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ROLE OF HIGH RESOLUTION COMPUTED TOMOGRAPHY IN EVALUATION OF PULMONARY DISEASES

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Abstract

With the incidence of pulmonary disease on marked rise, it can difficult to attribute to specific cause, clinically. Pulmonary diseases are significant public health problems. The prevalence of pulmonary diseases 80% Range between 40 patients of the imaging modalities can help elicit the subtle sings to establish the diagnosis. The goal is to HRCT at early stage so that complete clinical finding can be achieved. HRCT is a useful tool in the diagnosis and management as it can differentiate active from inactive pulmonary diseases with greater sensitivity.This study concludes that HRCT is a powerful and reliable investigation in the diagnosis of pulmonary diseases. Our study illustrates the potential role of HRCT in early detection of pulmonary involvement as a non-invasive, alternative modality for diagnosis and differentiation of active inflammatory process from fibrosis. Pulmonary diseases can be difficult to a specific cause, both clinically and radio graphically. Pulmonary diseases in the setting of a normal-appearing radiography and a nonspecific history and clinical findings can be a difficult dilemma. The precise diagnosis of pulmonary diseases can be elusive, since the signs and symptoms are frequently similar for the different diagnosis and conventional roentgenograms are non-specific for the diagnosis purpose. HRCT using thin sections has become the established method for evaluating defuse lung disease. When the CT findings are analyzed in the context of the clinical history, physical findings, pulmonary function test and laboratory data, characteristics HRCT findings may allow a confident diagnosis in conditions such as asbestosis, silicosis and idiopathic pulmonary fibrosis.In some cases such as allergic alveolitis, HRCT findings may preclude the need for lung biopsy, it can be used as a guide in selecting the best site for a biopsy. HRCT is more sensitive than chest radiography for detecting emphysema and it has replaced bronchi graph as the definitive method for detecting bronchiectasis. Multi slice CT is the most effective way to image patient after blunt chest trauma, which is second only to cans injury as a cause of post trauma death.

1. Introduction

Computed Tomography Scanner was invented by Sir Godfrey Newbold Hounsfield in 1972. Hounsfield first built a prototype head scanner and tested it first on preserved human brain, then

on a fresh cow brain from a butcher shop and later on him. In September 1971, CT scan was introduced into medical practice with a successful scan on a cerebral cyst patient at Atkinson Morley's Hospital in Wimbledon London, United Kingdom. A myriad of injuries may result ,including pulmonary contusion or laceration, pneumothorax, hemothorax, trachea-bronchial laceration diaphragmatic injury and the chest wall and the spinal injuries although the chest radiograph in useful in detecting a potentially life threatening conditions, chest radiography issimply not sensitive enough to reliably identify or quantify the extent of most thoracic injuries screening CT studies of the lungs to detect nodules has recently become popular ,but this remains a highly controversial indication. This is primarily due to the high false positive rate cause benign nodules such as granulomas and lymph nodes and current and lack of adequate studies to confirm decrease mortality rate from earlier tumor detection.HRCT chest scanning can begins superiorly from the level of clavicles and extends to the posterior CP angles. When a neoplasm is suspected, the scan should include the liver and adrenal glands because the detection of liver metastasis are maximized when scans are obtained immediately after administration of the contrast medium, it may be more appropriate to scan in a caudal-cranial direction through the liver and adrenal glands first and then superiorly through the remainder of the chest, where a high plasma iodine concentration. Is not as critical. This is not necessary with current MSCT scanner. Scans are typically obtained in full inspiration during a single breath hold therefore misregistration are no longer a problem when the posterior lung base is the region of primary concern, prone scans may be helpful to increase aeration to these areas. Lateral deceits scan are helpful in rare instance in distinguishing between complex pleural and pulmonary pathological conditions, such as differentiating emphysema from a large lung abscess.

1. Evaluation of imaging spectrum of pulmonary disease on High resolution Computed Tomography (HRCT).
2. To assess the cause of Lung disease using HRCT.
3. To assess the severity of pulmonary disease and exclude complications using HRCT.

Spectrum of high resolution computed tomography imaging in occupational lung disease.

BhawnaSatija, Sangal Kumar &DiptiGothi. HRCT has assumed an increasingly important role in evaluation of patients with diffuse lung disease including occupational lung disease. It is indicated in symptomatic patients or patients with abnormal pulmonary function findings ,with a normal or questionable chest radiograph .even when the chest radiograph is abnormal HRCT is useful to make a specific diagnosis or limit the differential diagnosis .It plays a critical role in assessing disease activity .The presence of ground glass opacity and nodules suggest active disease which may be reversible on cessation of exposure whereas presence of fibrosis is a marker of disease irreversibility.The growing burden of chronic obstruction pulmonary disease and lung cancer in women.

