ORIGINAL RESEARCH PAPER

Radiodiagnosis

ROLE OF MULTI DETECTOR COMPUTED TOMOGRAPHY IN DIAGNOSIS OF TUBERCULOSIS AND ITS MIMICKERS

KEY WORDS: Pseudoaneurysm, Uterine artery embolization, Secondary PPH

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ABSTRACT

Context: Worldwide 1.5 million people die of tuberculosis every year. Each year 0.9 million new cases of active tuberculosis are diagnosed and the rate keeps on increasing at one percent per annum. Infectious Diseases like tuberculosis are prevalent in South-East Asia especially India imposing a huge burden on our health care system.

Aims: To evaluate the Role of multi detector Computed Tomography in diagnosis of tuberculosis and differentiating it from its mimickers

Methods and Material: In this prospective study, records of patients from January 2015 to July 2016 were taken. A record of 100 patients was reviewed. The MD CT of patient's were scanned for various HRCT patterns to rule out the possibility of tuberculosis in AFB sputum negative patients.

Conclusions: From the present study, we conclude main role of HRCT for diagnosing PTB is the selection of probable or highly suspected PTB among patients with pulmonary infiltrates of unknown aetiology and with negative sputum smears in whom HRCT can predict the risk of PTB by depicting characteristic findings for PTB. It can also exclude other diseases and select patients that are difficult to diagnose with a pretest probability of PTB while missing only a few of those that are clearly positive for PTB.

INTRODUCTION

Mycobacterium tuberculosis the causative organism of tuberculosis has been present in human population since antiquity. Tuberculosis has been affecting world population for thousands of year. It was first isolated by Robert Koch in 1882 and causative agent was found to be Mycobacterium tuberculosis.[1] Worldwide 1.5 million people die of tuberculosis every year. Each year 0.9 million new cases of active tuberculosis are diagnosed and the rate keeps on increasing at one percent per annum.[2]

Infectious Diseases like tuberculosis are prevalent in South-East Asia especially India imposing a huge burden on our health care system. A large number of these cases go undetected due to low diagnostic accuracy. Hence in our cross-sectional study of 100 patients we tried to evaluate spectrum of MDCT findings in tuberculosis and its mimickers. Many of these patients have sputum negative which is mainstay in establishing diagnosis of PTB. Many other pulmonary pathologies mimics PTB on X-ray chest and clinical presentation. Hence, in this cross-sectional study we tried to evaluate HRCT pattern in such patients and find patterns which help differentiate PTB from mimickers.

MATERIALS AND METHODS

The present study was conducted in Department of Radio-diagnosis, SAMC and PG institute, Indore after approval from institutional research and ethical committee from 1st January 2015 to 31st July 2016 in patients of either sex with a suspicion of pulmonary tubercular pathology who were sputum smear negative.

STUDY DESIGN

The present study is a Prospective, Non-Randomized, Observational study.

SAMPLE SIZE AND SAMPLING TECHNIQUE

We had planned to include 100 patients in the final diagnosis accordingly we include 120 patients referred from various departments of the institute which meet the inclusion criteria in initial stage considering a drop out (subject or patient who got their MDCT but are not willing for pathological investigations) of 20 patients by the time of analysis. Thus, final analysis was carried out on 100 patients. Convenient sampling was used for the present study.

INCLUSION CRITERIA

1. Adult patients of age group 18-55 years
2. Patients with clinical and radiographic suspicion of tuberculosis referred for MDCT Chest for further evaluation.
3. Patients who are sputum AFB negative.
4. Patients and/or his/her legally acceptable representative willing to provide voluntary written informed consent for participation in the study

EXCLUSION CRITERIA

1. Sputum AFB positive patients
2. Patients not willing to give written informed consent
3. Patients in whom definitive diagnosis could not be reached were excluded from final diagnosis
4. Patients and/or his/her legally acceptable representative not willing to provide voluntary written informed consent for participation in the study

METHODOLOGY

Prospective subject and his/her legally acceptable representative will be provided detailed information about the study, procedures, risks / benefits, etc. After getting their verbal consent for participation in the study, a voluntary written informed consent will be obtained from them before initiating any study related procedures.

