and hypersensitivity pneumonitis (HP) (OP). A crucial part of the differential diagnosis is played by high-resolution computed tomography, or HRCT. RB is thought to be a marker for smoking exposure since it occurs quite often among smokers.

Keywords: HRCT, ILD, Smokers, Diagnostic tool

Introduction

The pathophysiology of interstitial lung disease (ILD) may be found, in the majority of instances, in the pulmonary interstitium. This is the connective tissue gap that exists between the alveolar epithelial cells and the neighboring capillary endothelial cells. The diagnosis of ILD requires a comprehensive set of tests and examinations.[1,2] Cigarette smoking, aspiration, certain medicines, radiation treatment, cancer, systemic disorders, environmental and occupational variables have all been identified as having a connection with the ILD in one third of the patients.[3] On the other hand, almost two-thirds of ILD cases have no reportable relationship.[4,5] Despite the fact that it does not have a sensitivity of one hundred percent, HRCT has an excellent detection rate for interstitial lung disorders. The specificity with which various ILDs may be characterized has been established, and it seems to be superior to that of conventional radiography.[6,7] However, with the development of high-resolution computed tomography (HRCT), it has been possible to clearly determine the usual CT-based morphologic patterns associated with idiopathic interstitial pneumonia (IIP). Because of this, radiologists play a significant and essential role in the diagnosis and characterization of the condition.[8] Niew hoehneret al.[9] were the first researchers to identify respiratory bronchiolitis (RB) as a separate histopathologic entity that manifests itself in young smokers. This condition, which is commonly referred to as "smoker's bronchiolitis," is distinguished by the buildup of cytoplasmic macrophages with a golden-brown

pigmentation inside the respiratory bronchioles.[10] It is important to note that RB may continue to exist in some people many years after they have quit smoking.[11] Additionally, the presence of regions of RB or DIP-like response might be regarded as a sensitive histologic marker of cigarette smoking. This is because RB and DIP-like reactions are both caused by smoking cigarettes. Desquamative interstitial pneumonia, abbreviated as DIP, was first characterized by *Liebow and colleagues.*[12] This illness is distinguished by the extensive accumulation of macrophages inside the alveoli, in conjunction with a generally moderate interstitial response; but, in certain cases, the disorder may progress to fibrosis and end-stage lung disease. At the present time, it is well knowledge that the histopathologic patterns of RB-ILD and DIP may overlap. The most important factor in distinguishing between the two conditions is the location and extent of the lesions, which are bronchiolocentric in RB-ILD and diffuse in DIP, respectively.[13]

Methodology

The sample size of this Cross sectional study is 100.Simple random sampling method was used to select the sample visiting with complaints of Interstitial Lung Diseases. A detailed history, complete physical examination and routine & appropriate investigations were done for all patients.

Inclusion and Exclusion criteria

The study subjects were chosen as per the inclusion and exclusion criteria:

Inclusion criteria

- Smokers with progressive dyspnea and cough
- Age >30 years

Exclusion criteria

- Age <30 years
- Pregnant females
- Patients who are unable to hold breath leading to undiagnostic quality of HRCT scan

When comparing the percentage values of the two groups, the chi-square test was utilized to analyze the frequency differences between the two groups. If the p-value was less than 0.05, then it was regarded to be statistically significant.

Result

The following table-1 provides information regarding the demographics of participants who took part in a research project concerning the role of high-resolution computed tomography (HRCT) in smoking-related interstitial lung diseases. The participants were all of a certain age. It demonstrates that ILDs affect a wide range of ages, with a higher prevalence in the age groups that range from 41 to 70 years old, which account for a combined total of 75 % of all cases. The age brackets that range from 51 to 60 years old and 61 to 70 years old have the highest individual percent ages, each making up 26 % and 27 % respectively. This indicates that there is a possibility of an increase in the occurrence of ILDs with age, particularly in the decades that follow the age of 40, and this may correlate with cumulative exposure to smoking over time. ILDs are still a problem in the population that is getting older as evidenced by the fact that individuals over the age of 70 make up a significant proportion (20 %).

Table 1: Describing the study groups as per Age

Age	N	%age
30 - 40 years	5	5
41 – 50 years	22	22
51 – 60 years	26	26
61 – 70 years	27	27
> 70 years	20	20
Total	100	100.0

The data presented in the table-2 indicate that there is a significant gender gap in the incidence of smoking-related interstitial lung diseases (ILDs), as measured by high-resolution computed tomography (HRCT) (HRCT). Males account for 68% of the cases, while females only make up 32% of the total, indicating that there is a significant bias toward males. This could be a reflection of higher smoking rates among males or a greater susceptibility to smoking-related ILD among those who fall into this demographic. According to the findings of HRCT scans, this may also suggest that males are more likely to develop radiologically detectable ILD changes as a consequence of smoking.