SB Cohen et al. Between 1980 and 2000, the Mortality rates for COPD increased in women by 291% and in Men by only 60%.within the next 20yrs, it is estimated that There will be more women than men with lung cancer. The epidemic of lung disease in women within the western world appears to be not only due to an increase in the no women smoking, but also due to an

inherently greater biological susceptibility of women to the harmful effects of cigarette smoke. Distinctive evaluation of non-mucinous and mucinous subtypes of bronchioloalveolarcarcinomas in EGFG and gene mutation analysis for Japanese lung adenocarcinomas confirmation of the correlation with histologic subtypes and gene mutation Yuji Sakuma MD, PHD et al.

2. Material and Methods

Design: Evaluation of High Resolution computed tomography in pulmonary diseases.
Participants: The source of data for this study are patients referred to Department of Radio diagnosis, Imaging and interventional radiology from OPD/IPD of C.S.S. Hospital, Under the age is of N.S.C.B Subharti Medical College Meerut.
Inclusion Criteria:-All the patients with clinically suspected pulmonary diseases.
Exclusion Criteria:- Pregnancy, All other lesions mimicking pulmonary disease. Patient who did not give consent. All operated cases. Uncooperative patients.
Method and Collection of Data :-After obtaining clinical history relevant clinical examination will be done. Patient will be subjected to imaging modality, after an informed consent for confirmation of diagnosis. CT examinations will be done on Phillips Ingenuity Core 128 slice CT.Imaging and Diagnosis of pulmonary disease will be made as per departmental protocols.

Patient Indications and Contraindications

A. Indications: The indications for the use of HRCT of the lungs include, but are not limited to, the following:

1. Evaluation of known or clinically suspected diffuse lung disease that is incompletely evaluated on standard chest CT or chest x-ray or that which is chest x-ray occult
2. Evaluation of suspected small airway disease
3. Quantification of the extent of diffuse lung disease for evaluating effectiveness of treatment
4. Guidance in selection of the most appropriate site for biopsy of diffuse lung disease

B. Contraindications: There are no absolute contraindications to HRCT of the lungs. As with any imaging procedure, the benefits and risks should be considered prior to thoracic CT performance.

Technique of Examination

All patients are screened before entry into the CT scanner room for metallic objects of the interest of part. Patients were examined in the supine position on the patient table, proper positioning, and proper interaction for breath holding, and immobilization of the chest was obtained. Set the HRCT protocol, initial topogram of the chest has obtained and planned according to the lungs field, HRCT protocol at 128 slice includes the entire chest from apex to diaphragm, set the protocol (KVp, ma, slice thickness, Interslice gap etc.), protocol also include axial plain with 3-5mm slice thickness, there by reconstruction, post processing and reformatting images into multiple plane.

3. Results

After HRCT procedure out the inclusion criteria, a total 40 patients of both sex and different age group, were included in the present prospective study. An informed consent was obtained from all the patients before they were subjected for evaluation. Out of 40 patients included in this study, 16/40 (40.0%) patients males and 24/40 (60.0%) patients females. Maximum number of HRCT patients were in the age group of 41-70 years (70.0%).

