Original Research Article

A study of HRCT pattern of lung diseases at tertiary health care center

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Abstract

Background: Diffuse lung diseases are those in which the disease process is widespread involving all lobes of both lungs but need not affect all lung regions uniformly[1.] It includes acute as well as chronic diseases, having wide array of causes such as infections, inhalational, neoplastic, cardiovascular, airway abnormalities, immunological and idiopathic. **Aims and Objectives:** To Study HRCT pattern of lung diseases at tertiary health care center. **Methodology:** A total 75 number of patients were studied with suspected diffuse lung diseases by high resolution computed tomography over a period of 18 months. Patients were selected on basis of:- Clinical history or pulmonary function test findings suggestive of diffuse lung disease. Findings of diffuse lung disease on chest radiograph. Data collected from these patients included their name, age, sex, history and relevant investigation reports. Machine used was PHILIPS TOMOSCAN AV EXPANDER. **Result:** Total cases included in study were 75, out of that 51 were positive for diffuse lung disease. 24 were normal. The maximum numbers of diffuse lung disease cases in our study were of interstitial lung disease, followed by infection and bronchiectasis. Most of the cases of ILD were those of idiopathic pulmonary fibrosis**.** Diffuse lung diseases were more common in males than females in our study. Tuberculosis was seen affecting all age groups from 21-70 years in our study. **Conclusion:** HRCT is the best non-invasive tool for diagnosis of diffuse lung diseases. HRCT can also be used for assessment of disease activity in patients who have chronic diffuse lung disease and in detection of active disease in some patients who have suspected diffuse lung disease who may have normal or nonspecific radiograph. The presence of disease activity is also helpful in guiding the treatment strategy. Based on the HRCT features, a histospecific diagnosis can be reached in most of the cases of diffuse lung disease obviating the need of lung biopsy.

Key Words: HRCT pattern of lung diseases, ILD (Interstitial lung disease), Diffuse lung diseases.

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Received Date: 20/11/2017 Revised Date: 22/12/2017 Accepted Date: 03/01/2018
DOI: https://doi.org/10.26611/1004511

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 05 January 2018

INTRODUCTION

Diffuse lung diseases are those in which the disease process is widespread involving all lobes of both lungs but need not affect all lung regions uniformly[1.] It includes acute as well as chronic diseases, having wide array of causes such as infections, inhalational, neoplastic, cardiovascular, airway abnormalities, immunological and idiopathic. The clinical assessment of a patient with suspected diffuse lung disease could be difficult and perplexing problem. Plain chest radiograph is an excellent, inexpensive and indispensable modality in investigation of such disease. However, it has a limited diagnostic accuracy due to superimposition of structures and poor contrast resolution. About 10% patients with diffuse lung diseases proven histologically, have normal chest radiograph. The pattern recognition approach for diffuse lung disease on chest radiograph has also been found to correlate poorly with histopathological findings. Conventional computed tomography uses thick sections (7-10mm) resulting in a reduction of the ability to resolve small structures due to volume averaging. It also uses low frequency spatial algorithm (standard or soft tissue algorithm), that smoothens the images and result in loss of the fine anatomical and pathological details. High resolution computed tomography (HRCT) was the introduced in 1985 by Zerhouni *et al*[2, 3]. It differs from conventional CT by using thin collimation with a high spatial frequency algorithm. The HRCT technique has evolved over the few decades, together with advance in CT technology. It has enabled imaging of the lungs with excellent spatial resolution, providing anatomic details similar to that available from gross pathology specimens

of the lungs. HRCT in diffuse lung disease helps in answering the following questions: Is the lung disease. If yes, what is it?, Is the lung disease active. From which site and what type of biopsy should be performed. Is there any change following treatment. The suggested indication for HRCT has evolved over the last few decades and are as follows[4, 5]To detect diffuse lung disease in patient with normal or equivocal radiograph of chest, To narrow the differential diagnosis or make histospecific diagnosis in patient with obvious but nonspecific radiographic abnormalities, To guide the type and site of lung biopsy, To investigate patients presenting with haemoptysis, To assess the distribution of emphysema in patients considered for volume reduction surgery, To evaluate the disease reversibility particularly in patients with fibrosing lung disease, Thus, HRCT is currently the most sensitive tool for non-invasive imaging of the lung parenchyma, in patients with suspected or known diffuse lung disease. Numerous studies have shown the basic superiority of HRCT over chest radiography and conventional CT in terms of improved detection of disease, provision of histospecific diagnosis and identification of reversible disease. The relative speed at which HRCT has become the imaging technique of choice for evaluating diffuse lung disease can be regarded as a testament to its effectiveness.