Brief clinical history, physical examination findings and chest findings were recorded. Detailed symptoms of pulmonary TB as: hemoptysis, constitutional symptoms as loss of weight, fever, or night sweating were recorded from every patient. Detailed clinical history to exclude old TB or intake of anti-tuberculous drugs in the past was also taken. Detailed history was taken to exclude presence of any chronic disease. Two successive samples of sputum for AFB were collected as per RNTCP (Revised National Tuberculosis Control Program) norm. If patient's sputum examination revealed AFB smear positivity, he/she was excluded from the study. All sputum samples were sent for direct smear examination using Zeihl-Neelsen stain.

After clinical workup, examining radiographs, patients will be

subjected to MDCT imaging on SIEMENS SOMATOM DEFINITION AS TRUE 64 SLICE SCANNER. The scans (120 kV; 10 mA; window width, 1,200 Hounsfield units [HU]; and window level,-600 HU) was obtained with a scan time of 7 s with the patient in the supine position at full end-inspiration from lung apex to base with 0.6 mm contiguous slices using the high-spatial frequency algorithm. The scans will be analyzed at the lobar level as well as the segmental level.

HRCT PARAMETERS:

Tube voltage	120kV
Effective tube current	10mA
Pitch	1
Scan type	Helical
Rotation length	Full
Exposure time	7 sec
Scan direction	Cranio-caudal
Phase of respiration	Full inspiration
Slice thickness	0.6 mm

The maximum radiation dose given was in the range 3 — 5 mSv. The average radiation dose was 4.2 mSv (±1S.D.)

DATA ANALYSIS

Image processing:

The reconstructed image data from scans was networked to the real time interactive workstation

Image analysis:

We investigated the following HRCT findings: centrilobular nodules, other nodules, fine reticular pattern, large nodules, branching linear opacities, tree-in-bud appearance, lobular consolidation, interlobular septal thickening, consolidation, ground-glass opacities, cavities, bronchiectasis, pleural effusion, lymph node enlargement, and the presence of a main lesion in apical segment, anterior segment of bilateral upper lobes and apical segment of bilateral lower lobes. We divided the small nodules of <8mm into centrilobular nodules and other nodules, that are interstitially or randomly distributed.

Nodules of >8mm and <30mm were regarded as large nodules. Fine linear nodular opacities associated with vessels or lymphatic lesions were regarded as a fine reticular pattern. Areas of consolidation demarcated by sharp margins corresponding to 1 or 2 lobules were regarded as lobular consolidation.

The diagnosis of active pulmonary tuberculosis was based on any one of the following:

1. Detection of TB bacilli in bronchial washings/ BAL. Sputum culture or bronchial washing/ BAL culture was done by BACTEC MGIT (Mycobacteria Growth Indicator Tube) 960 systems.
2. Detection of TB bacilli in cultures of sputum or bronchial
3. Demonstration of non-caseating granuloma on FNAC or TBLB suggestive of TB.

DATA COLLECTION AND METHODS

The data was recorded on the pre-structured proforma especially designed for the study.

STATISTICAL ANALYSIS

The sensitivity, specificity, positive predictive value, negative predictive value was calculated in the present study. MedCalc statistical software was used. Microsoft excel was used to prepare the master charts.

FINANCIAL INPUTS AND FUNDING

The patients are managed according to the protocol of the institution laid down for the management of the disease. All the charges as per the institution norms will be borne by the patient, but no additional investigations / tests will be conducted for the specific requirement of the study. Hence, there is no financial burden on the patient or the institution. Also, all study related expenditures will be borne by the investigator himself.