Table No.1: Distribution of patients on Males and Females

MALE		FEMALE		TOTAL	
FREQ	%	FREQ	%	FREQ	%
16	40.0	**24**	60.0	**40**	100.0

GRAPH 1: Distribution of patients on Males and Females

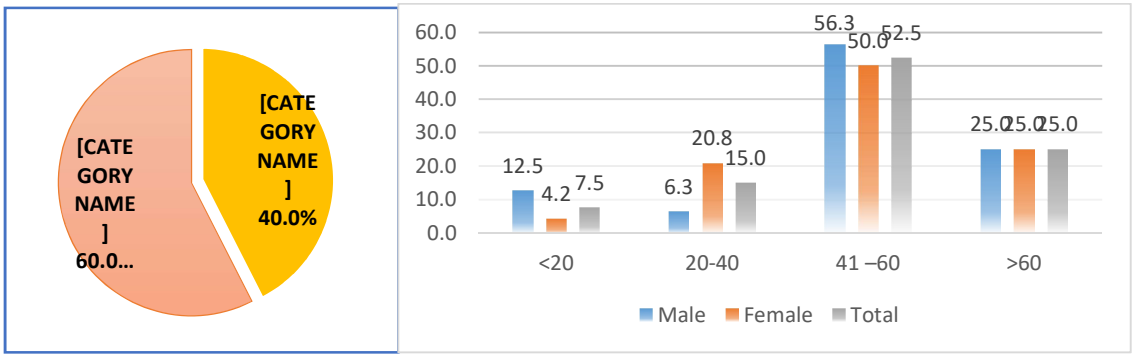


Table No.2: Age and Sex wise distribution

AGE GROUPS	MALE		FEMALE		TOTAL	
	FREQ	%	FREQ	%	FREQ	%
<20	2	12.5	1	4.2	3	7.5
20-40	1	6.3	5	20.8	6	15.0
41 –60	9	56.3	12	50.0	21	52.5
>60	4	25.0	6	25.0	10	25.0
TOTAL	**16**	100.0	**24**	100.0	**40**	100.0

χ^2value = 2.32 ρ - value equals 0.508 (NS)

The χ^2 value 2.32 and the ρ value equals 0.508 is considered to be not statistically significant.

Maximum number of patients were presented with cough with sputum (100.0%), and SOB (70.0%), Chest pain (80.0%), (45.0%) patients were presented with smoking.

Table no.3: Distribution of patients on the basis of clinical history.

CLINICAL HISTORY	PRESENTS		NOT PRESENT	
	FRE.	%	FRE.	%
COUGH WITH SPUTUM	40	100.0	0	0.0
SHORT OF BREATHNESS (SOB)	28	70.0	12	30.0
CHEST PAIN	32	80.0	8	20.0
SMOKERS	18	45.0	22	55.0
OLD TB.	6	15.0	34	85.0
FEVER	38	95.0	2	5.00

χ^2value = 95.49 ρ value equals < 0.001 (sig.)

The χ^2 value 95.49 and the ρ value equals < 0.001 is considered to be statistically significant.

GRAPH 3: Distribution of patients on the basis of clinical history.

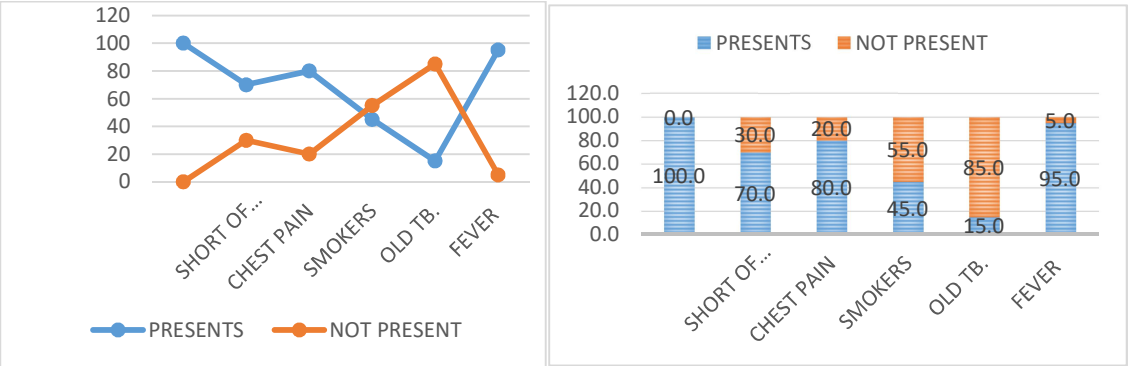


Table no.4: Distribution of patients on clinical findings.

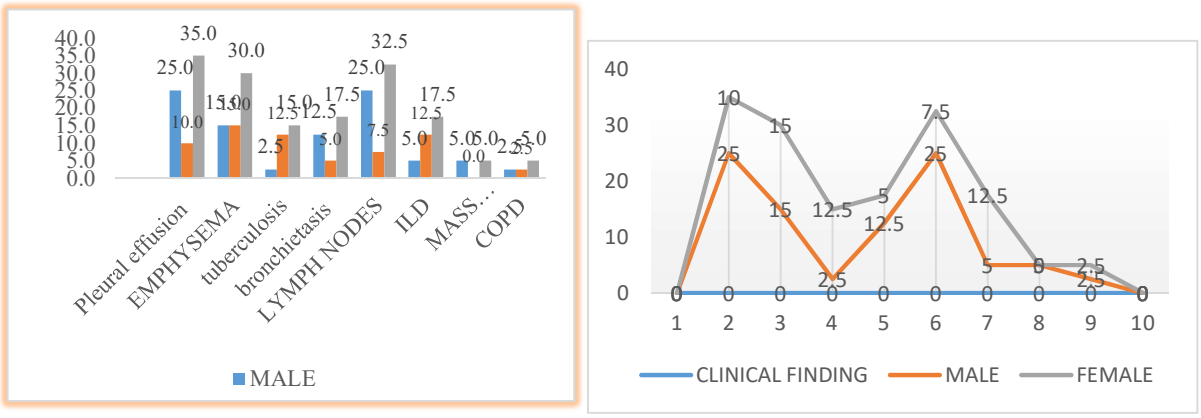
CLINICAL FINDING	MALE		FEMALE		TOTAL	
	FRE.	%	FRE.	%	FRE.	%
PLEURAL EFFUSION	10	25.0	4	10	14	35
EMPHYSEMA	6	15.0	6	15	12	30
TUBERCULOSIS	1	2.5	5	12.5	6	15
BRONCHIETASIS	5	12.5	2	5	7	17.5