Table 2: Describing the study groups as per Gender

Gender	N	%age
Male	68	68
Female	32	32

Total	100	100.0

Table 3: Describing the study groups as per Smoking history

Duration of Smoking	N	%age
5-10 years	30	30
11-20 years	24	24
21-30 years	36	36
>31 years	10	10
Total	100	100.0

Interstitial lung diseases (ILDs) detected by High Resolution Computed Tomography are shown in relation to smoking history in the table below (HRCT). There appears to be a correlation between long-term smoking and the onset of ILDs, with 36% of smokers falling into the 21-30 year category. Particularly notable is the fact that the %age of ILD cases rises steadily from those who have smoked for 5-10 years (30%) to those who have smoked for 21-30 years (36%), but then falls to 10% for those who have smoked for more than 31 years.(Table-3)

Table 4: Describing the study groups as per Symptoms

Symptoms	N	%age
Dry cough	74	74
Wet cough	24	24
Dyspnea	88	88
Joint Pain	34	34
Fever	38	38
Other	28	28

Interstitial lung diseases (ILDs) can be linked to smoking, and the presented table classifies the frequency of various symptoms in a population with ILDs identified by High Resolution Computed Tomography (HRCT). Dyspnea, or difficulty breathing, is the most common symptom, experienced by 88 % of the individuals, which aligns with the known clinical presentation of ILD where lung function is compromised. Seventy-four percent of people also reported having a dry cough, while only twenty-four % had a wet cough. This indicates that in this sample of people with ILD, a dry, hacking cough is more common. There may be systemic involvement or overlap with other conditions, such as connective tissue diseases, because joint pain and fever are present in 34% and 38% of cases, respectively. Twenty-eight % of respondents listed "Other," which could encompass a wide range of uncommon or vague symptoms.(Table-4)

Table 5: Describing the study groups as per relationship of Smokers with ILD diagnosed using HRCT

HRCT Diagnosis	Smokers	%age
UIP	16	16
NSIP	20	20
RB-ILD	48	48
DIP	9	9
Early interstitial lung disease	7	7

Table-5 provides an overview of the distribution of High Resolution Computed Tomography (HRCT) diagnoses among smokers. The percentages indicate the proportion of each ILD subtype that was found within the smoking population that was investigated. The diagnosis of Respiratory Bronchiolitis-Interstitial Lung Disease (RB-ILD), which accounts for nearly half of all cases (48 %), is the most common one. This finding is consistent with the disease's well-established connection to smoking. Non-Specific Interstitial Pneumonia (NSIP) is the second most prevalent at 20 %, followed by Usual Interstitial Pneumonia (UIP) at 16 %. Both of these forms of pneumonia are categorized as interstitial lung diseases. Smokers have a diagnosis rate that is 9 % lower for desquamative interstitial pneumonia (DIP) and 7 % lower for early interstitial lung disease respectively.

Discussion

ILDs were found to affect a wide range of ages in this particular study, with the highest prevalence being found in the age group of 41-70 years old, which accounted for 75 percent of the total number of cases. The age brackets that range from 51 to 60 years old and 61 to 70 years old each have the highest individual percent ages, making up 26 percent and 27 percent