MATERIAL AND METHODS

A total 75 number of patients were studied with suspected diffuse lung diseases by high resolution computed tomography over a period of 18 months. Patients were selected on basis of:-Clinical history or pulmonary function test findings suggestive of diffuse lung disease. Findings of diffuse lung disease on chest radiograph. Data collected from these patients included their name, age, sex, history and relevant investigation reports. Machine used was philips tomoscan av expander

RESULT

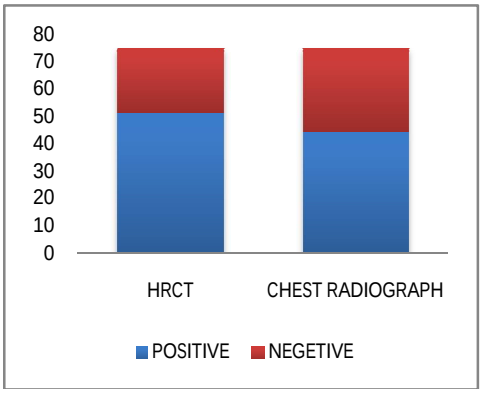

Figure 1: Distribution of 75 cases on chest radiograph and HRCT

Total cases included in study were 75, 51 were positive for diffuse lung disease. 24 were normal.

Table 1: Pathology wise distribution of 51 cases of diffuse lung disease

Sr. No	Pathology	No. Of Positive Cases	(%)
1	Interstitial Lung Disease	18	35.29
2	Infections	17	33.33
3	Bronchiectasis	8	15.69
4	Emphysema	6	11.76
5	Bronchiolitis Obliterans	2	3.92
	Total	**51**	**100**

The maximum numbers of diffuse lung disease cases in our study were of interstitial lung disease, followed by infection and bronchiectasis.

Table 2: Interstitial lung disease (18 cases)

Sr. No	Pathology	No. Of Cases	(%)
1	Idiopathic Pulmonary Fibrosis	9	50
2	Hypersensitivity Pneumonitis	4	22.2
3	Lymphangitis Carcinomatosis	2	11.1
4	Histiocytosis X	1	5.5
5	Lymphangioleiomyomatosis	1	5.5
6	Sarcoidosis	1	5.5

Most of the cases of ILD were those of idiopathic pulmonary fibrosis.

Table 3: Sex wise distribution of 75 cases

Case sex	IPF	LC	HP	SARCOI-DOSIS	HX	LAM	TOTAL
Male	7	1	3	0	1	0	12
female	2	1	1	1	0	1	6

Table 4:

Case sex	BR	EMP	BO	PCP	TB	NORMAL	TOTAL
Male	8	5	2	1	10	11	37
Female	0	1	0	1	5	13	20

Diffuse lung diseases were more common in males than females in our study.

Table 5: Distribution of 75 patients according to age

SR.NO	DISEASE	AGE IN YEARS						TOTAL
		11-20	21-30	31-40	41-50	51-60	61-70	
1	IPF	-	-	1	1	2	5	9
2	LC	-	-	-	-	1	1	2
3	HP	-	-	1	-	3	-	4
4	SARCOID	-	-	-	-	-	1	1
5	HX	-	-	1	-	-	-	1
6	LAM	-	1	-	-	-	-	1
7	EMP	-	-	-	2	1	3	6
8	BR	-	-	1	3	3	1	8
9	BO	1	-	1	-	-	-	2
10	PCP	-	-	-	2	-	-	2
11	TB	-	1	2	8	2	2	15
12	NORMAL	5	6	7	1	2	3	24
		TOTAL						**75**

Tuberculosis was seen affecting all age groups from 21-70 years in our study.