LYMPH NODES	10	25.0	3	7.5	13	32.5
ILD	2	5.0	5	12.5	7	17.5
MASS LESION/TUMOR	2	5.0	0	0	2	5
COPD	1	2.5	1	2.5	2	5

χ^2-value = 12.03; ρ - value equals 0.099 (NS)

The χ^2 value 12.03 and the ρ value equals 0.099 is considered to be not statistically significant.

GRAPH 4 Distribution of patients on clinical findings.

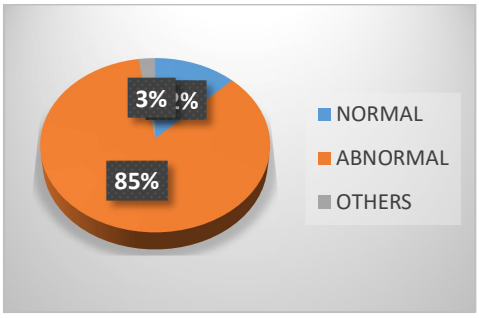


Distribution of Patients on Clinical Findings

In five (12.5%) patients the study ware normal. And the 35 (87.5%) patients were abnormal, pulmonary disease causes, (TB, ILD, COPD, P.E. lymph node etc.) constitute (87.5%) 35 patients the most common HRCT diagnosis in patients presenting with pulmonary diseases.

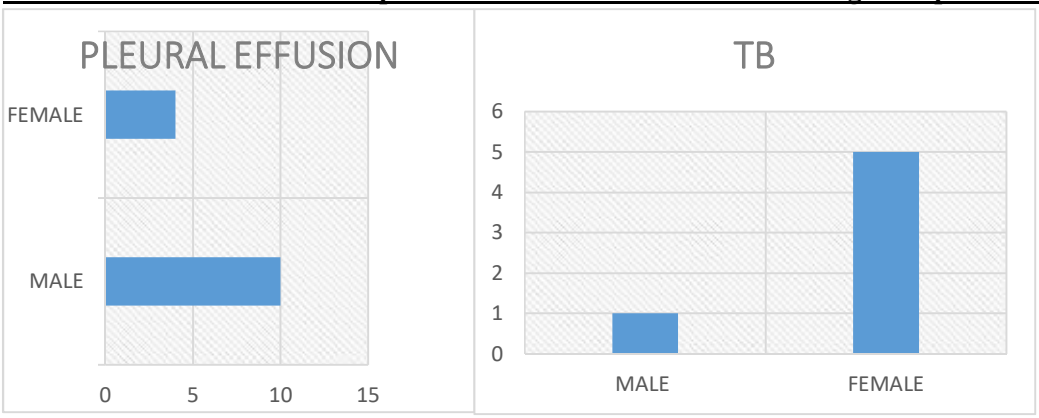
In five (12.5%) patients the study ware normal. And the 34 (85.0%) patients were abnormal, and others 1 (2.5%) pulmonary diseases causes.

GRAPH 5: Distribution of patients on basis of clinical findings of normal and abnormal.



The etiological spectrum varies in the different age groups. This study comprised of 14 cases of pleural effusion (35.0%), and 10 (25.0%) males and 4 (10.0%) females.