ETHICAL AND LEGAL CONSIDERATIONS

The protocol of the present study was submitted to the Ethics Committee of Sri Aurobindo Medical College & Postgraduate Institute, Indore. After getting their due approval, the study was initiated in the institute. A patient information and consent form was given to the parents in their local language which, when all their queries were satisfactorily answered and when they were willing to participate, signature of the patient and/or his/her legally acceptable representative was obtained and then only study related procedures were initiated.

OBSERVATION

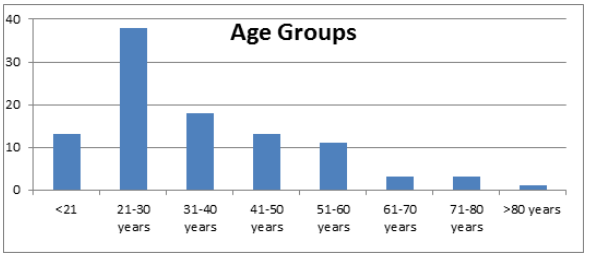
The present was conducted in Department of Radio-diagnosis, SAMC and PG institute with the primary objective to evaluate patterns of findings of pulmonary tuberculosis and its mimickers on multi-detector computed tomography. The present study comprised of 100 sputum negative patients who were clinically suspected as having pulmonary tuberculosis.

Following observations were made in our study.
The patients were divided into 8 groups on basis of age. (Table No. 1, Graph 1)

Table No. 1
Age wise distribution of cases

(N=100)

S.No.	Age Group	Number	Percentage
1.	<21	13	13.0
2.	21-30 years	38	38.0
3.	31-40 years	18	18.0
4.	41-50 years	13	13.0
5.	51-60 years	11	11.0
6.	61-70 years	3	3.0
7.	71-80 years	3	3.0
8.	>80 years	1	1.0
	Total	100	100.0



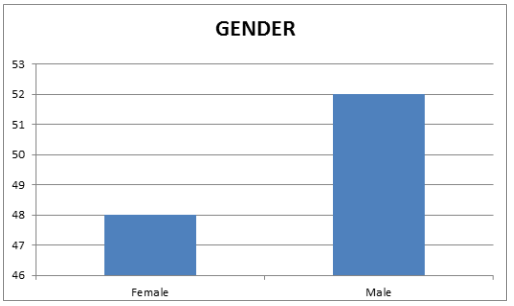
Graph No. 1 - Majority of the patients in our study were in the age group 21-30 years (38.0%). Mean age of patients was 35.416.4 years with age range of 18 years to 85 years.

Patients were categorized on basis of gender. (Table No. 2, Graph 2).

Table No. 2
Gender wise distribution of patients

(N=100)

S.No.	Gender	Number	Percentage
1.	Female	48	48.0
2.	Male	52	52.0
	Total	100	100.0



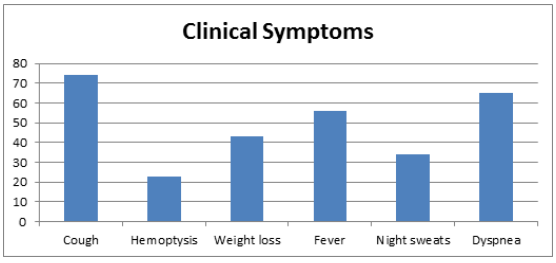
Graph No. 2 – There was slight male predominance in our study. Males being 52.0% and females 48.0%

On basis of presenting symptoms patients were categorized as follows.