DISCUSSION

Todo *et al.*, in 1982, initially described technique of High Resolution Radiology Section Computed Tomography (HRCT) for diffuse lung disease and described the potential benefits of the technique in assessment of various lung diseases[6]. HRCT brought revolution in pulmonary imaging where resolution reached the secondary pulmonary lobule or the functional unit of lung. HRCT allows delineation of the lung parenchyma down to the level of secondary pulmonary lobule. Highresolution computed tomography (HRCT) is both very sensitive and accurate, with an overall diagnostic accuracy of 92%[7]. Due to these features, HRCT has become an important diagnostic tool in pulmonary medicine and provides valuable information about various focal and diffuse lung diseases[8]. HRCT may be useful in the evaluation of patients with suspected pulmonary disease when the initial diagnostic workup fails to ascertain the diagnosis and when there is no agreement between clinical and radiological data [9]. Interstitial lung disease (ILD) represents a group of about 200 distinct disorders involving lung parenchyma. ILD is also termed as Diffuse parenchymal lung disease (DPLD) and classified broadly into idiopathic interstitial pneumonia (IIP) and other than IIP.[10] In our study we have found The study included 75 patients. 51 patients were diagnosed with diffuse lung disease of different age groups. Most of the patients had vague complaints such as dyspnoea and nonspecific findings of reticulonodular markings on the chest radiograph. The normal anatomy of the lung as outlined by HRCT was studied. The secondary pulmonary lobules with its various morphological features were identified. The HRCT patterns noted in each diffuse lung disease and the HRCT presentation of various diffuse lung disease were studied. Idiopathic pulmonary fibrosis affects the subpleural basal regions of the lungs. The hallmark of the disease is subpleural intralobular and interlobular interstitial thickening, irregular interfaces and fissural thickening. The early stage of the disease shows ground glass opacity. The late stage of the disease is characterised by honeycombing, architectural distortion, traction bronchiectasis, pleural thickening and emphysematous changes. Lymphangitis carcinomatosis is characterised by interlobular septal thickening due to tumour cell infiltration in the lymphatics and interstitium, with minimal architectural distortion. The disease may be unilateral or bilateral. The subacute stage of hypersensitivity pneumonitis shows ground glass opacities and centrilobular nodules. Mosaic perfusion due to bronchiolitis may be also seen. Superimposed fibrosis, honeycombing and architectural distortion are seen in the late chronic stage. Peribronchovascular, subpleural and centrilobular nodules with upper and mid zone predominance are seen in sarcoidosis. Peribronchial cuffing, nodular interlobular septal thickening and “beaded” fissures due to subpleural nodules are also seen. Nodular abnormalities in the absence of septal thickening and fibrosis represent the “active inflammatory” stage of disease. Pulmonary langerhans cell histiocytosis shows multiple, thin walled cysts of bizarre shapes and nodules with predominant upper lung affection. Lymphangioleiomyomatosis is commonly seen in premenopausal women and manifests as multiple, round, thin walled cysts seen diffusely in both lungs, with intervening normal lung parenchyma. Emphysema is seen as focal or diffuse areas of low attenuation with ill defined walls and paucity of vascular markings. Various types of emphysema, centrilobular, paraseptal and panlobular emphysema can be identified on HRCT. Paracicatrical emphysema is associated with parenchymal fibrosis and scarring. Emphysematous bullae are discrete areas of low attenuation greater than 1cm in diameter, with wall thickness less than 1mm. It’s possible to differentiate diseases causing cystic lucencies in the lung such as histiocytosis X, lymphangioleiomyomatosis, emphysema using HRCT. Accurate lobar as well as segmental localisation of bronchiectasis is possible on HRCT. The different types of bronchiectasis namely cylindrical, varicose and cystic can be identified. Cylindrical bronchiectasis is accurately delineated on HRCT, and may be missed on 10mm scans. Associated infection in the bronchiectatic lung can be diagnosed. Correlation between the cause of bronchiectasis and its site and type is also possible. Bronchiolitis obliterans is characterised by focal, sharply delineated areas of decreased lung attenuation and reduced vessel calibre with air trapping on expiratory scans. Bronchiectasis may also be seen. The HRCT findings are similar irrespective of cause of the disease. It is possible to differentiate the mosaic attenuation pattern produced by airway, vascular and infiltrative lung diseases using HRCT. The features of Swayer James syndrome are a small sized lung with decreased attenuation and hypoplasia of the ipsilateral pulmonary vasculature. Pneumocystis carinii pneumonia is manifested as “patchwork pattern” of ground glass opacities sparing isolated lobules, seen predominantly in bilateral perihilar and upper lobe regions. The HRCT features of active pulmonary tubercular disease include centrilobular opacities, tree in bud appearance, consolidation. Traction bronchiectasis, bronchovascular distortion, fibrosis and emphysema constitute signs of old infection. Miliary TB is seen as multiple, bilateral

randomly distributed nodules. HIV seropositive patients have a greater prevalence for miliary and disseminated TB than localized parenchymal disease. Thus high resolution computed tomography is very effective in visualizing the distorted architecture of lung parenchyma in diffuse lung disease. HRCT is capable of detecting disease processes much earlier in their evolution than chest radiograph and conventional CT. Patient's symptoms are also better correlated with HRCT than chest radiograph In the study done by HJ Gayathri Devi[11]most of the patients were above 50 years of age which was observed in other studies as well. [12] Female patients outnumbered male patients. Similar observation was done in the study by Jindal *et al.* [13] The commonest presenting symptoms were dry cough and breathlessness in the present study and the same has been observed in other Indian studies. [14] HRCT is considered as a standard procedure during the initial evaluation of all patients with ILD.[15] It is a useful diagnostic tool for IPF without biopsy.[16]Idiopathic pulmonary fibrosis was the most common diagnosis with 21 patients (male 10, female 11) and the same has been reported in other studies.[8] Honeycombing was observed in 43% of the patients by Sen andUdwadia[17] and 73% in our study. IPF is a chronic fibrosing interstitial pneumonia of unknown cause. It occurs mainly in older adults. [18] Christopher *et all* [19] have used the ILD-GAP model for predicting survival across chronic ILD. We could not apply the GAP model to predict the disease specific survival estimation because of small sample size in our study.