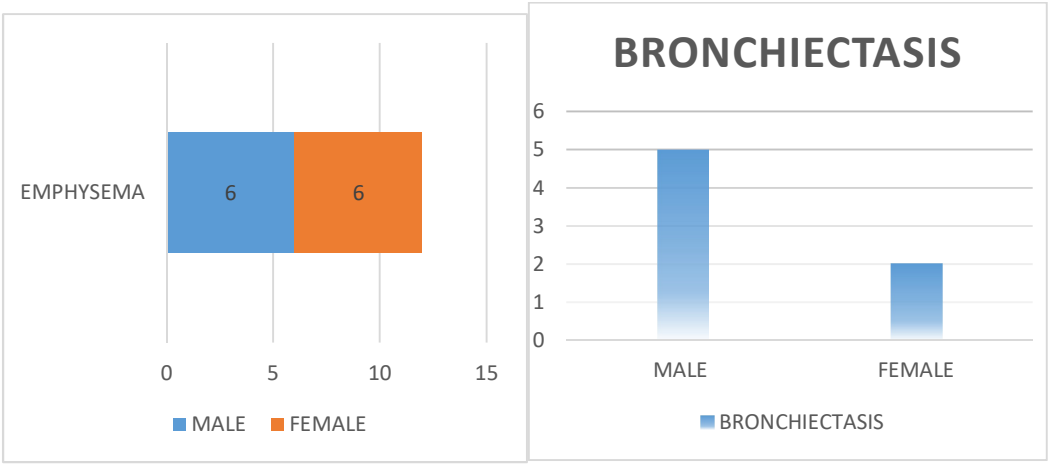
GRAPH 6: Distribution of patients on basis of clinical findings in pleural effusion &TB



The etiological spectrum varies in the different age groups. This study comprised of 6 cases of TB (15.0%), and 1 (2.5%) males and 6 (15.0%) females.

The etiological spectrum varies in the different age groups. This study comprised of 12 cases of emphysema (30.0%), and 6 (15.0%) males and 6 (15.0%) females.

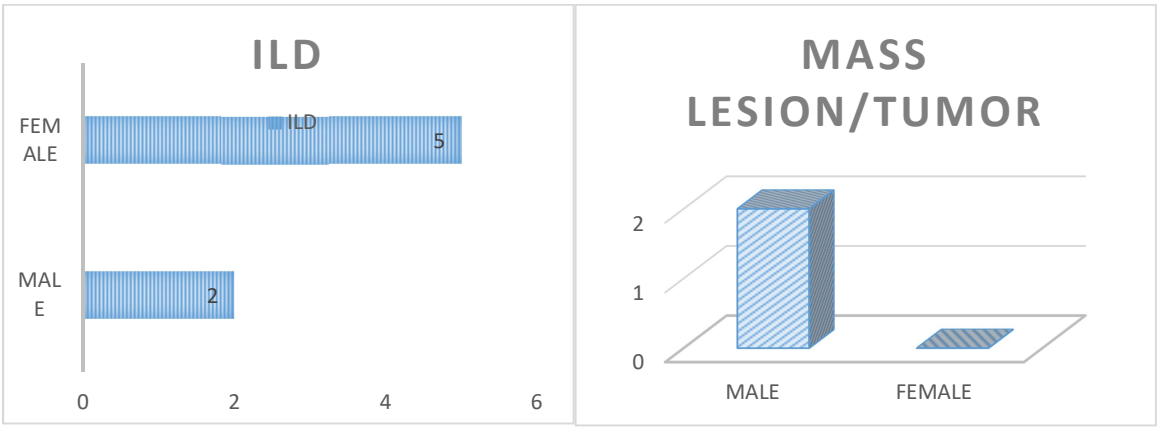
GRAPH 7 Distribution of patients on basis of clinical findings of Emphysema & Bronchiectasis.



The etiological spectrum varies in the different age groups. This study comprised of 7 cases of bronchiectasis (17.5%), and cases of 5 (12.5%) males and case of 2 (5.0%) females.