Table No. 3 Distribution of patients according to presenting symptoms

(N=100)

S.No.	Presenting Symptoms	Number	Percentage
1.	Cough	74	74.0
2.	Hemoptysis	23	23.0
3.	Weight loss	43	43.0
4.	Fever	56	56.0
5.	Night sweats	34	34.0
6.	Dyspnea	65	65.0



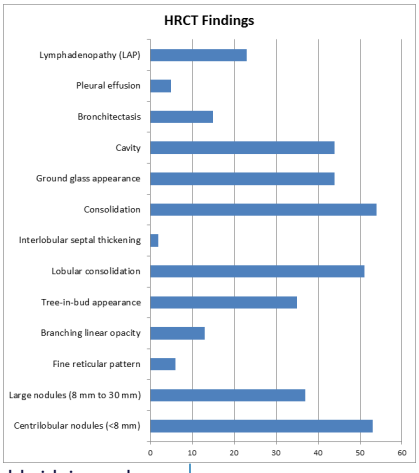
Graph No. 3 – In our study cough (74.0%) was the chief presenting complaint followed by dyspnea (65.0%). Third most common complaint was that of fever (56.0%). Less common symptoms were weight loss (43.0%), hemoptysis (23.0%), and night sweats (34.0%).

After detailed clinical work up, reviewing previous investigations patients were subjected to HRCT chest and on basis of HRCT pattern detected were grouped as follows. (Table No. 4, Graph 4).

Table No. 4 Distribution of patients on basis of HRCT patterns

(N=100)

S.No.	Lesions on HRCT	Number	Percentage
1.	Centrilobular nodules (<8 mm)	53	53.0
2.	Large nodules (8 mm to 30 mm)	37	37.0
3.	Fine reticular pattern	6	6.0
4.	Branching linear opacity	13	13.0
5.	Tree-in-bud appearance	35	35.0
6.	Lobular consolidation	51	51.0
7.	Interlobular septal thickening	2	2.0
8.	Consolidation	54	54.0
9.	Ground glass appearance	44	44.0
10.	Cavity	44	44.0
11.	Bronchiectasis	15	15.0
12.	Pleural effusion	5	5.0
13.	Lymphadenopathy (LAP)	23	23.0

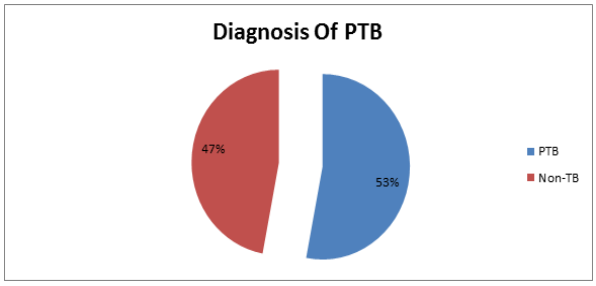


Graph No. 4 – According to our study the most common finding seen in on HRCT were nodules both centrilobular (n=53, 53.0%). Other important findings included both lobar (n=54, 54.0%) and lobular (n=51, 51.0%) consolidation, and cavities (n=43, 43.0%).Patients were subjected to further investigations like BAL, sputum culture, FNAC/biopsy and categorized into two broad groups. (Table No. 5, Graph 5)

Table No. 5 Distribution according to diagnosis

(N=100)

S.No.	Diagnosis		Number	Percentage
1.	PTB		53	53.0
2.	Non-TB		47	47.0
	S.No.	Non-TB distribution of diseases		
	a.	Interstitial lung diseases	32	68.0%
	b.	Malignancy	9	19.1%
	c.	Fungal disease	5	10.6%
	d.	Sarcoidosis	1	2.1%
	Total		100	100.0



Graph No. 5 - There were 53 (53.0%) patients in the PTB group and 47 (47.0%) patients in the Non-TB group (Table No. 6, Graph 6).

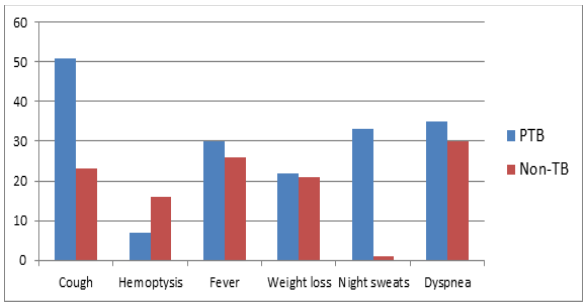
Clinical symptoms in two groups were statistically analyzed.