respectively of the total population in those age ranges. There is no information available regarding the incidence or prevalence in India. There is a wide age range affected by the disease, with cases being reported even in young children and infants. The disease manifests itself most frequently in adults in the middle years of their life.[14] There is a correlation between age and the prevalence of interstitial lung diseases (ILD). According to the findings of a study carried out by Ma et al.[15], it was discovered that people aged 70–79 had a higher global incidence of ILD as well as pulmonary sarcoidosis. Another study done by Choi and colleagues showed that the likelihood of developing ILD increases with age, with the risk being 6.9 times higher in people over the age of 70 compared to people in their forties[16]. In addition, Tang et al. conducted research on childhood ILD and found that the etiologic spectrum of ILD in children older than 2 years of age is expanding and that more genetic etiologies are being recognized[17]. This was discovered in a study that focused on childhood ILD. According to these findings, the incidence of ILD varies across different age groups, with individuals who are older being at a higher risk than those who are younger. According to the results of our research, dyspnea was found to be the most common symptom, accounting for 88 percent of cases. This finding is consistent with the impact that ILD has on the lung function. The prevalence of dry cough was found to be a whopping 74 percent, which was significantly higher than that of wet cough. (that's 24 percent). Pain in the joints and fever were symptoms that were reported in 34% and 38% of cases, respectively, suggesting that the immune system may be involved throughout the entire body. Despite what Gagiya et al (2012)[18] have found, Shortness of breath during exercise was the most common symptom, occurring in all cases (100 percent), followed by a dry cough (43.29 percent), anorexia (50 percent), and joint discomfort (50 percent) (50 percent). ILDs can cause a number of symptoms, including shortness of breath with exertion, dry cough, anorexia, and joint pain. ILDs are diagnosed using a combination of clinical, radiological, and pathological criteria; however, the availability of non-invasive investigations such as high-resolution computed tomography (HRCT) has made early recognition of these conditions much easier[19]. However, identifying ILDs can be difficult, and in only a minority of cases can a specific etiological factor be pinpointed as the cause of the condition. Patients who suffer from autoimmune diseases should have a thorough evaluation for ILD because there is a possibility that they are at an increased risk[20]. According to the findings of our research, the most common form of ILD to be diagnosed was Usual Interstitial Pneumonia (UIP), which accounted for 37 percent of all cases. Non-Specific Interstitial Pneumonia (NSIP) accounted for the remaining 16 percent. The most common form of ILD that was diagnosed was known as Usual Interstitial Pneumonia (UIP) (37 percent). Other forms, such as Hypersensitivity Pneumonitis, RB-ILD, DIP, and Early ILD were much less common, and a definitive diagnosis was unable to be made in 12% of cases. Other forms of interstitial lung disease. These findings are consistent with the ones that were reported by Muhammed SK et al., Maheshwari U et al., and Sen T Udwadia ZF et al.[21-23]. According to the findings of our research, the most prevalent diagnosis is one known as Respiratory Bronchiolitis-Interstitial Lung Disease (RB-ILD), which accounts for nearly half of all cases (48 percent). It is quite common to find RB in smokers, and the presence of this substance is regarded as a marker for smoking exposure. It is not clinically significant on its own because the vast majority of people who have RB do not show any symptoms. It is not uncommon to discover that RB is associated with other diseases that are brought on by smoking, such as lung cancer or lung tumors. This relationship is observed quite frequently. When compared to RB, the characteristics of HRCT are both more pronounced and more widespread in RB-ILD. There is a possibility that RB, RB-ILD, and DIP all reflect varying degrees of the same pathological process, which is an inflammatory response of the bronchiolar and alveolar tissue that is caused by smoking. If this is the case, then the severity of each of these conditions would reflect the pathological process[24]. Iwasawa T et al.[25] found that many different histological patterns of ILDs coexist in the lungs of smokers, which makes it challenging or even impossible to categorize them as a single disease. Following an evaluation from multiple disciplines and taking into account how the disease is likely to behave, management strategies ought to be derived from the most likely diagnosis. In their article published in2015[26], Hagmeyer and Randerath discussed the interstitial lung disease that is caused by smoking. When considering a diagnosis of SR-ILDs in a smoker who also exhibits symptoms such as exertional dyspnea and/or a dry cough, it is necessary to take into account the fact that SR-ILDs are a possibility. According to the findings of Attili et al(2008)[27], current and former smokers may be at a greater risk of developing idiopathic pulmonary fibrosis (IPF) than non-smokers (IPF). The co-occurrence of lower lung fibrosis and upper lung emphysema in smokers is increasingly being recognized as a distinct clinical entity. High-resolution computed tomography is sensitive for the identification and characterization of idiopathic lung disease (ILD), and it has the potential to enable diagnosis and categorization of smoking-related idiopathic lung diseases (SR-ILDs) into separate unique entities.

Conclusion

The most important findings show that the prevalence of ILD rises significantly with age, particularly among those who are between the ages of 41 and 70 years old, which suggests a correlation with prolonged exposure to smoking. Males were found to be significantly more affected than females, indicating that there may be differences in smoking patterns or gender-specific susceptibility to ILD. A significant gender disparity was observed, with males being more affected than females. It was found that the length of time a person smoked was a significant factor, with the highest incidence of ILD occurring among individuals who smoked for 21-30 years. The analysis of symptoms revealed that dyspnea and dry cough were the predominant symptoms, which reflects the clinical impact of ILDs. The research also shed light on the distinct radiological manifestations of the various ILD subtypes, with RB-ILD emerging as the most prevalent form of the condition in smokers. These findings collectively highlight the critical role that smoking plays in the pathogenesis of ILD and the importance of HRCT in the diagnosis and understanding of these complex diseases. Additionally, these findings emphasize the importance of smoking as a risk factor for developing ILD.

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