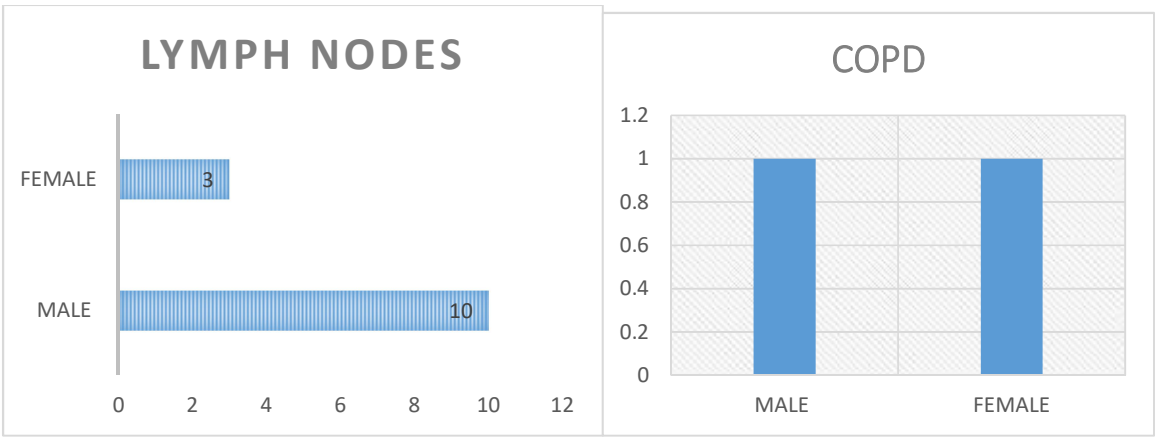
The etiological spectrum varies in the different age groups. This study comprised of 7 cases of ILD (17.5%), and 2 (5.0%) males and 5 (12.5%) females.

GRAPH 8 Distribution of patients on basis of clinical findings of ILD & mass lesion/tumor



The etiological spectrum varies in the different age groups. This study comprised of 2 cases of mass lesion / tumor (5.0%), and 2 (5.0%) males and no case of females.

GRAPH 9: Distribution of patients on basis of clinical findings of lymph nodes & COPD



The etiological spectrum varies in the different age groups. This study comprised of 13 cases of lymph nodes (32.5%), and 10 (25.0%) males and 3 (7.5%) females. The etiological spectrum varies in the different age groups. This study comprised of 2 cases of COPD (5.0%), and 1 (2.5%) males and 1 (2.5%) females.

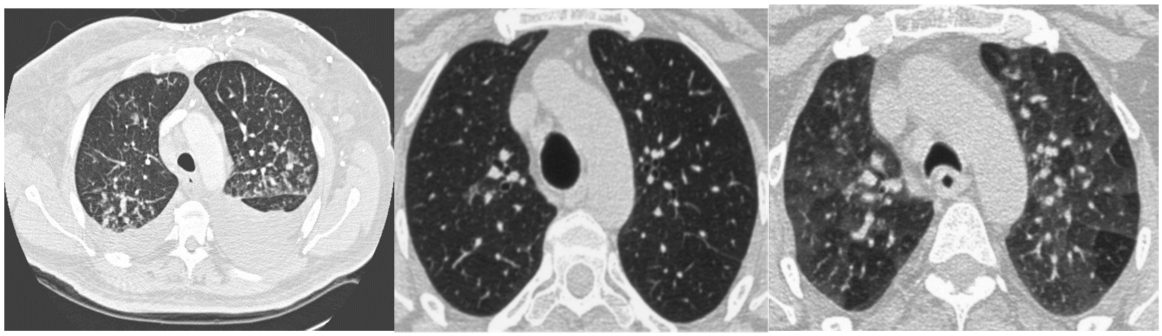
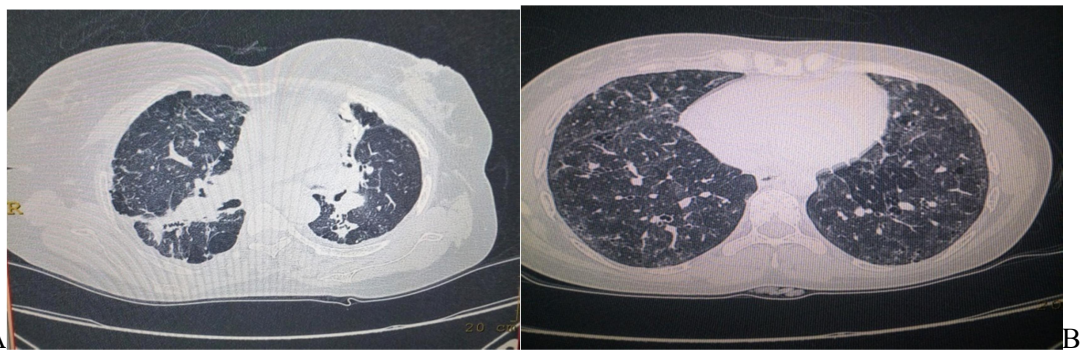