Table No. 6

Comparison of demographic and clinical features in the two groups

(N=100)

Characteristics	PTB		Non-TB		p value
	No.	%	No.	%	
Cough	51	96.2	23	48.9	<0.001
Hemoptysis	7	13.2	16	34.0	0.0175
Fever	30	56.6	26	55.3	1.0
Weight loss	22	41.5	21	44.6	0.840
Night sweats	33	62.3	1	2.1	<.001
Dyspnea	35	66.0	30	63.8	0.836



Graph No. 6 - Cough was the most common presenting complaint in patients with tuberculosis. Fever was equally present in both the groups. Hemoptysis was more common in non-tubercular patients. Weight loss and Night sweats were common in patients with tuberculosis.

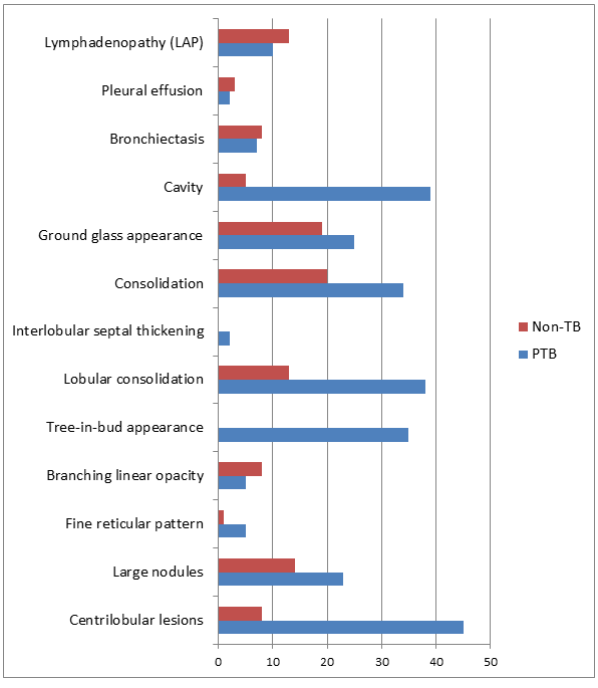
HRCT pattern in two groups were statistically analyzed.

Table No. 7

(N=100)

S. No.	HRCT lesions	PTB patients	Non TB patients	Total	p value
1.	Centrilobular lesions	45(86.5 %)	8(17.0%)	53(53.0 %)	<0.0001
2.	Large nodules	23(43.4 %)	14(29.8 %)	37(37.0 %)	0.213
3.	Fine reticular pattern	5(9.4%)	1(2.1%)	6(6.0%)	0.209
4.	Branching linear opacity	5(9.4%)	8(17.0%)	13(13.0 %)	0.373
5.	Tree-in-bud appearance	35(66.0 %)	0(0.0%)	35(35.0 %)	<0.0001
6.	Lobular consolidation	38(71.7 %)	13(27.7 %)	51(51.0 %)	<0.0001
7.	Interlobular septal thickening	2(3.8%)	0(0.0%)	2(2.0%)	0.496
8.	Consolidation	34(64.2 %)	20(42.6 %)	54(54%)	0.0491
9.	Ground glass appearance	25(47.1 %)	19(40.4)	44(44.0 %)	<0.5485
10.	Cavity	39(73.6 %)	5(10.6%)	44(44.0 %)	<0.0001
11.	Bronchiectasis	7(13.2%)	8(17.0%)	15(15.0 %)	0.780
12.	Pleural effusion	2(3.8%)	3(6.4%)	5(5.0%)	0.663
13.	Lymphadenopathy (LAP)	10(18.86 %)	13(27.65 %)	23(23.0 %)	<0.346

Statistically significant correlation was observed between presence of centrilobular nodules, tree-in-bud appearance, lobular consolidation, and cavity for diagnosis of pulmonary tuberculosis on HRCT. They all were highly significant with p value <.001.