CONCLUSION

HRCT is the best non-invasive tool for diagnosis of diffuse lung diseases. HRCT can also be used for assessment of disease activity in patients who have chronic diffuse lung disease and in detection of active disease in some patients who have suspected diffuse lung disease who may have normal or nonspecific radiograph. The presence of disease activity is also helpful in guiding the treatment strategy. Based on the HRCT features, a histospecific diagnosis can be reached in most of the cases of diffuse lung disease obviating the need of lung biopsy.

REFERENCES

1. Fraser RG, Pare JAP: Diagnosis of diseases of the chestVolume 1, 1st Ed, Philadelphia, Sounders 1970; 465-497.
2. Zerhouni EA, Naidich DP, Stitk FE et al: Computed tomography of the lung parenchyma: part 2 interstitial disease J Thoracic imaging 1985; 1: 54-64.
3. Zerhouni E: Computed tomography of the lung parenchyma an overview Chest 1989:95: 901-907.
4. Miller NL: Clinical value of high resolution CT in chronic diffuse lung disease, AJR 1991; 157:1163-1170.
5. Padley SGP, Adler B, Miller NL: High resolution computed tomography of the chest: current indications J Thoracic imaging 1993; 8:189-199.
6. Todo G, Itoh H, Nakano Y, et al. High-resolution CT for the evaluation of pulmonary peripheral disorders. Jpn J Clin Imaging. 1982; 27:1319-26.
7. Allen CM, AL-Jahdali HH, Irion KL, Ghanem SA, Gouda A, and Khan AN. Imaging lung manifestations of HIV/AIDS. Ann Thorac Med. 2010; 5(4): 201–16.
8. Webb WR, Muller NL, NaidichDP. High resolution CT of the lung. 4th ed. Lippincott Williams and Wilkins. 2009; 4:415.
9. Morresi NA, Souza AS, Gamsu G. HRCT lungs in AIDS patients with pulmonary infections. Int Conf AIDS. 1991:16-21; 7:218.
10. Travis WD, Costabel U, Hansell DM et al. An official American Thoracic Society/European Respiratory Society statement: Update of the international multidisciplinary classification of the idiopathic interstitial pneumonias. Am J RespirCrit Care Med.2013;188:733-48
11. Palat P, Parmar HD. Recent trends in interstitial lung disease: Study of 25 cases. Int J Med Sci Public Health.2013; 2(1): 52-55.
12. SK Jindal et al. Fibrosingalveolitis- a report of 61 cases seen over past 5 years. Indian journal of chest disease and allied science.1979; 21: 174.
13. Sen T, UdwadiaZF. Retrospective study of interstitial lung disease in a tertiary care centre in India.Indian J Chest Dis Allied Sci.2010 Oct-Dec;52(4):207-11
14. Raghu G, Brown KK. Interstitial lung disease: Clinical evaluation and keys to an accurate diagnosis. Clin Chest Med 2004;25:409419.
15. ElliotTL, Lnch DA, Newell JD Jr et al. High resolution computed tomography features of nonspecific interstitial pneumonia and usual interstitial pneumonia. J Comput Assist Tomogr.2005; 29:339-345.
16. Tiyas Sen and Zarir F. Udwadia.Retrospective Study of Interstitial Lung Disease in a Tertiary Care Centre in India.The Indian Journal of Chest Diseases and Allied Sciences. 2010; 52.
17. SomenathKundu, SubhraMitra, JoydeepGanguly et al.Spectrum of diffuse parenchymal lung diseases with special reference to idiopathic pulmonary fibrosis and connective tissue disease: An eastern India.2014; 31: 354-360
18. Raghu G, Collard HR, Egan JJ et al. An official ATS/ERS/JRS/ALAT statement: idiopathic pulmonary fibrosis: evidence-based guidelines for diagnosis and management. Am J RespirCrit Care Med.2011; 183:788-824.
19. Ryerson CJ, Vittinghoff E, Ley B, et al. Predicting Survival Across Chronic Interstitial Lung Disease Chest 2014; 145(4):723-728.

Source of Support: None Declared
Conflict of Interest: None Declared