Fig.no.1 Patient being evaluated for suspected pleural effusion,Expiratory

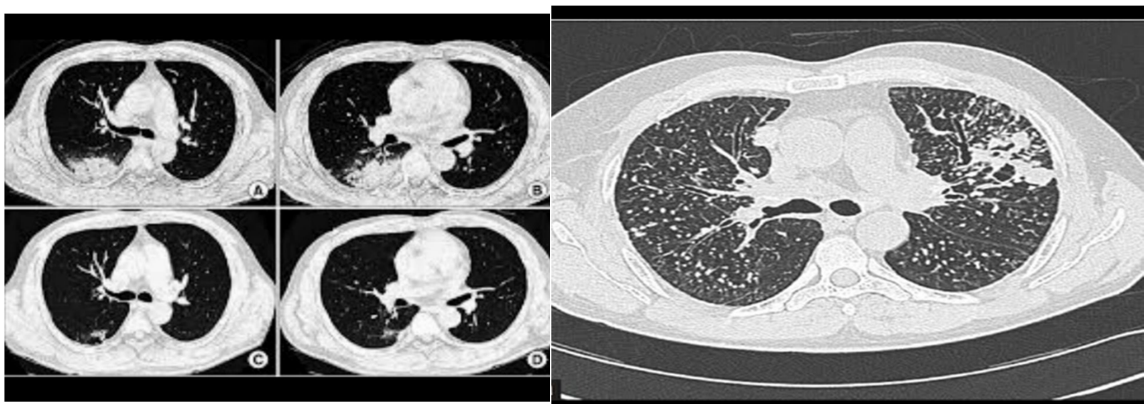


A B

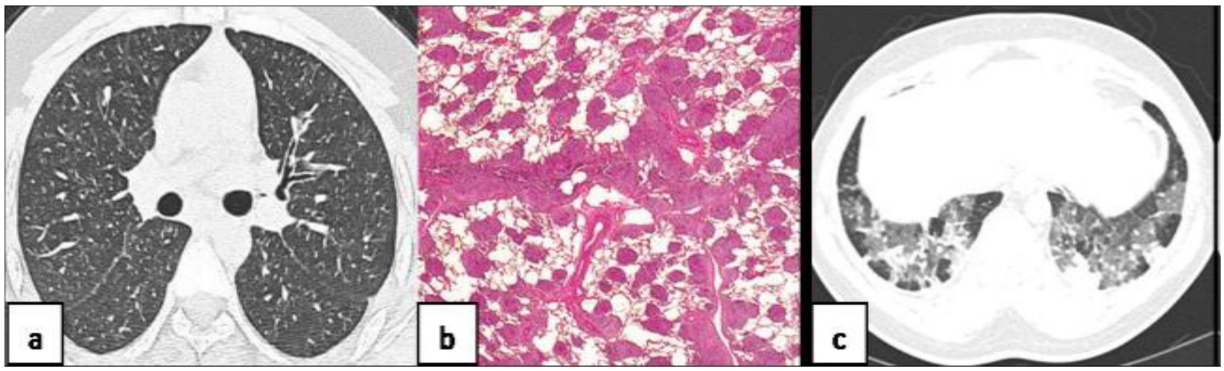
Fig. no.2 Active TB images, A. TB nodes and lymph nodes, B. patient being evaluated for suspected interstitial lung disease.

Fig.no 3. Patient being evaluated for suspected B/L emphysema and lymph nodes.

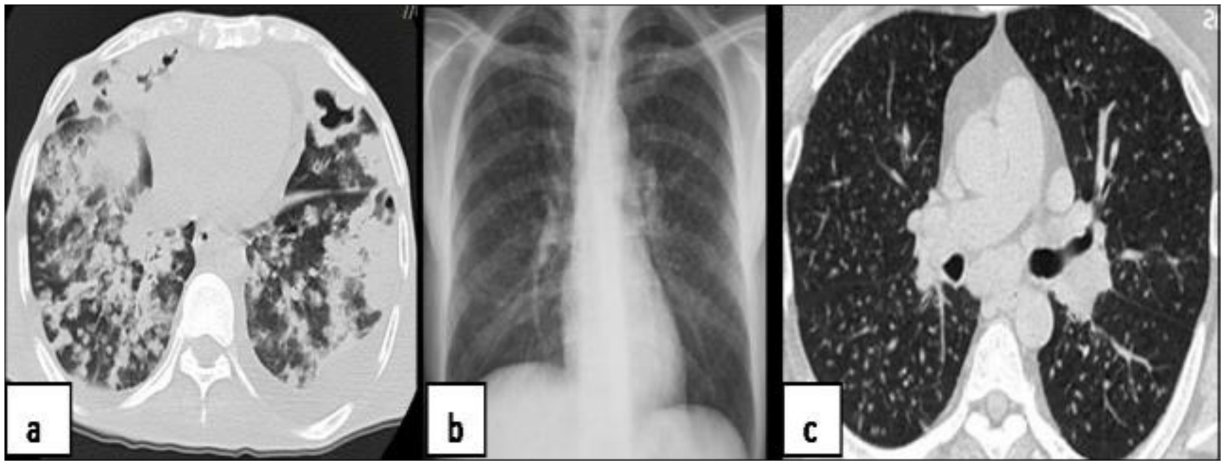
Fig.no 4 Patient being evaluated for suspected emphysema and lymph nodes,2.COPD.