Graph No. 7 - Centrilobular nodules, lobular consolidation, cavity were the most common findings in the tubercular group observed in 45 (86.5%), 38 (71.7%) and 39 (73.6%) patients respectively. LAP, GGO, large nodules and consolidation were the most common findings in the non-tubercular group observed in 13 (27.6%), 19 (40.4%), 14 (29.8%) and 20 (42.6%) patients respectively.

DISCUSSION

Infectious Diseases like tuberculosis are prevalent in South-East Asia especially India imposing a huge burden on our health care system. A large number of these cases go undetected due to low diagnostic accuracy. Hence in our cross-sectional study of 100 patients we tried to evaluate spectrum of MDCT findings in tuberculosis and its mimickers. Many of these patients have sputum negative which is mainstay in establishing diagnosis of PTB. Many other pulmonary pathologies mimics PTB on X-ray chest and clinical presentation. Hence, in this cross-sectional study we tried to evaluate HRCT pattern in such patients and find patterns which help differentiate PTB from mimickers.

The age of patients in our study ranged from 18 years to 85 years. The mean age was 35.4±16.4 years. Most of the patients were of age group 21-30 years. Mean age of the male patients was 38.9 16.8 years and 31.3 15.2 years for female patients. The mean age of the patients with pulmonary tuberculosis was 32.32 15.09 years and for the patients who were diagnosed non-pulmonary tuberculosis was 38.77 17.36 years. The age factor was not found to be significantly associated with an increase in the risk for PTB. In the study done by Nakanishi et al[3] the mean age of the patients with pulmonary tuberculosis was 62.6± 16.1 years and the mean age of the non-tubercular patients was 63.5±15.3 years. No significant association was demonstrated with age. The younger mean age in our study could be explained by the fact that ours being developing country has much higher exposure rate of tuberculosis and so occurs at a younger age as compared to the developed countries. In a similar study done by Tozkoparanet et al[4] in Istanbul the mean age of the patients with tuberculosis was 22.6±3.1 years and no significant association with tuberculosis was established even in this study. In a study done in Korea by Lee et al[5] the mean age was 40 years and young age was found to be significantly associated with increased risk for pulmonary tuberculosis.

Out of 100 patients included in our study 52 (52.0%) were males and 48 (48.0%) were females. Out of the 53 patients diagnosed with pulmonary tuberculosis 23 (43.4%) were males and the rest 30 (56.6%) were females. No definite association with any sex could be delineated. In the literature also no significant association of sex distribution with Tuberculosis was seen. In the study by Nakanishi et-al[3] out of the 47 tubercular patients were males however this was attributed to the fact that the percentage of male patients participating in the study was more (76 males out of 116 total patients). In a similar study by Lee et al[5] 19 out of 40 patients diagnosed with pulmonary tuberculosis were males and 21 were females. No significant association of pulmonary tuberculosis with gender was seen in these studies.

In our study chronic cough was found to be significantly associated with patients diagnosed of active tuberculosis. Among 53 patients with tuberculosis 51 (96.2%) patients had cough as the chief complaint. In the study done by Jung et al [6], Nakanishi et al[3] and Lee et al[5] cough was not found to be significantly associated with tuberculosis. In study done by Tozkoparan et al [4] cough was found to be associated more commonly with inactive tuberculosis. They gave the explanation of this finding that a relatively small amount of bacteria in smear negative disease could not stimulate cough receptors in the airways. However in our study cough and that too chronic was found to be significantly associated with tuberculosis.

A negative co-relation was demonstrated with symptoms of hemoptysis i.e. hemoptysis was seen more in patients who were diagnosed non-tubercular. Out of the 23 patients with hemoptysis only 7 (13.2%) had tuberculosis and 16 (34.0%) patients were non-tubercular. Similar finding was demonstrated by few studies done previously. Tozkoparan et al [4] gave an explanation for this finding that relatively small amount of bacilli in smear negative patients are not able to cause the pathological changes required to produce hemoptysis. In most of the other similar studies done in the sputum smear negative patients hemoptysis was not found to be significantly associated with tuberculosis.

In our study besides chronic cough and hemoptysis, night sweats were also found to be significantly associated with tuberculosis. Out of the 53 patients diagnosed with pulmonary tuberculosis 33 (62.3%) had history of night sweats and only one non-tubercular patient had history of night sweats. However no association with tuberculosis of this finding was seen in the previous similar studies. Present study did not show significant association of other clinical

features with tuberculosis. Fever was present in 56 (56.0%) patients out of which 30 (56.6%) had tuberculosis and weight loss was seen in 43 (43.0%) patients out of which 22 (41.5%) had tuberculosis. Dyspnea was seen in 65 patients out of which only 35 (66.0%) patients had tuberculosis and 30 (63.8%) patients were of non-tuberculosis group.

Although the clinical and laboratory findings between PTB and other pulmonary diseases rarely differ significantly, HRCT findings can differentiate them significantly. We looked for the following findings on HRCT thorax; centrilobular nodules, fine reticular pattern, large nodules, masses, branching linear opacities, tree-in-bud appearance, lobular consolidation, interlobular septal thickening, consolidation, ground-glass opacities, cavities, bronchiectasis, pleural effusion, lymph node enlargement.

Centrilobular nodules are well defined lesions in the centre of secondary pulmonary lobules which measures 2-4 mm in size and are separated from the pleural surface or interlobular septa by more than 2 mm. In our study the centrilobular nodules were found to be present in 53 (53.0%) patients out of 100. Out of which 45 (86.5%) were diagnosed as tubercular. The centrilobular nodules were significantly associated with the risk of tuberculosis with a p value of <0.0001. The association of centrilobular nodules with tuberculosis has also been demonstrated in previous studies. Nakanishi et al [3], Lee et al [5] and Tozkoparan et al [4] found centrilobular nodules to be significantly associated with tuberculosis. These nodules were mostly distributed in the upper lobes and apical segment of lower lobe.

Cavitary lesions in the lung parenchyma were found to be significantly associated with tuberculosis in our study with p value <0.0001. Out of the 44 (44%) patients with cavitatory lesions 39 (73.6%) were diagnosed as tubercular and 5 (10.6%) were non tubercular. Similar association was seen in the previous studies. These cavitatory lesions are seen usually with surrounding centrilobular nodules.

It is a branching linear structure with more than one contiguous branching side. This was the most specific finding seen in the patients of tuberculosis in our study though it was seen only in 35 (66.0%) out of the 53 (53.0%) patients diagnosed as tubercular. Similar findings are seen in study done by Nakanishi et al.

The other significantly associated finding was lobular consolida tion. Nodules of size <8mm into centrilobular nodules. Nodules of >8mm and <30mm were regarded as large nodules. Areas of consolidation demarcated by sharp margins corresponding to 1 or 2 lobules were regarded as lobular consolidation. The association of interlobular septal thickening was however fallacious as it was seen only in 2 patients. Pleural abnormalities are also common. However no significant pleural abnormalities were detected in our study though few cases did show evidence of pleural effusion.