Patient being evaluated for suspected lymph nodes and mass lesion.



Predominantly nodular findings (a) HRCT image of a patient with sarcoidosis shows small well-defined centrilobular nodules with perilymphatic distribution and symmetrical lymph node enlargement (b) HPE shows extensive pleural and interlobular segments.



Patients of active TB images (a) HRCT in a patient with TB shows fluffy alveolar opacities and 'tree in bud'- centrilobular nodules suggestive of active disease (b, c) Chest radiograph PA view and HRCT of another patient shows multiple diffuse micro nodules.

Discussion

Pulmonary diseases can be difficult to diagnose because of a specific cause, both clinically and radio-graphically. Pulmonary diseases on normal-appearing radiography and a nonspecific history and clinical findings can be a difficult dilemma. The precise diagnosis of pulmonary diseases can be elusive, since the signs and symptoms are frequently similar for the different diagnosis and conventional roentgenograms are non-specific for the diagnosis purpose.

Clinical profile: Age distribution

This study included patients across all age groups with pulmonary diseases. The youngest patient was 16 years old male and oldest was 80 years female. Maximum number of patients were seen in fourth (17.5%), five decade (37.5%) and six decade (20.0%). **Gender distribution:** Out of these 40 patients, 16 (40.0%) were male and 24 (60.0%) females. There was female predominance, the difference being nil in one and eight decade, being minimal third decade and seventh decade and equal predisposition under 10 years of age.**Presentingcomplaint:**The most common complaint seen was cough with sputum in 100.0% of patients, fever in 95.0%, chest pain in 80.0%, short of breathness in 70.0%, smokers 45.0% and OLD TB in 15.0% of patients respectively.**Etiological spectrum:** The etiological spectrum varies in the different age groups. In five (12.5%) patients the study were normal, 34 (85.0%) patients were abnormal, and others 1 (2.5%) was evaluated with pulmonary disease. This study comprised of 14 cases of pleural effusion (35.0%), and 13 cases of lymph node (32.5%), 12 of emphysema (30.0%), 7 of bronchiectasis (17.5%), 7 case of ILD (17.5%), 6 cases of TB (15.0%), 2 cases of COPD or mass lesion / tumor (5.0%).Under 20 years of age three cases of HRCT were seen. Under 30year's four cases and under 40 years only two cases were seen. Under 50 years of age seven cases were

seen, and the maximum cases under 60 years and under 70 years of HRCT were seen. Under 80 years of age two cases of HRCT were seen.

Conclusion

With the incidence of pulmonary disease on marked rise, it can be difficult to attribute to specific cause, clinically. Pulmonary diseases are significant public health problems. The prevalence of pulmonary diseases ranging 80% between 40 patients of the imaging modalities can help elicit the subtlefindings to establish the diagnosis. The goal is to have HRCT done at early stage so that complete clinical finding can be achieved. HRCT is a useful tool in the diagnosis and management as it can differentiate active from inactive pulmonary diseases with greater sensitivity.This study concludes that HRCT is a powerful and reliable investigation in the diagnosis of pulmonary diseases. Our study illustrates the potential role of HRCT in early detection of pulmonary involvement as a non-invasive, alternative modality for diagnosis and differentiation of active inflammatory process from fibrosis. We conclude that there are many abnormalities on the high resolution computed tomography of patients with persistent asthma. Changes suggestive of bronchiectasis, namely bronchial dilatation, frequently resolve spontaneously. Therefore, the diagnosis of bronchiectasis by high resolution computed tomography in asthmatic patients mustbe made with caution, since bronchial dilatation can be reversible or can represent false dilatation. Non-smoking chronic asthmatic subjects in this study has no evidence of centrilobular or panacinar emphysema. In case of Tuberculosis, HRCT findings of ill-defined nodules, consolidation, tree-in-bud appearance and cavitation's are best indicators of active disease.

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