The most important HRCT findings in our study were centrilobular nodules, cavity lobular consolidation and tree-in-bud appearance. In a similar study by Nakanishi et.al [3] the significant findings found to be associated with tuberculosis were the presence of large nodules, tree in bud pattern and lobular consolidation. Tozkoparan et al [4] found out centrilobular nodules, other small nodules, lobular consolidation and cavitatory lesions to be associated with tuberculosis. Lee et al [5] also found centrilobular nodules, tree-in-bud and cavity to be the most important findings as in our study. In the study by Jung et al [6] cavity and tree-in-bud pattern were found to be deterministic in the diagnosis of tuberculosis.

p-values depicting association of the various HRCT findings with tuberculosis in our study and other similar studies in sputum negative patients is tabulated as under:

	Our Study	Nakanishi et al [3]	Tozkoparam etal [4]	Lee et al [5]	Jung et al [6]
Centrilobular lesions	<0.0001	0.46	0.019	0.001	0.435
Other nodules	0.002	0.97	0.016	-	-
Large nodules	0.213	0.03	-	-	-
Fine reticular pattern	0.209	0.99	NS	-	-
Branching linear opacity	0.373	0.20	-	-	-
Tree-in-bud appearance	<0.0001	0.002	-	0.001	0.001
Lobular consolidation	<0.0001	0.02	0.017	-	-
Interlobular septal thickening	0.496	0.29	-	-	-
Consolidation	0.0491	0.47	-	0.662	0.726
Ground glass appearance	<0.548	0.81	NS	-	-
Cavity	<0.0001	0.82	0.001	0.002	0.05
Bronchiectasis	0.780	0.14	NS	-	-
Pleural effusion	0.663	0.24	-	-	-
Lymphadenopathy (LAP)	<0.346	0.97	NS	0.418	0.14

The high specificity demonstrated in our study could be due to the high prevalence of tuberculosis in our country and the low sensitivity and specificity of the smear examination producing false negative results.

Few of the cases also demonstrated miliary nodules distributed randomly miliary nodules being caused by hematogenous dissemination are smaller in size than centrilobular nodules caused by endobronchial spread.

Of the greatest importance in making diagnosis of active tuberculosis are findings of endobronchial spread of infection. On HRCT this is depicted by the presence of poorly defined centrilobular nodules or rosettes of nodules 2 to 10 mm in diameter branching and centrilobular opacities48. Pathologically these centrilobular nodules represent the presence of intra-bronchiolar and peri-bronchiolar inflammatory exudates, whereas the branching tree in bud correlates with the presence of solid caseous material filling or surrounding terminal or respiratory bronchioles or alveolar ducts. With more extensive disease coalescence of the centrilobular opacities occurs resulting in focal areas of bronchopneumonia. This explains the presence of centrilobular nodules and tree in bud pattern in our cases as well as the other similar studies.

SUMMARY AND CONCLUSION

Patients suspected of pulmonary tuberculosis, but with negative sputum smears for acid fast bacilli (AFB) cause an important medical problem in daily medical practice that is difficult to analyze as the clinical features, laboratory findings as well as/the chest X-ray findings of the common pulmonary infections are not specific or deterministic. Clinicians find it difficult to decide whether antitubereulous therapy for these patients is to be initiated or not. Prompt initiation of antitubereulous therapy for PTB is required for the effective control of the disease. However treating an inactive patient may cause avoidable side effects including drug-induced hepatitis, particularly in the older individuals and those with chronic liver diseases.

All of the patients in our study had their sputum smears negative for AFB and they were suspected tubercular on the basis of clinical features and/or chest X-ray findings. Although the clinical and laboratory findings between PTB and other pulmonary diseases are quite similar, HRCT findings can differentiate between them to a greater extent. The present study showed that cavity, centrilobular nodules, tree-in-bud appearance, lobular consolidation and other nodules on HRCT were significantly associated with an increased risk for PTB.

To conclude the main role of HRCT for diagnosing PTB is the selection of probable or highly suspected PTB among patients with pulmonary infiltrates of unknown aetiology and with negative sputum smears in whom HRCT can predict the risk of PTB by depicting characteristic findings for PTB. It can also exclude other diseases and select patients that are difficult to diagnose with a pretest probability of PTB while missing only a few of those that are clearly positive for PTB.

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